

# In Search of New Approaches to the Problem of Quality Adjustment in CPI

Don J. Sellwood

**Abstract:** This paper argues that the methods used to allow for quality changes in consumer price indices fail to yield acceptable results. It examines the assumptions and concepts underlying current practice from a number of alternative research paradigms. It restates the acknowledged reservations on the concept of normative consumer rationality on which utility theory and quality valuation are based. It suggests that utility is descriptive of all and every consumer decision but predictive of none. However reasonable the behavioural predictions of utility may seem they are no more than a restatement of the assumptions underlying the theory. Methodologically, if an entity serves no purpose but to maintain a pre-existing belief in the nature of the economic world parsimony requires that it should be dropped. Empirical results derived from methods based on the theory of utility, such as hedonic regression, need not be discarded but must be re-evaluated for what they can say about consumers' quality valuations. Normative models of rationality do not explain consumer choice. According to empirical studies in psychology and alternative research perspective such as social theory, neuroscience and evolutionary theory, rationality is always bounded and governed by a complex of influences on the decision maker; including context, culture, self image and personal history. The information taken into account in a particular purchase is always limited. Given this complexity there can be no faithful mechanism whereby a consumer valuation of quality can manifest itself in actual observed price differences and such differences cannot be equated to such valuations. There is no one hidden hand 'the market' but many hands. Further the paper suggests that a general notion of quality is misleading. Quality is not a phenomenon, a physical thing in the world. It cannot exist without a consumer. The specifications or characteristics of products relate to real things. Quality is an attribute assigned to these things by the consumer. Research should focus on exemplars, or prototypical examples, of quality changes. Results from existing methods, in particular the valuation of quality as observed differences in prices, should be assessed by reference to appropriate criteria which have yet to be established and agreed. Objectivity in quality adjustment should be seen as long-term inter-subjective agreement on standard procedures that yield results which are acceptable against such agreed criteria.

## 1. Introduction

Despite more than twenty years working in or around consumer price indices I have yet to come across a "quality adjustment" that I would regard as exemplary, an example that could be widely seen as a prototype. This paper is an attempt to say why this should be the case. It is a response to arguments made at earlier meetings of the Ottawa Group and I acknowledge with gratitude earlier discussions with Jack Triplett, Erwin Diewert, Bohdan Schultz and Paul Armknecht on this subject. They and the work of others, particularly Ralph Turvey, Leendert Hoven, Brent Moulton and Robin Lowe, have prompted me to look in more depth at the problems of quality and quality adjustment in consumer price indices.

In her testimony to the Senate following the Boskin Report, Katherine Abrahams, Commissioner of Labor Statistics, said of the benefits of improved knee surgery techniques that the greater mobility given to patients was of undoubted value but "there is no obvious or clearly objective way to quantify that value." She gave a list of examples of quality adjustments that had been made to take account of changes

in the reliability or durability of new cars. She did not, and I am sure would not, describe these as either obvious or clearly objective. Nevertheless, she might have claimed that they were indubitably quality improvements and therefore warranting adjustment. This seems to sum up the problem of quality, we all agree that it “exists” but we do not agree on what it is that exists or how to allow for it.

This paper reflects a conviction that the problem of quality will not be solved by the next generation of index compilers repeating the same routines that have been followed over the past twenty years in the vain hope of containing the problem. It is not simply a matter of finding the best of existing practice. If real progress is to be made then new insights and understanding are necessary. The paper argues that it is the way that we talk about quality that inhibits our progress. The concepts, theories, methods and procedures that are now part of the culture of CPI construction and use are entrenched to the extent that they allow only certain ways of thinking. What is required is not new empirical practices based on the existing paradigm but a new paradigm. This involves a re-analysis of the elements of quality, and distinctions to be made between its various manifestations. It ends with a plea for an agreed convention on how to treat a strictly limited number of cases where existing or new procedures yield “acceptable” results.

I make no claim to have found the answer, but I hope that I have elaborated the problem in a way that will help others in a fruitful direction. In my search I have encountered many well established but different ideas relevant to the way in which consumers choose between, and value, different products. In my view these different perspectives all raise serious and specific doubts about the precepts underlying current approaches. Given the recent renewal of criticisms of CPIs for their failure to take due account of quality change, addressing these specific doubts may at least lend credence to existing practices.

## **2. Background - Current approaches**

Any procedure for calculating a CPI when an item in the sample is replaced involves a judgement as to quality change. Quality judgements are called for whenever there is a change in the specification of an item in the sample. That is, whenever an item chosen for pricing in the sample has to be replaced by another item, a new model or another brand. The price of the original or replaced item (or an estimate thereof) is used in the index in one month and that of the replacement item in the next month. The price change may be computed in a variety of ways but all necessarily imply a specific allowance for the change in quality, a “quality adjustment” of the price difference between the replaced item and its replacement.

Planned revisions of the sample, or the unforced replacement of some or all of the representative items, do not necessarily require quality adjustment. Whenever the weights of an index are updated and a link is made the sample may be updated. This could be done annually. However, it has to be recognised that annual updating cannot circumvent the quality problem. That is to say that “forced” replacement of an item in the sample because of model replacement should not be treated by linking even in a chain index. This is in effect the same as automatic linking and equivalent to assuming the price difference between items and their replacements are entirely due to quality change. If items available to the consumer are changing in quality then adjustments for quality change arise whatever the frequency of weight updating.

Armknrecht and Moulton<sup>1</sup> have provided a good description of the practices currently followed to deal with quality change. The essential points they make are:

---

<sup>1</sup> Armknrecht and Moulton, (US Bureau of Labour Statistics), Proceedings of International Conference on Price Indices, Stockholm, Sweden, November 1995.

- (i) quality adjustments are necessary when a priced variety is permanently missing from the CPI sample;
- (ii) adjustments are made by:
  - a) direct adjustment - with estimations made by either
    - (i) price collector,
    - (ii) expert or
    - (iii) hedonic regression;
  - b) imputation using:
    - (i) overlap prices, including linking,
    - (ii) overall means, imputing the average change for the stratum, or
    - (iii) class means, imputing a relevant mean change, e. g. that for new varieties.

They show that different results are obtained by the different procedures and indicate the need for further studies. They stress that "practitioners must be selective and use the most appropriate imputation procedures based on pricing practices." However, there appears to be little evidence that index compilers have undertaken studies of actual "pricing practices".

Imputation in the above taxonomy covers the practice of "linking" (either automatic linking or linking after due consideration). This and the use of the mean of movements of other prices in the stratum to project a missing price which is then subsequently replaced are variations on the overlap price method. This assumes that the difference between the projected price for an item and the price of its replacement has been determined by the market and takes account of any quality difference. An assumption which requires justification, particularly where there is any indication that the prevailing pricing practice is to take the introduction of a new model as an opportunity to increase price. It may be tested by an examination of the scale of implicit quality adjustments resulting from such imputations. The use of class means recognises that missing prices may not be typical of the stratum in which they occur and requires the computation of an appropriate group index for, say, new varieties but the quality adjustment issue remains.

Bohdan Schultz has shown<sup>2</sup> that any imputation procedure for missing or replacement items involves an implicit quality adjustment which can be expressed in terms of the available prices. In the case of the overlap price procedure and linking, the adjustment factor is the ratio "replacement price/replaced price" in the overlap period or at the link. For other procedures the implicit adjustment factors are relatively simple functions of base and/or other prices in the elementary aggregate or of other prices used for the imputation. These implicit quality adjustments can therefore be computed from CPI data where such data are retained.

Schultz gives some results for clothing which show that implicit adjustments for all of the six items examined contributed to a decrease in the official price index (Schultz para 5.b). Although it did not necessarily follow that the CPI underestimated the true price movement the amplitude of the factors was in some cases too great to be ignored. For example he found it hard to believe that "the average quality

---

<sup>2</sup> Bohdan Schultz (Statistics Canada), Proceedings of International Conference on Price Indices, Stockholm, Sweden, November 1995.

for dress shirts improved by 50 % during the period in question, when no major changes in shirt design or fabric took place". This and other, mostly unpublished, evidence indicate that current practices for making quality adjustments lead to unacceptable results. The extent of the errors may depend on the rules and procedures for identifying replacements (and hence the numbers of adjustments) as well as on the specific explicit or implicit adjustments made.

The adjustments that are made may be summarised as depending on either

a) an individual determination of the price equivalent of a quality difference. The individual, a price collector or an "expert." (in some cases more than a single individual may be involved) is called upon to make a judgement on behalf of the consumers who are covered by the index.. The judgements include the judgement that price differences are entirely due to quality difference.

or

b) an assumed relationship between the prices that are observed or observable and the quality difference. The consumers' evaluation of which is expressed in the prices charged as a result of the operation of the market.

The former may sometimes be described as "subjective" and the latter as "objective" but the question that has to be answered is whether satisfactory warrants can be established for either of the above approaches and, if so, in what circumstances. Subjective approaches can only be judged by the results they give and this requires index compilers to calculate the cumulated effects of such decisions. This also applies to the objective approaches but in this case it is possible to examine the rationale given for them.

### **3. The classical economic approach to quality**

The paradigm governing the "objective" treatment of quality changes in CPIs derives from classical economic theories of the behaviour of consumers, of suppliers and of the market. These involve a number of assumptions which have been extensively examined and defended. North<sup>3</sup> suggests that "Perhaps the best summary of the neo-classical behavioral assumptions was made by Sidney Winter. He argues that there are seven steps to what he calls the classic defence of neo-classical behavioral assumptions. They are :

1. The economic world is reasonably viewed as being in equilibrium.
2. Individual economic actors repeatedly face the same choice situations or a sequence of very similar choices.
3. The actors have stable preferences and thus evaluate the outcomes of individual choices according to stable criteria.

---

<sup>3</sup> Douglas C. North, *Institutions, Institutional Change and Economic Performance*. C.U.P 1990. He notes "The extensive literature dealing with these issues is best seen in the proceedings of a conference held at the University of Chicago in October 1985 entitled *The Behavioral Foundations of Economic Theory* (Hogarth and Reder, eds.). At this conference a large number of psychologists, economists, and a few members of other social science disciplines gathered and explored fruitfully the complexities and issues involved in the behavioral analysis employed by economists. In addition, see the survey by Mark Machina in the first issue of the *Journal of Economic Perspectives* (1987), the 1987 Annual Lecture to the Scottish Economic Society given by Frank Hahn (Hahn, 1987), and *Rationality in Economics* by Shaun Hargreaves-Heap (1989).

4. Given repeated exposure, any individual actor, could identify and would seize any available opportunity for improving outcomes and, in the case of business firms, would do so on the pain of being eliminated by competition.
5. Hence no equilibrium can arise in which individual actors fail to maximize their preferences.
6. Because the world is in approximate equilibrium, it exhibits at least approximately the patterns employed by the assumptions that the actors are maximizing.
7. The details of the adaptive process are complex and probably actor and situation specific. By contrast, the regularities associated with optimization equilibrium are comparatively simple; considerations of parsimony, therefore, dictate that the way to progress in economic understanding is to explore these regularities theoretically and to compare the results with other observations.

North adds the rider that “It is important to emphasize a particular point here. The behavioral assumptions that economists use do not imply that everybody’s behavior is consistent with rational choice. But they do rest fundamentally on the assumption that competitive forces will see that those who behave in a rational manner, as described above, will survive, and those who do not will fail; and that therefore in an evolutionary, competitive situation (one that employs the basic assumption of all neo-classical economics of scarcity and competition), the behavior that will be continuously observed will be that of people who have acted according to such standards.”

The economic theory of rational consumer behaviour is Subjective Expected Utility Theory. This makes four basic assumptions about decision makers<sup>4</sup>:

- a) That they have a clearly defined utility function allowing a cardinal number to be assigned as an index of preference for each of a range of future outcomes.
- b) That they have an exhaustive view of possible alternative strategies open to them.
- c) That they can create a consistent joint probability distribution of scenarios for the future associated with each strategy.
- d) That they choose between alternative strategies in order to maximise their subjective expected utility.

---

<sup>4</sup> James Reason. Human Error, Cambridge University Press 1990.

The theory it is argued does not depend critically on these assumptions. Varian<sup>5</sup> points out that one “can ask what axioms about a person’s choice behaviour would imply the existence of an expected utility function that would represent behavior. Similarly, we can ask what axioms about a person’s choice behavior would imply the existence of subjective probabilities; i.e. that the a person’s choice behavior can be viewed as if he were evaluating gambles according to their expected utility function with respect to some expected probability measures”. As it happens, he says “such sets of axioms exist and are reasonably plausible.” Varian argues further that “A utility function is often a very convenient way to describe preferences, but it should not be given any psychological interpretation.” Utility is thus not directly observable, but this does not seem to be a serious problem since, “normally, a consumption bundle that maximises utility will also minimise expenditure and vice versa”. This means that the Hicksian demand function at a given utility is the same as the Marshallian demand at a specific income. The Marshallian demand function is the ordinary market demand function which is observable because it is expressed as a function of prices and incomes which are themselves observable.

#### **4. Critique of classic approaches**

North’s reaction to Winter’s seven points above was:

1. For some purposes the concept of equilibrium is a valuable tool of analysis, but for most of the issues that we are concerned with there is not one equilibrium, but multiple equilibria that arise because “there is a continuum of theories that agents can hold and act on without ever encountering events that lead them to change their theories” (Hahn, 1987, p. 324).
2. Although individual actors face many repetitious situations and, as noted above, can act rationally in such situations, they also are confronted with many unique and non repetitive choices where the information is incomplete and where outcomes are uncertain.
3. Although Becker and Stigler (1977) have made an impressive case for relative price changes accounting for many apparent changes in preferences, the stability issue is not so easily dismissed. Not only do anomalies show up at the disaggregated level at which psychological research has been conducted, but certainly historical evidence suggests that preferences over time change. I know of no way to explain the demise of slavery in the nineteenth century that does not take into account the changing perception of the legitimacy of one person owning another.
4. Actors would certainly like to improve outcomes, but the information feedback may be so poor that the actor cannot identify better alternatives.
5. Competition may be so muted and the signals so confused that adjustment may be slow or misguided and the classic evolutionary consequences may not obtain for very long periods of time.
6. The condition of the world throughout history provides overwhelming evidence of much more than simple rational non co-operative behavior.

---

<sup>5</sup> Hal R. Varian, *Microeconomic Analysis*, Norton 1992.

7. The behavioral assumptions of economists are useful for solving certain problems. They are inadequate to deal with many issues confronting social scientists and are the fundamental stumbling block preventing an understanding of the existence, formation, and evolution of institutions.”

There are no doubt many critiques of this critique but it seems to make some points that apply with considerable force in the context of quality adjustment.

The rationality of individuals (consumers) has been widely researched and this has resulted in many other doubts about the assumptions made in classical economics. Herbert A. Simon in his Nobel Prize recipient lecture put it thus:

"The refutation of the theory has to do with the *substance* of the decisions, and not just the process by which they are reached. It is not that people do not go through the calculations that would be required to reach the SEU decisions — neo-classical thought has never claimed that they did. What has been shown is that they do not even behave *as if* they had carried out those calculations, and that result is a direct refutation of neo-classical assumptions."

Reason<sup>6</sup> notes that “The formal theory requires that the decision maker comprehends the entire range of possible alternatives, both now and in the future; but the actuality is that human beings, even when engaged in important decisions, do not work out detailed future scenarios, ... Rather, the decision maker is likely to contemplate only a few of the available alternatives ...they often neglect seemingly obvious candidates.”

Eberle and Hayden<sup>7</sup> also point out that people do not behave so as to maximize subjective expected utility. "There was no empirical base or even introspection that would indicate human rationality should be defined 'as the maximization of an objective function over a conserved entity' (Mirowski 1987)." They maintain that Jevons, Walras, Edgeworth and nearly every other early neo-classical economist admitted that they were “borrowing the physical metaphor to render consumption theory a mathematical science”. Their main argument is that the theory is not consistent with the behaviour of an open system. Real world systems are composed of cultural values, social beliefs, personal attitudes, technology, social institutions, and the natural environment. Social systems are structured by myths, constraints, rules, customs, beliefs, legal codes, and the like.

It seems, on this evidence “reasonable” to conclude that consumer behaviour is far from the normative model of rationality suggested by Subjective Expected Utility Theory. The theory of utility is certainly elegant but claims that the “non-observable” is observed indirectly through functions the properties or form of which are not themselves observed (or observable) but are derived from assumptions or axioms, which however plausible, are rather difficult to accept without empirical support. To postulate the existence of a concept such as utility for the purpose of mathematical conjecture is surely rational. To proceed from there to draw conclusions about human rationality on the basis of that existence seem only to confirm its non-existence in practice.

---

<sup>6</sup> James Reason, *Human Error*, Cambridge University Press 1990.

<sup>7</sup> Eberle and Hayden, *Journal of Economic Issues* 3 Sept. 1991.

The failure of the classical theory, and the empirical methods based on it, to yield satisfactory quality adjustments seems unsurprising given the gap between its assumptions about consumer behaviour and actual behaviour. A few of the large number of hedonic regressions which have been carried out might be expected to yield significant results by chance. The failure arises at the conceptual level, the concept of rationality does not represent actual behaviour and without a “rational” decision process it is difficult to see by what mechanisms the “market” could be said to reflect consumers’ valuation of the quality of a product or a product characteristic. If consumer preferences are not observable then presumably producers and sellers set prices according to their own prejudices. However, *I come to raise Caesar not to bury him*. In response to a similar arguments against the “cost of living” concept at the Ottawa meeting Jack Triplett rightly posed the question “What is the alternative?”

There may be no alternative but to appeal to some higher concept or principle. The problem is to establish the most appropriate concept. Maybe knowing more about the way that our rationalisations can lead us astray can help us to avoid some of the pitfalls in defining the concepts we use. A social theorist might argue that what the classical economist does is just what all humans attempt to do in order to understand the world. Indeed the same has been said of those working in the most “objective” of human activities, the natural sciences. Popper<sup>8</sup> maintained that science creates "at will artificial conditions that either exclude, or reduce to zero, all the interfering or disturbing propensities." Thus, gravity is described on two bodies rather than three when the results become unpredictable. Popper also distinguished 3 worlds: World 1 the physical world, World 2 mental representations, and World 3 social consciousness, traditions, theories, institutions and non-material culture including mathematics. Meanings are in the shared understandings of human beings which are not in World 1 realities but in Worlds 2 and 3<sup>9</sup>. For the economist World 1 involves the physical interactions of bodies that are the very stuff of Worlds 2 and 3.

This social theoretic perspective has been taken up by a number of scientists in attempting to avoid the pitfalls of poor conceptualisations. Rose<sup>10</sup> argues similarly to berate neurogeneticists who he thinks are prone to faulty conceptualisation. He maintains that "in any search for explanation and intervention it is necessary to seek the appropriate level that effectively determines outcomes". He refers to “naive neurogenetic determinism” as “based on a faulty reductive sequence whose steps include: reification, arbitrary agglomeration, improper quantification, belief in statistical normality, spurious localization, and dichotomous partitioning between genetic and environmental causes." One might, again, ask “What is the alternative?” to which the reply can only be “None but each step must be taken with greater care.”

We can perhaps understand the point that Rose makes by applying his first steps<sup>11</sup> to the concepts of quality, rationality and utility:

**Reification**, according to Rose converts a dynamic process into a static phenomenon. Rather than a process of choice and evaluation “rationality” becomes a normative decision in the determination of

---

<sup>8</sup> Robert E. Ulanowicz, ‘Evolution, Order and Complexity’, Routledge Frontiers of Political Economy 1996, Edts Khalil & Boulding.

<sup>9</sup> Davis and Hersh, Mathematical Experience, Penguin 1990.

<sup>10</sup> Steven Rose, The rise of neurogenetic determinism, Nature vol . 373, 2 Feb. 1995.

<sup>11</sup> The remaining steps are briefly:

**Belief in normality** assumes that any given population of quantified values take a continuous Gaussian form; preferences are assumed to be transitive monotonic etc.

**Spurious localisation** disarticulates the phenomenon and attaches it to a part; easily identified characteristics are assumed to account for all of the quality differences

**Misplaced causality** mistakes correlation or consequence for cause; if there is a single thing called alcoholism there is a single cause; rational choice and decision are assumed to cause price differences

**Dichotomous partitioning** price differences are market decisions or inflation (part quality and part inflation) rather than a complex of factors.

All this leads to the **subversion of scarce resources** so that research effort becomes misfocussed. Effort goes into hedonic studies.



“quality” which in turn becomes a property of the good or service rather than an observer dependent attribute. “Utility” becomes that “thing” for which every consumer strives. According to discourse theory:<sup>12</sup> “The human ability and tendency to reify (‘thingify’, or make real) can, over time, create thought patterns so grandiose that they obscure the daily practices of life from which these categories are primordially derived. .... Such reifications then tend to ignore, even deny, the most obvious evidence arising from the lifeworld. ... It is difficult enough to overcome one's own habits of thought and action, much less confront the combined sedimented habitual components of others en mass. But that does not make them external to human invention; that does not make them an ontologically external monolith.” It is therefore necessary to deconstruct, unpack or disaggregate the mind-numbing categories.

**Arbitrary agglomeration** lumps together reified interactions all as exemplars of one thing. “Quality change” is thus used to describe changes arising from a variety of sources; technological factors, taste or fashion and from services attached to sales. “Rationality” is assumed to apply to all purchasing decisions in which one thing “utility” is maximised as if all outcomes were in essence the same and the agglomeration is itself reified as “the market”.

**Improper quantification** argues that the reified and agglomerated phenomena can be given numerical values. Thus it is assumed that all “quality characteristics” can be expressed in terms of prices, rather than that only some changes in particular goods or services be may quantified under certain well defined circumstances. “Rationality” and “utility” are observable in demand curves, rather than that the results of consumer decisions in certain restricted situations exhibit a common pattern.

Another way of expressing the difficulties of developing and applying utility or other economic theories was given by Samuels<sup>13</sup>. He argued that “Facts, at least those of any significance, are generally theory laden. They do not exist independent of the theory by which they are facts; and theories are what they are in part because of certain readings of the putative or ostensible facts. Among other things, descriptions embody theories. .... Theories are tautological in two interrelated senses. First, the conclusions of a theory are tautological with, - that is, derived from and give effect to - its assumptions, including the specification of its central problem. ... One implication of the tautological character of a theory is the possibility of excluding from it all the variables that, as complications, would prevent the desired result from being reached”.

Pattee<sup>14</sup> makes a similar point “the model is related to the world only through explicit observables. All other aspects of the model are essentially imaginative constructs that, beyond generating predictions, appear to be ontologically moot, and are justified only by highly informal metaphysical interpretations, and by aesthetic values such as simplicity, coherence, and elegance.” He might have said that models are ontologically mute in that they can show nothing of reality.

Smedsland takes this argument about the tautological nature of theories much further with respect to behavioural theories which he maintains are only true by virtue of the meanings of the words used. For example,

---

<sup>12</sup> I regret that I am unable, at the time of writing, to attribute this rather nice statement of the meaning and danger of reification.

<sup>13</sup> Warren J. Samuels, The Roles of Theory in Economics, in *The Role of Economic Theory*, edited by Philip A. Klein, Kluwer Academic, 1994.

<sup>14</sup> Howard H. Pattee, The Problem of Observables, in *Evolution, Order and Complexity*, Routledge Frontiers of Political Economy 1996, Edts Khalil & Boulding.

“Axiom 8: *Person P tries to perform act A in context C at time t, if and only if A is the act which, for P in C at t, has the highest expected utility.* The act with the highest momentary expected utility is the act for which the product of the likelihood of achieving a goal and the value of that goal is the highest among the alternatives available at a given moment. This principle embodies how we talk about reasons for action. All attempts to state the reasons for an act in ways which contradict this axiom fail to make sense.”<sup>15</sup>

Thus we can see that to say a consumer maximises their utility when they make a purchase is not to say anything new. The statement reduces to something like “When a consumer decides to make a choice in a given context they make the best choice for themselves in that particular context.” Thus “utility theory” is necessarily descriptive of all consumer decisions but it is predictive of none, of itself it can provide no insight into the choices or valuations that consumers actually make.

Kurt Dopfer<sup>16</sup> explains how order emerges to enslave or lock in individual behaviours. "whenever an explanation about an event in the world is called forth, a set of answers is provided that not only provides an answer to the problem but also - in answering the problem - confirms the status of the ideology on which the answer is based." This not only happens to generate stabilities in consumer behaviour it also explains how the preconceptions of neo-classical economics persist. "It is a paradox that scientific theories have a high capacity to survive, not because they are objective and without ideology, but just because they have a capacity to restate their major propositions in terms that make them immune against challenges from outside." The neo-classical response to all this is thus likely to be that it is outside the realm of economics. These theories apply to the behaviour of all humans, economists, scientists, consumers and producers. We can but remember that we are human.

## 5. Other kinds of rationality

*“When I use a word it means just what I choose it to mean - neither more nor less.”*

Humpty Dumpty<sup>17</sup> might have had “rationality” in mind when he said this. Various researchers have attempted to capture the rationality of the consumer (human thinking) and in doing so have differentiated the concept according to their research paradigm. In order to cope with the failure to follow obviously sensible norms concepts like “Bounded Rationality” were developed. According to the model consumers always take rational decisions within the bounds of the information which is at hand at the time of the decision. They do not, however, always spend much time seeking to establish and find the appropriate information. Such rationality is characterised by satisficing behaviour, settling for the satisfactory rather than the optimal, and by the use of “heuristics”, or rules of thumb, such as the availability and representative heuristics famously researched by Tversky & Kahneman. This imperfect rationality can lead to particular shortcomings when judged against the normative model. Heuristics of representativeness, (like causes like) lead to the failure to appreciate base or conditional probabilities - Bayes’ theorem. The availability heuristic (things are judged more frequent the more readily they come to mind) lead to things, e.g. “all other problems” not being represented in the analysis and discounted in

---

<sup>15</sup> Jan Smedslund in *Rethinking Psychology*, edited by Jonathan Smith, Rom Harré and Luk Van Langhenove, Sage 1995.

<sup>16</sup> Kurt Dopfer, *Journal of Economic Issues*, Vol. XXV, No. 2, June 1991, Towards a Theory of Economic Institutions (where an economic institution is any correlated behavior of agents that emerges either by self-organization or by policy prescription, and that reoccurs under the same or similar conditions).

<sup>17</sup> Lewis Carroll, *Through the Looking Glass and What Alice Found There*.

the decision.<sup>18</sup> Thus breaking down one quality change into a number of sub-components may increase its perceived value.

Reason (see footnote 6) identifies two fascinating and easily recognised strategies mediated by bounded rationality. ‘Thematic vagabonding’ flitting from issue to issue and ‘encysting’ lingering at length over the trivial whilst ignoring the important.

Richard Thaler<sup>19</sup> argues that basing the economic theory of the consumer on a rational maximising model fails to recognise that in certain well defined situations consumers act in a way that is inconsistent with economic theory. He proposes Kahneman and Tversky's prospect theory as an alternative basis. The endowment effect is the tendency of people to value an object more highly if they possess it than if they do not. Tversky and Kahneman suggest, by reference to utility theory, that the endowment effect implies that indifference curves shift in a systematic way when individuals acquire goods. Festinger's theory of cognitive dissonance provides support for this view. He noted that people tended to change their minds when confronted with a gap, or inconsistency, between action and belief, or between one belief and another. Thus once they have decided to buy a particular model of car, they seldom admit they have made a mistake. Rather, all sorts of reasons to justify their action occur to them. There is thus an argument for taking a “retrospective” view of quality changes, though this might make the association with purchase price more difficult.

Scott D. Roberts<sup>20</sup> suggests an approach which takes in the personal, social and contextual factors affecting consumer choice. He prefers to follow the ideas of Eric Wolf, an anthropologist, who defined four exhaustive 'funds' or categories of consumption for which economic resources are set aside; fund for rent, the subsistence fund, the replacement fund and the ceremonial fund. These are, supposedly, left over from feudal times. Rent has obligatory claims, subsistence relates to minimal food intake, the replacement fund is for equipment for working and for consumption (e.g. cooking) and the ceremonial fund is to meet social needs. These categories are required by their socio-economic and cultural context outside of which the consumers' consumption preferences cannot be understood.

Other theorists see a consumer's decisions as driven mainly by his or her self image. This accords with a wide body of socio-psychological research where both individuals and societies are seen as continually constructing, deconstructing and reconstructing themselves, as they attempt to cope with the world in which they find themselves.

Thus we see that, according to a number of researchers, individual consumers behave in highly complex ways that may be characterised by heuristics or rules of thumb. Choices are context dependent, what comes to mind is what is near in time or results from some association that is a function of the consumers' social and cultural context rather than of the goods or services.

---

<sup>18</sup> Fischhoff et al., *Journal of Experimental Psychology*, 1978, 4.

<sup>19</sup> Richard Thaler, "Towards A Positive Theory of Consumer Choice", *Journal of Economic Behavior and Organization*, 1 (1980)

<sup>20</sup> Scott D. Roberts, Rethinking resource allocation in modern society: A meaningsbased approach, *Journal of Economic Psychology* 12 (1991).

## 6. The physiological determinants of consumer's choice

Human and hence consumer reasoning has been studied more closely still. Over the last 10 or 20 years great strides have been made by neuroscientists in understanding the development and operation of the human brain and numerous philosophers, psychologists, therapists etc. have used these findings to develop new theories of behaviour; the ways individuals act and think. Though debate continues there is a fair measure of agreement that normative rationality is not a good model of consumer rationality. Neuroscience has discovered enough about how learning must take place that we can reject many of our preconceived notions. Evolutionary theory suggests that following the normative model may not be a good strategy. One evolutionary biologist, Richard Dawkins, suggests that "God's utility function" maximises the survival of the genes.

My reading of Freeman<sup>21</sup> and others suggests that the following seems to be widely agreed:

- a) that the new-born has only the potential to become an adult it "knows" nothing and can do very little;
- b) all new-borns are programmed to grow if appropriately nourished both with food and sensual experiences; they have potential e.g. for language;
- c) all new-borns are programmed to explore the environment in which they find themselves; this may be at the root of the constant human, consumer, pursuit of novelty;
- d) the programming is the product of evolution and involves a genetic blue print and a variety of biochemical components. The content and form of which is a function of all aspects of the experience of its ancestors;
- e) in probing its environment the new-born experiences various sensations and on repeat probing expects the same sensation; the basis of rational expectations, events tend to recur;
- f) if the sensation is different the new-born will note the difference, as close match with previous experience will act as a reinforcement. Much of learning depends on detection of difference but action relies on there being no difference so that repetition will produce the same outcome, consumers prefer not to have to think;
- g) the accumulated experiences lead to a representation of the environment being recorded in the brain together with the probings (movements, etc.) which produced them; these latter become established as habits which save the trouble of thinking;
- h) the individual thus obtains an increasingly detailed representation of its environment and a set of behaviours which allow it cope with, to further explore and sometimes to influence its, by now mostly social, environment;

---

<sup>21</sup> Walter J. Freeman (University of California, Berkeley), *Journal of Consciousness Studies* 4, No. 1, 1997 and Laurence Erlbaum, *Societies of Brains* 1995.

- i) some probings of the environment will seem more successful, e.g. for relieving hunger, than others, these will be accompanied by a flood of electro-chemical activity across wide areas of the brain. Emotional responses arise in this way and can have unpredictable results leading to seemingly irrational behaviour;
- j) the representation of the environment is “distributed”, with different areas of the brain recording different experience, sensori-motive, colour, sound, movement in the visual field, faces, etc. New experiences or situations will interact with many different areas of the brain with no guarantee that the associations triggered are those that are required by a normative model;
- k) failure of probings leading to pain or discomfort likewise lead to strong responses and impact in those areas where representation occurs; negative associations may also be without obvious logic;
- l) the strong responses are also represented in the brain and can be reactivated as can other representations in dreams and imagining.

This basic learning process is facilitated by the programming which guides the development of connections between neurones in specific areas of the brain and the release of chemicals to make these. The constituents for certain representations may only be there for a limited time. A representation is not like a picture. There is no analogue of “daddy” in the child’s brain. Rather daddy can be brought to mind by reactivating the traces of previous experience. Likewise thinking in order to choose between one motor car and another will involve associations which reactivate previous experiences. To follow the normative model humans have to behave contrary to their basic design; the way they have evolved.

The brain has been conditioned by evolution to have a potential for speech. Language is just another way that the individual can probe its environment, seeking to predict and to control. At first, copying or repeating is automatic. Each individual is but a long line of copies and copiers. In time, the representations allow increasingly complex probings with words and patterns of words and even with economic models. Again specific areas of the brain are dominant but wide areas are activated and changed with the use of words.

The individual learns behaviours, scripts and roles, copied from those around them. They learn to think by following the expressed thoughts around them. A child will believe the beliefs that are not questioned and those that are held by persons who are loved or approved. If a particular form of rationality is valued by them then the child will try to copy it. It is important to note that what matters in what the child learns is whether the learning is helpful. Truth and accuracy are not the point. The issue is whether what the child has learned helps it to cope in its environment which is predominantly a social environment. “Rationality” on the normative model is only “helpful” if the price (time) of search for information does not carry too high a price. The model is not used and is not learned and extensive tuition would be necessary to change matters. That is not to say that the idea of such rationality is not part of the culture. It clearly is and is used to support positions other than those taken by classical economists.

Freeman and others look to non-linear dynamics to model brain function and hence thinking. He argues that “The implication of the dynamical model is that the meaning of a stimulus is different for everyone who receives it, because the sum of experience for each of us is unique. Since the sensory activity is washed away, and only the construction is saved, the only knowledge that each of us has is what we construct within our own brains. .... Each successful stimulus also invokes a learning experience, so that a person is changed by it, and new experience accumulates. As existentialist philosophers from Kierkegaard to Heidegger and Sartre have concluded, each of us constructs ourselves by our own actions.”

Shared knowledge, such agreement as exists on values or quality, is accounted for by our shared experiences of community, language, and culture. I now turn to the influence of these on the consumer.

## 7. Cultural determinants of consumer choice

It may seem obvious that the way an individual thinks is, in part, determined by his or her community, language and culture, but their influences are highly complex and by no means obvious. These influences have been widely studied and the following observations attempt to pick out some of the central themes which have emerged and which seem of potential interest in the understanding of consumer rationality and quality adjustment. There appears to be a certain convergence of views away from the Cartesian view of social reality which underpins classical economics towards a view of society which parallels Freeman's view of the individual. Society is seen as an evolutionary system which like the individual has developed ways of predicting and controlling the environment in which it finds itself. Language and discourse are the central tools through which it attempts to achieve this. The idea of language as a tool rather than a means of representing and thereby capturing reality owes much to the work of Wittgenstein and is of particular relevance to the problems which have been encountered in understanding rationality and quality.

Wittgenstein's view (see Shotter<sup>22</sup>) is that "in everyday life, words do not in themselves have a meaning, but a use, and furthermore, a use only in a context; they are best thought of not as having already determined meanings, but as means, as tools, or as instruments for use in the 'making' of meanings - 'think of words as instruments characterized by their use,' (The Blue Book, Wittgenstein, 1965 : 67). For, like tools in a tool-box, the significance of our words remains open, vague, ambiguous, until they are used in different particular ways in different particular circumstances. When we say: 'Every word in language signifies something' we have so far, says Wittgenstein (1953: no. 13), 'said nothing whatsoever; unless we have explained exactly what distinction we wish to make,' and we make different distinctions (with the same word) in different situations - 'our talk gets its meaning from the rest of our proceedings' (Wittgenstein, 1969: no. 229). This is utterly to repudiate the assumption that words in language already have a meaning independent of the circumstances of life in which they are used".

What Wittgenstein says about words applies with particular force to "rationality" and "quality" and to theories about how consumers and, for that matter, producers and sellers, take decisions. It reinforces the points made above from Rose and Smedsland. Seen from this stance the problem of quality adjustment is one of finding more effective tools rather than seeking to uncover some hidden reality.

The effects of culture are much discussed under such research headings as postmodernism and structuralism. Harland<sup>23</sup> for example says that Barthes, one of the heavyweights in this field, attempts to explain our modern western society as a single cultural force field, criss-crossed by meanings and interpretations like a pool of water criss-crossed by waves. Meanings existing only through the varying mental dispositions of individual minds. Semiotics, or the theory of signs has been developed with the aim of explaining the varying individual dispositions from an understanding of the larger social movements. What does this mean for the way we look at quality?

For Barthes we don't just eat the material steak we enjoy the idea of the steak, which represents a kind of power and heartiness which we can assimilate. This adds a further dimension to the "quality" of steak.

---

<sup>22</sup> Quoted in John Shotter, *The Cultural Politics of Everyday Life*, Open University Press (1993).

<sup>23</sup> Richard Harland, *Superstructuralism*, Routledge 1988.

That idea of steak has been transformed by the B.S.E. crisis and the ideas and images, of stumbling cows, it conveyed. Similarly wine is not just a taste but is also a visual image the drinking of which is part ritual. The recent finding that red wine reduced the likelihood of a heart attack changed that image without any change in the wine. Such changes in quality are essentially cultural. If the price of red wine rises and the price of beef falls what should the CPI record. We tend to assume that our preferences are simply a function of our own likes and dislikes but they are strongly influenced by local cultural factors. We can dislike a particular make of car because a close friend dislikes that make.

For Foucault, another heavyweight in the field, one way of talking about something drives out other perfectly legitimate ways of doing so. Wine-buffs have words (rounded, smooth, full-bodied) and ways of tasting without which their experience of the taste and smell is quite shapeless. As a result they can successfully discriminate between the 'same' wines grown in adjacent villages. But, a different discourse might have been defined by other criteria, e.g. valuing the oxidation of wine in a religious ceremonial context.

This may seem to be making the issue of quality adjustment even more difficult than it already is. The intention is, however, to identify different aspects of "quality" so that, in the words of these theorists, it may be deconstructed into components some of which might be handled more easily than others.

## **8. Summing up so far**

Utility theory is coherent and elegant. Its assumptions are simple but it is weak on prediction and has, in its present form and application failed to deliver acceptable quality adjustments. Its assumptions of rational consumer behaviour, while always in theory remaining assumptions have, in practice, been mistaken for facts about the world. Utility is so general a concept that it can always be said to be maximised. Classical consumer theory appears to have proceeded with total disregard for actual consumers. Numerous studies have shown that consumer rationality does not often correspond to the normative model. Though this norm may be part of the culture, in that it is part of everyday language, there are many other factors, such as context and self image, which will influence specific consumer choices. Consumers base their decisions on what comes most readily to mind rather than conduct exhaustive searches to amplify the, always limited, product information.

Price differences between similar or substitute products do not ordinarily reflect consumers quality judgements. The assumption that markets mediate in a systematic way is a requirement of theory not an observed phenomenon. If consumers do not make well defined judgements then suppliers cannot know these in setting prices. Suppliers are likewise not model rationalists. Markets do not clear but work as an open systems which can have stabilities far from equilibrium. Nevertheless, there is general agreement that quality does vary between products and over time. It is therefore necessary to look more closely at what differences between products give rise to this agreement and whether they can be distinguished from other differences and their value agreed.

## 9. Examples of quality changes

For our purposes so far a quality change can be any difference between the specification of one product and another. It is not a characteristic of the product but an attribute assigned to the product by the consumer or other observer. On this definition, it might simply result from a change in the consumer's view of an unchanged product. As already noted existing definitions lump together too many things under the heading "quality" and it is therefore appropriate to seek some sub-categories. The aim is, if possible, to distinguish using prototypes or exemplars between the many things that can be thought of as quality those that can be lumped together into categories for which a particular method or procedure may be found and agreed.

The following are examples of very different quality changes.

- i) The penny farthing bicycle for a long time enjoyed considerable success as a comfortable, classy, well working machine, much preferred to its rival, the low-wheel rear driven safety bike, today seen as the natural form of a bicycle. This illustrates that the attributes of the artefact are relative to the particular social group for whom the artefact has meaning<sup>24</sup>.
- ii) Dumbo, Walt Disney's film was not a simple tale of rejection but a "study of madness" and society's reaction to it. It is a complex portrayal showing madness as a condition that needs segregating and shutting away from society, but society is itself shown to be suspect. The subject who has been labelled crazy is not, in fact, mad<sup>25</sup>. This is a further example that meaning depends on social context. It can also change the way in which others evaluate a thing. It would be difficult for the reader not to reflect on madness whilst watching Dumbo.
- iii) When clocks were first available they were not so much used to tell the time but to enhance the image of the owner. It was fashionable to have one. Knowing the time accurately does not help unless others operate to the same degree of accuracy<sup>26</sup>. Likewise the value of having e-mail increases with the number of others who have it. The initial cost and valuation of technical innovation is not a good indication of the longer term quality perspective.
- iv) Wine, drinking of wine is a ritual, wine is not to be accessed by its taste alone but by the contribution it makes to the image of the drinker.
- v) The QWERTY keyboard illustrates the problem of the institutionalised view of the "right" product which excludes or keeps out of the market better designs.
- vi) Contact Lenses have clearly represented a major quality advance for many consumers. They have both a functional benefit for vision and a personal image enhancing attribute. Recent research has produced new blends of polymers which will provide the ideal combination of a soft oxygen-permeable lens material that can be worn continuously for a month. These may be followed by permanent lenses that can be implanted just below the surface cells of the eyeball.

---

<sup>24</sup> Richard Harland Superstructuralism Routledge 1988.

<sup>25</sup> Dr A. Beverage Psychiatric Bulletin Sept. 96 Royal College of Psychiatrists

<sup>26</sup> Gerhard Dohm-van Rossum: History of the Hour, Clocks and Modern Temporal Orders. Univ. Chicago Press 1996.



- vii) This year's model of motor car, or item of apparel, commands a premium over older models, this may be because it has improved characteristics but many consumers no doubt believe it enhances their image to have the latest model. After a year they may still be attached to their purchase or they may regard it as out-of-date.

The above examples show how many different phenomena are lumped under the heading "quality change". The forgoing text suggests that some deconstruction of the concept may provide useful insight. Quality might, for example, be partitioned along the following dimensions:

- i) Internal v. external; i.e. personal to the particular consumer, image enhancing against having collective functional value by wide or general consent.
- ii) Short-term v. long-term; i.e. transitory, fashionable and simply a variation on existing themes or temporally unstable, against a step in a process of product development or a permanent shift towards added or new functionality that is temporally stable.

If it were possible to distinguish quality changes which are functional and have long-term collective value then the size of the quality adjustment problem may be reduced.

## 10. Some practical steps for progress on quality adjustment

**Develop criteria** which limit the kinds of specification changes which are to be regarded as quality changes using a to be agreed set of criteria. e.g. changes which involve

- a) additional cost
- b) technological development
- c) physical change
- d) long term potential
- e) a combination of the above.

It is necessary to say what are the principles from which these criteria derive and what are the minimum standards necessary to qualify as a change.

**Quantify and evaluate existing adjustments.** Where implicit and explicit adjustments have been made the resulting adjustments should be evaluated. Specific measures can be taken such as

- (i) the numbers of specification changes or missing prices that are identified in a given period or periods;
- (ii) the proportions of cases under (i) where the substitute or replacement variety is judged to be non-comparable with the previously priced variety;
- (iii) the explicit or implicit quality adjustments expressed as a proportion of the previous price and both distributed by kind of adjustment and accumulated over the period in question;
- (iv) Schultz type studies might be carried out either for particular goods over a period or by taking samples of actual imputations across different categories of goods and examining the distributions of implicit adjustment factors.

The main test is whether the results are “reasonable” e.g. would publication raise undue criticism. It should be possible to say under what assumptions or pricing practices particular imputation procedures would be valid. Presumably "excluding the base price" would be justified in a situation where missing varieties are simply a matter of random variations in supply to the sampled outlets.

**Determine consistent procedures.** Quality assessments can clearly differ from one group of consumers to another but, in general, such differences should be small. It therefore seems appropriate to seek adjustment procedures which when applied by different persons to the same case will give the same result within certain limits. The limits should be set with the following objectives in mind:

- a) where an adjustment has once been determined all similar situations should be treated similarly;
- b) adjustments should be less than producer cost; (what are the bases for such limits?)
- c) price collection practices using tight specifications should be distinguished from those using loose specifications but should not per se lead to different measures of quality change;
- d) other differences in sampling procedures leading to more or less quality adjustments should be identified. In particular, sample updates made at annual or other predetermined stages should be distinguished from forced substitutions between updates so that the overall quality adjustment does not depend on the sampling procedure.

**Examine Pricing Practices.** Another more general line of inquiry might be, as Armknecht and Moulton suggest, to examine "pricing practices" and establish which imputation procedures are most appropriate in the context of particular practices. One pricing practice which would invalidate most of existing imputation procedures would be that of increasing prices with the introduction of new models. Clearly for manufacturers and suppliers of both goods and services the introduction of a new model provides an opportunity to increase the price by more (or less) than the value of any quality improvement over the previous model. To the extent that this happens all procedures followed in constructing CPIs other than direct quality adjustment will lead to an understatement of inflation. Pricing practices might be examined by contacting suppliers, by case studies on selected products, from existing academic or other research. Existing CPI data may also show the extent to which prices of replacement varieties exceed those they replace.

## 11. Conclusions

Classical approaches to quality adjustment have failed to yield acceptable results except in the most trivial of cases. The problem for today’s index compilers is, not to blindly repeat the arguments and procedures of their forebears but to reassess the available research and information in order to develop new approaches.

The failure arises from an inadequate differentiation of “quality” and its many manifestations and a mistaken belief in the judgement of the consumer. Stabilities between price differences and product characteristics are taken as the results of a sophisticated valuation process. They may in fact be little more than eddies in the stream of the production consumption process. The quality adjustments computed, either deliberately or by default, are not themselves evaluated.

Research suggests that consumer rationality does not follow the normative model but is a reflection of human faculties which have evolved and have been relearned and reconstructed by successive generations of consumers. Consumer choices are situated in particular historic and social contexts in which each consumer must express their own individuality within the cultural norms of their time and place.

Nevertheless, it must be accepted that quality changes are taking place. Quality adjustments are appropriate where a broad consensus on the incidence and value of a specific change can be established. The concept of quality must be decomposed to distinguish the transitory and subjective here and now differences, which represent the variety that the consumer population needs to express itself, from those longer term developments in products that are clearly valued in retrospect. The application of existing methods and procedures to these cases should be preceded by further empirical studies of the results actually given by such methods and by investigations into pricing practices. If this analysis is correct, these latter do not and cannot reflect the consumers' valuations of quality changes.