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MEASUREMENT OF THE PURCHASING POWER OF INCOMES WITH LINEAR EXPANSION DATA—AN ABSTRACT

BY S. N. AFRIAT

Purchasing power is attributed to an income taken as an indivisible whole. It does not bear on money which is not thus specifically identified. The object of purchasing power measurement is to decide the relation between incomes which are to be considered as having the same purchasing power in two periods in which prices are different. In principle this could be any monotonic increasing relation. But in usual practice it is established as a homogeneous linear relation, determined by a single number, the "price-index" which gives the slope of the relation.

The question of comparison is understood in terms of a hypothetical utility relation which regulates expenditures. An income is spent for the effect of maintaining a standard of living. This standard of living is the final value of the income, and represents its purchasing power. But money does not purchase a standard of living directly. Rather, it purchases a bundle of goods. Then the bundle of goods, in being consumed, produces the use-value or utility which provides the standard of living.

Income and prices together determine the set of bundles of goods which are attainable, this being the budget set. It is assumed that income is spent efficiently, so as to obtain the best bundle in that set, that is, the one which is of greatest utility. With some provisors about utility (it is continuous, and represents that greater quantities of goods give higher utility) this is equivalent to the supposition that the utility attained could not be attained with any less money. If prices change, the budget set is altered and consequently so is the utility purchasing power of the income. A different income is needed to attain the same standard of living, and this is determined from the utility order.

This states the theoretical concept of comparison of income purchasing powers at different prices. However, the method used in practice does not come from this immediately. Instead it proceeds on a basis, not offered by the general comparison concept, that prices have a "level". It is taken that a ratio of price "levels" is expressed by a "price-index" given by some kind of average of individual price ratios. In order to keep constant purchasing power as prices change, incomes must be adjusted in proportion to the price level. With this scheme there is a homogeneous linear relation between equivalent incomes.

The supposition of a homogeneous linear relation between equivalent incomes at different prices has several equivalent expressions. In terms of utility, it is that the utility relation be a cone, and in terms of demand behaviour it is that any expansion path be a ray through the origin. The last statement shows that when prices are fixed the pattern of consumption, defined by the proportions of quantities demanded, is also fixed and independent of income.

A consequent defect in the use of a price-index is that it permits no recognition of variation in the pattern of consumption at different levels of income. The simplest

remedy for this defect is to adopt a more general hypothesis, allowing a general linear relation between equivalent incomes. This corresponds to a more general form of utility and allows expansion paths to be general lines not necessarily passing through the origin. Thus when prices are fixed the pattern of consumption varies with income. However, the marginal pattern, defined by proportions of quantities added to demand for a small addition of income, is still fixed. This can be recognized as a remaining defect, since in reality not only the pattern but also the marginal pattern significantly varies in movement from low to high incomes, turning away from necessities towards luxuries. But it is a lesser defect, and it preserves the practical simplicity of a linear relation between equivalent incomes.

This non-homogeneous extension of the price-index method can be called the *marginal price-index* method. It produces a general linear relation between equivalent incomes, the slope of which defines the marginal price-index. The relation itself is determined by both the slope and also one point of it, for instance an intercept on one of the axes, or generally any one pair of incomes which it represents as equivalent. Thus essentially two numbers are involved, instead of just one as in the usual homogeneous method.

Though the marginal price-index does not by itself establish a comparison between incomes, it gives a comparison between income increments by giving the ratio of increments which when applied to equivalent incomes will leave them still equivalent. Thus like the homogeneous price-index it provides a general valuation of money but the significance is specifically more limited. It is not an index of general purchasing power of money in the way that a homogeneous index admits interpretation by virtue of homogeneity. Rather it consolidates the repudiation of that idea, and with that the idea that prices can always be treated as having "level".

This paper reviews standard practice based on the usual homogeneous Laspeyres price-index, and then studies a modification employing the same data which shows the corresponding non-homogeneous method.*

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* The article appears in the *Journal of Econometrics* 2 (1974).