

## ON HOW TO CALCULATE PERMANENT INCOME

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Some recent studies on the Permanent Incomes Hypothesis (PIH) seem to view permanent income as some sort of a moving average of measured income.<sup>1</sup> It is our contention that this approach is essentially misleading. There are at least three reasons for this contention.

*First*, there appears to be some misunderstanding about the meaning of "horizon" on the part of some authors using the moving average method. In some studies a three year moving average has been used. This may be partly because Friedman in his calculations of the consumption function for the United States estimated the consumer units horizon as approximating three years. Tobin appears to have been misled by this, for in a review of Friedman's *A Theory of Consumption Function*, he asserts, ". . . permanent income is something like a moving average of observed income over a period of two to five years."<sup>2</sup> Friedman's very vague and somewhat incorrect usage of "horizon" in his book may have contributed to this confusion.

In his later studies however, Friedman corrected his earlier vagueness. In Friedman's own words: "I have referred to the consumer units 'horizon' and estimated it from empirical data as approximating three years in length. But 'horizon' here means something very different from what it usually does. In particular the concept is definitely not to be interpreted as 'a moving average of observed income for a three year period.' As it has generally been used, 'horizon' implies a cutting-off point—that a consumer does not look beyond three years, if that is the length of his horizon. As I use it, it means that it is the dividing line between the effects he considers transitory and those he considers permanent; that he will not adjust his consumption pattern to actual or possible changes in circumstances, except as these can be expected to affect his consumption possibilities for a period longer than three years; and hence that he does not look beyond three years. His permanent income for a three year period may differ from his average measured income for those three years just as the expected

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<sup>1</sup>Some studies that have recently employed the moving average method are: Jefferey G. Williamson, "Personal Savings in Developing Nations: An Intertemporal Cross-Section From Asia," *Economic Record* (June 1968), K. L. Gupta, "Personal Savings in Developing Nations: Further Evidence," *Economic Record* (June 1970) and "On Some Determinants of Rural and Urban Household Saving Behaviour," (December 1970), Uma Datta Roy Choudhury, "Income, Consumption and Saving in Urban and Rural India," *Review of Income and Wealth* (March 1968).

<sup>2</sup>James Tobin, "On a Theory of Consumption Function," in *Consumer Behavior*, Vol. 2, edited by L. H. Clark, New York University Press, 1955, p. 448.

value of the mean of a sample of three observations may differ from the observed mean of a specific sample.”<sup>3</sup> The term “horizon” is, therefore, used by Friedman to dichotomize factors affecting income into transitory and permanent factors. The numerical value of “horizon” is determined by the data itself. A three year moving average to calculate permanent income, therefore, misrepresents the PIH.

*Second*, the moving average method does not properly depict consumer behavior. It appears to assume that the consumer’s memory remains more or less fixed as time goes on and after a point it disappears altogether. Economists like Herbert A. Simon disagree with this view. Following Jost’s Law they suggest that “if two associations are of equal strength but of different age, the older diminishes less with time.”<sup>4</sup> On the assumption that learning is not homogeneous, only an exponential forgetting function would be compatible with this view. Friedman’s use of an exponentially declining lag function for calculating permanent income from the time series data (described below) incorporates this point satisfactorily. The underlying notion of such a function is that a consumer’s rate of loss of retained material is dependent on the age of the memory or that the rate of loss is dependent on the completeness of original learning, or some combination of these.<sup>5</sup> When there is a crisis situation a consumer unit lengthens his memory. This is natural because when expectations have been badly upset it is prudent to use more information than before in making new decisions. Friedman’s technique has the merit that the weighting pattern and the permanent income series that best represent the “memory period” of the consumer is determined by the data itself. Thus the psychological foundations of the moving average method are very shallow indeed compared with Friedman’s technique.

*Third*, the moving average method does not take into account the impact of structural changes in the economy. This point is particularly relevant to an evaluation of the tests of the validity of the PIH for some developing economies. The process of economic development inevitably involves structural changes. But due to the various obstacles to economic development the pace of structural change may be very gradual. It is inevitable that the results of such changes are registered in important economic variables such as national income, aggregate consumption, price level, etc. It is obvious, therefore, that if one were to use a two or three year moving average to calculate permanent income one is not adequately taking into account the process of economic development. On the other hand, a little reflection will convince one that Friedman’s technique has the merit of capturing the process of structural change since a given year’s permanent income is affected by several previous years.

<sup>3</sup>Milton Friedman, “On A Theory of Consumption Function,” in *Consumer Behavior*, *ibid.*, pp. 465–66. For a further analysis of the concept of horizon and the related ideas see Milton Friedman, “Windfalls, the ‘Horizon’ and Related Concepts in the Permanent Income Hypothesis,” in *Measurement in Economics: Studies in Mathematical Economics and Econometrics*, by C. F. Christ *et al.*, Stanford, 1963.

<sup>4</sup>Herbert A. Simon, “A note on Jost’s Law and Exponential Forgetting,” *Psychometrika* (December 1966), p. 505.

<sup>5</sup>*Ibid*, p. 506.

In order to test the extent of difference made in the results by the use of the two methods we computed consumption functions for Canada (1944–1966) and for the United States (1949–1970).<sup>6</sup>

For calculations according to Friedman's method, the following function was fitted:

$$Y_p(T) = \beta \int_{-\infty}^T e^{(\beta-\alpha)(t-T)} Y(t) dt,$$

where  $Y_p$  is permanent income,  $Y$  is measured income,  $T$  is the date for which the estimate is constructed, and  $t$  covers the whole range of earlier dates.  $\beta$  is the rate at which all future receipts are discounted to yield permanent income.  $\beta$  may also be referred to as the speed of adjustment of permanent to the measured values of income.  $1/\beta$  can be regarded as the horizon or "the number of years purchase".  $\alpha$  is the estimated rate of growth of income.<sup>7</sup> It may be noted that a certain pattern of expectation formation is implied in this equation. It is assumed that the expected or the predicted values of current measured income are revised over time at a rate that is proportional to the difference between the expected and actual income.

The results differ. By using Friedman's method for Canada the marginal propensity to consume out of permanent and transitory incomes are approximately 0.90 and 0.45 respectively. By using the moving average method the respective marginal propensities are approximately 0.85 and 0.60.

For the United States (1949–1970) the marginal propensities to consume out of permanent and transitory incomes were approximately 0.82 and 0.64 respectively, by using Friedman's method. By using the three years moving average method the respective propensities were 0.80 and 0.76.<sup>8</sup>

In both cases we notice that the moving average method tends to lower somewhat the marginal propensity to consume permanent income and raise considerably the marginal propensity to consume out of transitory income. In addition, our calculations revealed that the moving average method consistently overestimated permanent income and underestimated permanent consumption for both Canada and the United States.

<sup>6</sup>In order to save space we report here only the main results. A reader interested in details may see Prem S. Laumas, "A Test of the Permanent Income Hypothesis," *Journal of Political Economy* (September 1969) and Prem S. Laumas and Khan A. Mohabbat, "Permanent Income Hypothesis: Evidence from Time Series Data," *American Economic Review*, September 1972.

<sup>7</sup>For further details of this method see, Milton Friedman, *A Theory of Consumption Function*, pp. 141–152. For some very fruitful applications of this technique see Philip Cagan, "The Monetary Dynamics of Hyperinflation", in Milton Friedman (ed.), *Studies in the Quantity Theory of Money* (University of Chicago Press, 1956), pp. 25–117; George Morrison, *Liquidity Preference of Commercial Banks* (University of Chicago Press 1966), and P. S. Laumas and G. S. Laumas, "Interest-Elasticity of Demand for Money," *Southern Economic Journal* (July 1969).

<sup>8</sup>It must be pointed out that consumption as defined in the PIH (consumption of non-durable goods plus the rental value of durable goods) is hard to compute due to lack of data. Consequently, two linear regressions were computed, one including durable goods and the other excluding durable goods. The first estimate gives too large a measure of consumption from the viewpoint of the PIH and the second too small. We assume that the values intermediate between them would reflect true values from the viewpoint of the PIH. It appears that neither Williamson nor Gupta nor Choudhury used the "correct" concept of consumption from the standpoint of the PIH.

In conclusion we may add that although one might be tempted to use a moving average method to test the relevance of PIH to Asian countries due to lack of adequate data (Friedman's method has the weakness of wasting too many years in computing permanent income) one must be cautious in drawing far reaching conclusions about the validity of the PIH, based on the results of such a method, especially when we know that the psychological postulates underlying this method are so shaky.