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Permanent-Income Hypothesis

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Abstract

The permanent income hypothesis (PIH) is a theory that links an individual's consumption at any point in time to that individual's total income earned over his or her lifetime. The hypothesis is based on two simple premises: (1) that individuals wish to equate their expected marginal utility of consumption across time and (2) that individuals are able to respond to income changes by saving and dis-saving. In this article we present the intuition and empirical implications of the PIH in several standard contexts.

Keywords

Buffer stocks; Consumption insurance; Euler equations; Impatience; Liquidity constraints; Marginal utility of consumption; Martingales; Permanent income hypothesis; Precautionary wealth; Preferences; Retirement; Retirement consumption puzzle; Uncertainty

JEL Classifications

D4; D10

The permanent income hypothesis (PIH) is a theory that links an individual's consumption at any point in time to that individual's total income earned over their lifetime.

The PIH is based on two simple premises: (1) that individuals wish to equate their expected marginal utility of consumption across time and (2) that individuals are able to respond to income changes by saving and dis-saving. Because consumers are making their consumption decisions based on lifetime resources, the PIH implies that today's consumption will respond differently to changes in today's income depending on whether the income changes are expected as opposed to unexpected, or temporary as opposed to permanent. The PIH provides a sharp contrast to Keynesian consumption rules, which assume consumers make their consumption decisions based only upon current income.

The major insights of the PIH originated in Friedman (1957). They are closely related to the ideas expressed in Modigliani and Brumberg's (1954) life-cycle hypothesis (see Carroll 2001, for a summary of Friedman's original work). Since the 1950s there have been many additional theoretical and empirical contributions. This article presents the intuition and empirical implications of the PIH that have evolved since the 1950s in several standard contexts.

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The Canonical Model

Consider the canonical model in which an individual lives $T+1$ periods and earns y_t in period $t = 0,\ldots,T$. For now, we assume that the income stream is known at time zero. The canonical model assumes that the individual can borrow and lend freely at an interest rate r. The standard model also assumes that the future is discounted at the rate $\beta < 1$ and utility is additively separable across time and additively separable across consumption and leisure. For simplicity, we treat leisure as fixed and treat income as exogenous to the consumer. We revisit these assumptions below. Let $u(c)$ represent the period utility enjoyed from consumption, where $u' > 0$; $u'' < 0$. The consumer's problem is therefore:

$$\max_{\{c_t\}_{t=0}^{T}} \sum_{t=0}^{T} \beta^t u(c_t) \tag{1}$$

subject to $\sum_{t=0}^{T} (1+r)^{-t} c_t \leq \sum_{t=0}^{T} (1+r)^{-t} y_t + A_0$, where A_0 represents initial assets.

A necessary condition for an interior optimal consumption plan is $u'(c_t) = \beta(1 + r)u'(c_{t+1})$, for all $0 \leq t \leq T - 1$. Therefore, the relationship between consumption in two periods is independent of the relationship between income in those two periods. For example, suppose that individual's discount the future at the rate of interest such that $\beta(1 + r) = 1$. With such a restriction on preferences, the individual will consume the same amount each period. Also for simplicity, let $T \to \infty$ and $A_0 = 0$ (and impose the 'no-Ponzi-game' condition $lim_{t \to \infty} A_t/(1 + r)^t \geq 0$). The budget constraint then implies that consumption in each period equals the annuity value of the present discounted value of income, or 'permanent income,' such that:

$$c = r\sum_{t=0}^{\infty} (1+r)^{-t} y_t. \tag{2}$$

Note that consumption is a function only of permanent income, and not how that income is allocated across periods. The ability to borrow and lend is key to the permanent income hypothesis. This allows the individual to transfer income across periods at the rate $(1 + r)$. Access to such an asset makes the present discounted value of income the only relevant constraint on consumption.

The result has a natural implication in a life-cycle model. Suppose individuals work for $S < T$ periods and then retire. Aside from a potential trend due to time discounting, the PIH implies that consumption should not respond to the drop in income at a known period of retirement. Rather, assets built up over the working years are used to finance retirement consumption. Similar examples are plentiful. For example, a teacher on a 9-month salary consumes steadily over 12 months, or a yearend bonus is used for purchases throughout the year. The fact that income is expected to change tomorrow should already be incorporated into today's consumption plan.

In the above model, there was no uncertainty about future income. This is reasonable for predictable changes to income such as retirement or seasonal work, but less useful in understanding consumption's response to unexpected 'shocks' such as an unemployment spell or changes in business cycle conditions. We extend the model to the case of uncertainty by assuming that income follows a stochastic process. In particular, let yt denote the random variable of income at time $t = 0,\ldots,T$.

We continue our assumption that individual's have access to a risk-free bond. Let Et denote expectations conditional on information as of time t. At any point in time, t, the consumer's problem can be expressed as the following:

$$\max_{\{c_\tau\}_{\tau=t}^{T}} E_t \sum_{\tau=t}^{T} \beta^{\tau-t} u(c_\tau) \tag{3}$$

subject to the period-by-period budget constraint: $A_{t+1} = (1 + r)(A_t + y_t - c_t)$. Notice that Eq. (3) differs from Eq. (1) in that individuals in Eq. (3) are maximizing expected utility. The first-order conditions imply the following 'Euler equation':

$$u'(c_t) = \beta(1+r)E_t u'(c_{t+1}). \quad (4)$$

The marginal utility of consumption varies in a predictable way due only to the interest rate and the subjective discount rate. All other movements are unpredictable (with respect to information available prior to time t). Jensen's inequality implies that consumption will be a martingale when $\beta = 1 + r$ only if marginal utility is linear in consumption (that is, quadratic utility). In many standard utility functions, marginal utility is convex, implying that consumption trends upward in expectation when marginal utility is a martingale. Moreover, all else equal, consumption will respond more to unanticipated permanent innovations to income than to transitory innovations.

Empirical Tests of the Canonical Model

Equation (4) states that, aside from r and β, information known at time t should not affect the change in the marginal utility of consumption between t and $t + 1$. Estimating Eq. (4) has been the focus of numerous empirical studies, beginning with seminal paper of Hall (1978). Using aggregate data, Hall finds that lagged consumption and lagged income have minimal predictive power for changes in current consumption growth between t and $t + 1$. This, by itself, may be interpreted as a victory for the PIH. However, Hall also finds that a lagged index of stock prices does have predictive power for future consumption changes, an apparent violation of Eq. (4). Hall's study was followed by a large empirical literature exploiting aggregate consumption data to test whether innovations to consumption are predictable using information available in prior periods. However, a consensus has emerged that aggregation issues undermine the validity of tests using aggregate data.

A large literature has emerged testing Eq. (4) using micro data. For example, Attanasio and Weber (1995) and Attanasio and Browning (1995) find support for the PIH using data from the US Consumer Expenditure Survey and the UK Family Expenditure Survey, respectively. Additionally, Shea (1995), Parker (1999), Souleles (1999), Browning and Collado (2001), and Hsieh (2003), among others, have used micro data to examine how consumption responds to anticipated changes in income. These results, however, have been mixed. The conclusion of this literature is that, at least in some instances, consumption responds to predictable changes in income. This excess sensitivity of consumption to predictable income changes has been seen as a violation of the canonical model of the PIH outlined above.

Moving Beyond the Canonical Model

Depending on the context, the ability to freely borrow and lend may be considered too restrictive or not restrictive enough. On the one hand, it rules out state-contingent insurance contracts between consumers. On the other hand, the ability to borrow against future income is often limited in practice due to lack of enforcement. We now briefly describe how the canonical PIH differs from optimal consumption patterns in models with complete insurance markets or models with borrowing constraints.

Perfect insurance in an economy inhabited by agents that enjoy utility as given by Eq. (3) implies that individual consumption depends only on aggregate income rather than how that income is distributed across individuals. That is, consumption depends only on aggregate shocks and not on idiosyncratic shocks. This contrasts with the PIH's statement that consumption responds to idiosyncratic permanent income shocks. The difference reflects the limits of the insurance provided by a risk-free bond. However, there is a parallel as noted by Cochrane (1991). The implication that consumption should not respond to idiosyncratic income shocks was formalized and tested by Townsend (1994) using data from Indian villages and Cochrane (1991) using US data. While Townsend rejects perfect risk sharing, he presents evidence that there is significant insurance of idiosyncratic shocks within villages in India. Cochrane rejects perfect insurance in the case of long illness and involuntary job loss, but fails to reject in the case of several other idiosyncratic shocks.

Another alternative to the standard PIH asset market structure is limiting the amount one can borrow against future income. The inability to borrow implies that Eq. (4) may not hold. When constrained, a consumer may be forced to adjust consumption in response to a transitory or predictable shock to income. For example, if an individual receives a temporary income decline, the inability to borrow against future income may necessitate that consumption moves with contemporaneous income. Zeldes (1989) argues that liquidity constraints do bind for a significant fraction of consumers. Moreover, the inability to borrow presents consumers with the risk that a series of negative income shocks may force consumption down to extremely low levels. To mitigate this risk, potentially constrained consumers build up a 'buffer stock' of savings. See precautionary saving and precautionary wealth for a discussion of the accumulation of wealth for precautionary reasons.

Life-Cycle Consumption

While liquidity constraints can explain the empirical fact that consumption is excessively sensitive to changes in predictable income, empirical critiques remain about the ability of individuals to rationally make consumption decisions today based on their expectations of future income realizations. Two of the strongest critiques are that consumption expenditures are hump-shaped over the life cycle (peaking when households are in their mid-forties) and that there is a significant decline in consumption expenditures at the time of retirement. The latter fact has been referred to as the 'retirement consumption puzzle' and has been documented and discussed by, among others, Bernheim, Skinner and Weinberg (2001).

The two empirical critiques are related. According to the standard permanent income hypothesis outlined above, individuals should be smoothing their marginal utility of consumption over their lifetimes. Researchers have been trying to modify the PIH so that it matches these two additional empirical facts. For example, Attanasio et al. (1999) find that, if preferences are a function of demographics, the life-cycle profile can be matched. Alternatively, Gourinchas and Parker (2002) find that a model with a properly calibrated income process can match the hump-shaped consumption profile if households are liquidity constrained and sufficiently impatient.

Aguiar and Hurst (2005, 2007) adopt a different approach from those above by appealing to the intuition of Becker (1965). They argue that the PIH theory concerns consumption while the data reports expenditure. The distinction is important because consumption requires time as well as market goods. In particular, households may substitute time for expenditure and maintain a constant level of consumption as expenditures fall. This margin of substitution is suppressed in the canonical form of the model, but Aguiar and Hurst (2005, 2007) document that it is empirically important and reconciles the PIH with both the life-cycle profile of expenditure and the changes in expenditure associated with retirement.

In summary, the current state of literature has expanded on the insights of Friedman's original discussion of the PIH by building in additional features to the canonical model to match a wide variety of empirical regularities. However, this discussion highlights the broader point that any empirical test of the PIH is always a joint test of the hypothesis itself as well as the specific restrictions the researcher places on preferences (for example, whether utility is non-separable between consumption and leisure, the curvature of marginal utility, or the extent to which individuals are impatient), information (for example, assumptions about the income process), or technologies (for example, the existence of liquidity constraints, a home production sector, or complete markets) used to construct the hypothesis' empirical counterpart.

See Also

- ▶ Friedman, Milton (1912)
- ▶ Modigliani, Franco (1918–2003)
- ▶ Precautionary Saving and Precautionary Wealth

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