Asian Economic and Financial Review

journal homepage: http://aessweb.com/journal-detail.php?id=5002

THE TESTING OF HALL'S PERMANENT INCOME HYPOTHESIS: A CASE STUDY OF IRAN

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ABSTRACT

The objective of this study is to test the Hall's permanent income hypothesis for Iran using cointegration and error correction model from annual data covering the period of 1980-2010 using annual data from 1980 to 2010. The basic model of permanent income hypothesis showed the validity of absolute income hypothesis while the Campbell and Mankiw (1990) consumption model suggested that the proportion of forward looking consumers in total population is 34 percent and the remaining consumers are backward looking. Therefore in Iran, there is larger fluctuation in per capita income and small opportunity for consumption smoothing.

Keywords: Permanent Income Hypothesis, Absolute Income Hypothesis, Consumption.

INTRODUCTION

According to permanent income hypothesis (PIH) the consumption of individuals depend upon their permanent income rather than current income. To test the PIH, Friedman (1957) suggested that individuals can estimate their permanent income on the basis of current income lags. Thus Friedman introduces lags in consumption function. Lucas (1976) argued that lags of current income cannot explain the current consumption. In response to this critique, Hall and Fredric (1982) presented theory of rational expectation-permanent income hypothesis (RE-PIH). He argued that current consumption is adequate to estimate future consumption because any information which affects future consumption is already included in current consumption. Hall further explained that the disposable income, both current and past, have no effect on future consumption. Therefore according to Hall, consumption follows a random walk (Khan and Manzoor, 2012) .

Consumption expenditure is the largest component of output and the marginal propensity to consume determines the size of the multiplier and the dynamic effects of shocks to the economy. If the multiplier is large, fluctuations in economic activity would be large. While the Keynesian absolute income hypothesis of consumption implies a large MPC and multiplier, theories based on the inter-temporal utility maximization hypothesis, such as the permanent income hypothesis of Friedman (1957) and the life-cycle hypothesis of Modigliani and Brumberg (1954) imply that MPC and multiplier will be much smaller. Furthermore, the validity of the Ricardian equivalence theory also depends on the validity of PIH and LCH. Therefore, it is important to understand the relative importance of these consumption theories. Although PIH and LCH share a similar optimization model and conclusions, PIH is more popular in empirical works (Rao and L., 2007).

In Pakistan, (Khalid, 1994) explicitly tested the Hall's random walk hypothesis and he concluded that Hall's random walk hypothesis is not valid for Pakistan. Khalid (1994) neither used Euler equation approach nor the Campbell and Mankiw (1990) consumption model, which separates the proportion of forward looking consumers from backward looking consumers.

Since much of the existing empirical work on this controversy has used data from the developed countries, it would be useful to test with data from the developing countries. It is reasonable to expect that the proportion of PIH consumers would be relatively smaller in the developing countries because of limited inter-temporal consumption substitution possibilities. In this paper we test this conjecture with data from Fiji and Australia using a common approach. In this paper, we intend to examine the testing of hall's permanent income hypothesis for Iran, according to Khan and Manzoor (2012) article.

The purpose of this paper is, therefore, to investigate test the Hall's permanent income hypothesis for Iran, and to obtain policy implications from the results. The paper is organized in the following fashion. Section 2, describe Hall's Random Walk Hypothesis. Section 3, describe the econometric methodology and section 4 presents data and empirical study. Final section contains the conclusions.

Hall's Random Walk Hypothesis

The pioneer of testing PIH under the rational expectation with Euler equation was Hall (1978). According to PIH aggregate consumption function can be represented by the individual's decision (Khan and Manzoor, 2012).

Thus the typical individual maximizes:

$$Max\ E_t \sum_{i=0}^{T-t}(1+\delta)^{-i}U(C_{t+i}) \quad U' > 0, U'' < 0 \qquad (1)$$

Subject to $\sum_{i=0}^{T-t}(1+r)^{-i}(C_{t+i} - YL_{t+i}) = W_t$

Where

C_t Private consumption at period t

E_t Expectations subject to information at period t

T Life time of the individual

W_t Wealth excluding human capital at period t

YL_t Disposable labor income at period t

δ Rate of subjective time preference

r Real rate of interest

The first order condition (Euler equation) can be obtained from the maximization of above equation (1) as:

$$E_t U'(C_{t+1}) = \left[\frac{1+\delta}{1+r}\right] U'(C_t) \quad (2)$$

This equation says that marginal utility of today with constant multiple is the best forecast of marginal utility of tomorrow.

If we assume that marginal utility is linear and $r = \delta$ then we find that current consumption is the best predictor in the next period consumption:

$$E_t(C_{t+1}) = C_t \quad (3)$$

This in turn implies:

$$\Delta C_t = \varepsilon_t \quad (4)$$

Where ε_t is a rational forecasting error and innovation in permanent income. Thus, according to this arrangement of the permanent income hypothesis, the change in consumption is cannot be forecasted.

To test the basic model PIH with the data, for this purpose the econometric model is as under:

$$\Delta C_t = \alpha + \beta \Delta Y_t + \varepsilon_t \quad (5)$$

Where ΔC_t is log difference of real consumption, ΔY_t is log difference of current real labor income, ε_t is random error. If $\beta = 0$ this shows the validity of PIH, otherwise it shows that current income can effect current consumption.

In the above model we assume that all consumers are forward looking. But in the real world it may not be possible. Therefore, we also used the Campbell and Mankiw (1990) consumption model to find out the separate proportion of forward looking and backward looking consumers. The Campbell and Mankiw model assumes that the proportion of $(1-\lambda)$ individuals are forward looking and satisfy the PIH while a proportion of (λ) follow the "rule of thumb" and consume their current income. Furthermore, the Campbell and Mankiw consumption model also allows some intertemporal substitution (δ) for the forward looking consumers. Thus the Campbell and Mankiw consumption model is (Khan and Manzoor, 2012):

$$\Delta C_t = \alpha + \lambda \Delta Y_t + (1-\lambda)\delta . r_t + \varepsilon_t \quad (6)$$

Where r is the real interest rate, ε_t is the random term.

Data

For Iran, data have been collected from various sources. These data comprise yearly observations over the years 1980-2010, namely:

Gross domestic product (GDP) is used as a proxy for labor income because GDP is highly correlated with labor income; and its real value is obtained by deflating it with consumption deflator. The long-term deposit rate is used as a proxy of real interest rate after inflation adjustment and Consumer Price Index (CPI) is used as the consumption deflator. The study is based on an annual data from 1980 to 2010 and is taken from the Internationals Financial Statistics (IFS) database.

ADF Unit Root Test

(Nelson and Plosser, 1982) argue that almost all macroeconomic time series typically have a unit root. Thus, by taking first differences the null hypothesis of nonstationarity is rejected for most of the variables. Unit root tests are important in examining the stationarity of a time series because nonstationary regressors invalidates many standard empirical results and thus requires special treatment. Granger and Newbold (1974) have found by simulation that the F-statistic calculated from the regression involving the nonstationary time-series data does not follow the Standard distribution. This nonstandard distribution has a substantial rightward shift under the null hypothesis of no causality.

Thus the significance of the test is overstated and a spurious result is obtained. The presence of a stochastic trend is determined by testing the presence of unit roots in time series data. Non-stationarity or the presence of a unit root can be tested using the (Dickey and Fuller, 1981) tests.
The test is the t statistic on φ in the following regression:

$$\Delta Y_t = \beta_0 + \beta_1 . trend + \rho Y_{t-1} + \sum_{i=0}^{\infty} \varphi_i \Delta y_{t-i} + \varepsilon_t \qquad (7)$$

Where Δ is the first-difference operator, ε_t is a stationary random error (Chang *et al*., 2001).

The results of the unit root tests for the series of energy consumption and GDP variables are shown in Table 1. The ADF test provides the formal test for unit roots in this study. The p-values corresponding to the ADF values calculated for the three series are larger than 0.05. This indicates that the series of all the variables are non-stationary at 5% level of significance and thus any causal inferences from the three series in levels are invalid.

Table 1. Results of ADF Test for Unit Roots

Variables	Trend and Intercept	first difference	Critical values (5%)	
LCONS	-2.51	-5.72	-3.63	-3.64
LGDP	-1.97	-4.27	-3.57	-3.58
L DISC	-1.99	-4.57	-3.57	-3.58

Note: The optimal lags for the ADF tests were selected based on optimising Akaike's information Criteria AIC, using a range of lags. We use the Eviews soft ware to estimate this value.

The analysis of the first differenced variables shows that the ADF test statistics for all the variables are less than the critical values at 5% levels (Table 1). The results show that all the variables are stationary after differencing once, suggesting that all the variables are integrated of order I(1).

Tests of Cointegration

The cointegration test is based in the methodology developed by Johansen (1988) and Johansen and Juselius (1990). Johansen's method is to test the restrictions imposed by cointegration on the unrestricted variance autoregressive, VAR, involving the series. The mathematical form of a VAR is

$$y_t = \theta_1 y_{t-1} + \cdots + \theta_p y_{t-p} + \vartheta X_t + \varepsilon_t \quad (7)$$

where y_t is an *n*-vector of non-stationary *I(1)* variables, x_t is a *d*-vector of deterministic variables, $\theta_1,\ldots,\theta_p$ and ϑ are matrices of coefficients to be estimated, and ε_t is a vector of innovations that may be contemporaneously correlated with each other but are uncorrelated with their own lagged values and other right-hand side variables. We can rewrite the VAR as (Eq. (8)):

$$\Delta_{y_t} = \prod_{y_t-1} + \sum_{i=0}^{\infty} \Gamma_i \Delta_{y_t-i} + \beta_{xt} + u_t \quad (8)$$

Where (Eq. (9))

$$\Pi = \sum A_i - I_t \quad that \ \Gamma_i = -\sum A_j \quad (9)$$

Granger's representation theorem asserts that if the coefficient matrix n has reduced rank r<n, then there exist *n* x *r* matrices α and β each with rank r such that $\pi = \alpha \beta'$ and $\beta' y_t$ is stationary. Here, *r* is the number of cointegrating relations and each column of β is a cointegrating vector. For *n* endogenous non-stationary variables, there can be from (0) to (*n*-1) linearly independent, cointegrating relations (Aktas and Yılmaz, 2008) (Yin and Xu, 2003).

As indicated, the basic idea behind cointegration is to test whether a linear combination of two individually non-stationary time series is itself stationary. Given that integration of three series is of the same order, it is necessary to test whether the three series are cointegrated over the sample period. The results of the Johansen cointegration test for the series LCON, LDISC and LGDP are reported in Table 2.

Table 2. Results of Johansen's Cointegration Test

Null Hypotheses	Alternative Hypotheses	Trace Statistic	Critical Value (5%)
H0	H1		
r=0	r=1	16.40	15.49
$r \leq 1$	r=2	3.58	3.84

Source: we use the Eviews soft ware to estimate this value.

The likelihood ratio tests show that the null hypothesis of absence of cointegrating relation (r = 0) can be rejected at 5% level of significance. Thus, we can conclude that consumption and GDP are cointegrated in the long run.

EMPIRICAL RESULTS

The estimated result of the basic model of PIH and Campbell and Mankiw consumption model are presented in table 3. Three different econometric methods i.e. Ordinary Least Square (OLS), Instrument-Variable (IV) and Non-Linear Least Squares (NLLS) were used to estimate equations (5) and (6). The third and fourth column of table 3 presents the results of basic model of PIH, which shows that there is strong and significant relationship between change in consumption and change in current income, these results are consistent with AIH. Thus, it indicates that the individuals' consumption strongly rely on their current income rather than their expected life time income. Therefore the results of Basic model of PIH show the inconsistency of PIH. The above estimation assumes that all individuals are forward looking but in real world it may not be possible. Therefore, the study used the Campbell and Mankiw consumption model. The Campbell and Mankiw consumption model which includes both types of consumers: forward looking and backward looking. The best way to estimate the Campbell and Mankiw model is instrument-variable (IV) approach as suggested by Campbell and Mankiw (1990) because the error term " ε_t " may be correlated with ΔY_t and due to this the OLS estimators will become inconsistent.

Table3. Estimation of Basic Model of PIH and Campbell and Mankiw Consumption Model

	$\Delta C_t = \alpha + \beta \Delta Y_t + \varepsilon_t$		$\Delta C_t = \alpha + \lambda \Delta Y_t + (1-\lambda)\delta . r_t + \varepsilon_t$			
	α	β	α	λ	$(1-\lambda)\delta$	δ
1- OLS coefficient	1558	0.7400	2045	0.7830	-0.0490	-0.3358
T ratio	3.23	10.23	2.37	5.28	-3.68	-4.24
2. IV Coefficient	-	-	2412	0.888	-0.0712	-0.3213
T ratio	-	-	4.25	2.89	-6.34	-3.27
3. IV_NLLS Coefficient	-	-	-0.0241	0.7821	-0.0523	-0.1324
T ratio	-	-	-5.23	4.53	-6.24	-8.38

Note: For the estimation of IV and IV-NLLS model we used $y_{t-1}, y_{t-2}, y_{t-3}, r_{t-1}, r_{t-2}$ and r_{t-3} as instrumental variables.

The empirical results of the Campbell and Mankiw consumption model support the result of basic model of PIH. All three estimation methods indicated the presence of small number of forward looking individuals. The proportion of forward looking consumers is 34 percent, 21 percent, and 32 percent of the total population, shown by the OLS, IV and NLLS regression respectively. Therefore both the basic model of PIH and Campbell and Mankiw model show the violation of PIH for Iran. The real interest rate appears with a negative sign but it is statistically insignificant in all OLS, IV and NLLS regression. Therefore in the case of Iran current income plays a very vital role in determination of individuals' consumption. Thus consumption does not follow a random walk in Iran.

CONCLUSION

This paper has examined the relationship between consumption and GDP in Iran using the annual data covering the period of 1980- 2010. Prior to testing, the ADF test and Johansen maximum likelihood test were used to examine for unit roots and cointegration. The basic model of PIH showed that the consumers' consumption in Iran depends upon their current income rather than permanent income hence indicated the validity of the AIH. The same results are found by the (Campbell and Mankiw, 1990) consumption model. On the basis of Campbell and Mankiw consumption model we found that the proportion of backward looking consumers is much greater than the forward looking consumers, only 33 percent of consumers' consumption choices are based on permanent income and the remaining follow the rule of thumb. The real interest rate has a correct sign but statistically insignificant in all three models simultaneously. It is hoped this study results will encourage further work on micro data analysis of PIH.

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