A Comparative Analysis of Keynes and Friedman Consumption Models for Romanian Case

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***Abstract*—** The statistical analysis of private (household) consumption by using correlation models is necessary and of great importance due to the multiple dependencies and interdependencies that occur between population consumption and other indicators, both at the macroeconomic level (household final consumption expenditure) and at microeconomic level (household consumption by categories, endowment with durables etc.).

The aim of this paper is to analyze comparatively the performance of the Keynes and Friedman consumption functions for the Romanian case. In this regard we used data for the period 1970-2013 using time series for the case of Romania estimating models by using both original and the logarithmic series. The results showed significant relationships between the variables included in the models but nevertheless taking into account the specific performance indicators the models can still be improved and updated to nowadays economic environment influences regarding the private consumption in order to reduce the limitations of the classical consumption functions and to obtain better forecast results that are essential in drawing social and economic policies for the economic welfare of individuals.

***Keywords*—** Absolute Income Hypothesis, Consumption Theory, Permanent Income Hypothesis, Private Consumption

I. Introduction

CONSUMPTION expenditure accounts for over two thirds of the main macroeconomic indicator GDP in most of the developed countries and the need for analyzing its relationship with other macroindicators and forecasting it by using adequate models is crucial for drawing the efficient macro policies regarding socio-economic welfare.

Two of the most known and applied consumption functions are based on the Absolute Income Hypothesis (AIH) developed by English economist John Maynard Keynes (1936) [1] and on the Permanent Income Hypothesis (PIH) firstly introduced by American economist and Nobel Laureate Milton Friedman (1957) [2]. AIH models consumption expenditure on income by assuming that if the income will grow, the consumption will also grow but at a smaller rate, implying also that the savings will grow more for the wealthy ones than for the poorer ones. On the other hand PIH model considers that consumption and income are both composed of a transitory and a permanent component and that current consumption depends more on the permanent income and lagged value of consumption rather than on current income, the argument being that people will plan their consumption based on their expected income in future and rational expectations and not on their present income even if it is affected by economic shocks.

Since the introduction of AIH and PIH there were many researchers who tested these two classical models to determine if they are rejecting or not the assumptions implied by each one of them and if they can be used for forecasting the consumption pattern for specific country or cross-country cases.

Some recent relevant researches regarding estimation of Keynes' AIH with interesting results were conducted by on [3] on Nepal, [4] and [5] on Nigeria, [6] on Kenya, [7] on U.S.A. and Europe.

Regarding testing the validity of Friedman's PIH the latest studies using time series data were employed by [8] on D-8 countries, [9] on Ghana, [10] on Iran, [11] on Pakistan,) [12] and [13] on 15 selected EU member states, [14] on 10 Asian countries and by others: [15] on Canada, U.K. and U.S., [16] on U.S. and [17] on Nigeria.

The purpose of this study is to estimate a version of the consumption function based on AIH and PIH for the case of Romania in order to verify the validity of both models and to compare the estimated coefficients with respect to current and permanent income. Therefore, by analyzing the relationship between consumption and income in Romania for the period 1970–2013 the present empirical study will serve as a complement on previous works by also filling the gap that exists in the specialized literature regarding the subject for this specific country.

II. Data And Methodology

The variables used for estimating Keynes' AIH and Friedman's PIH are the Household Final Consumption Expenditure (CONS), and Gross National Income (GNI) as a proxy for Real Disposable Income. Household (private) consumption is defined as the households expenditure on purchasing goods and services in order to directly meet the individual needs of resident households members, government expenditure for individual consumption (education, health, social security, and welfare, culture, sport, recreation,

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This work was cofinanced from the European Social Fund through Sectoral Operational Programme Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/134197 "Performance and excellence in doctoral and postdoctoral research in Romanian economics science domain".

collection of households refuse) and non-profit institutions serving households expenditure for individual consumption, whereas GNI (formerly Gross National Product) is defined as the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.

The data covers annual values of CONS and GNI in Romania for the period 1970-2013 measured in 1970 bln. $ constant prices, that was retrieved from the World macroeconomic research, 1970-2013 e-book [18].

The methodology used for verifying the main hypothesis of the study concerning the AIH and the PIH by using both original and log-transformed series was estimating the models by Ordinary Least Squares after checking for stationarity of the data. All the procedures were computed with the EViews version 6.0 software.

III. Results

First we plotted the evolution of the series analyzed on the period 1970-2013 for both the original and log-transformed series, as the latter are considered to have more reliable results.

We can see in Fig. 1 that the path of CONS and GNI is described by a general upward trend on the period considered with a notable fall in levels at the middle of time span just after the fall of the communist regime in Romania.

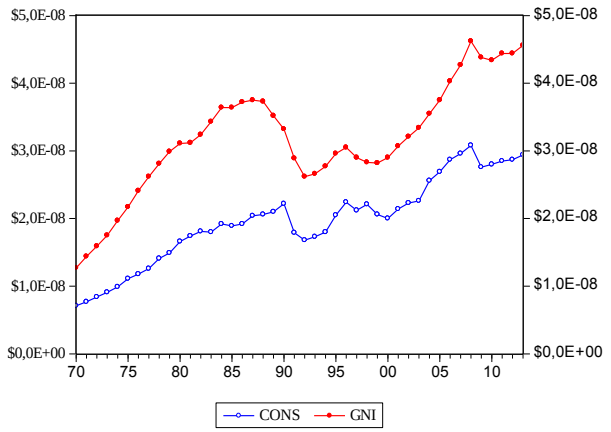

Fig. 1 Evolution of CONS and GNI in the period 1970-2013 (constant prices 1970 billion $)

The log-series evolution displayed in Fig. 2 have smoothed the trend of the original ones and stabilized the variance by reducing possible heteroskedasticity.

Considering that both CONS and GNI are macroeconomic processes affected by inertial influences over time we assume they should be integrated or first order as most economic indicators and we verify this hypothesis by computing the results of two unit root test Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity test in order to proof the assumption for both original CONS and GNI and log-series denoted LCONS and LGNI.

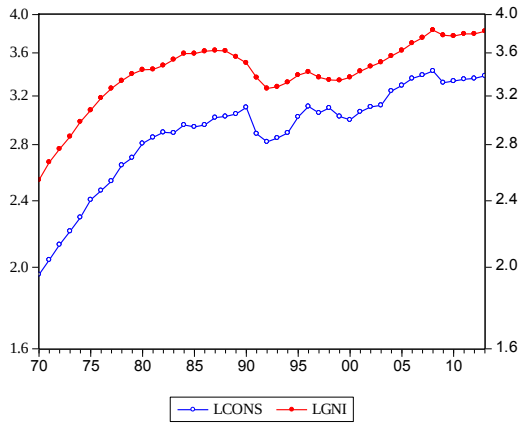

Fig. 2 Evolution of LCONS and LGNI in the period 1970-2013 (constant prices 1970 billion $)

TABLE I
UNIT ROOT TESTING RESULTS USING ADF, PP AND KPSS TESTS FOR CONS, GNI, LCONS AND LGNI

	CONS			GNI		
Test options	ADF	PP	KPSS	ADF	PP	KPSS
Without constant or trend	I(1)*	I(1)*	-	I(1)*	I(1)*	-
With constant	I(1)*	I(1)*	I(1)*	I(1)*	I(1)*	I(1)*
With constant and trend	I(1)*	I(1)*	I(0)*	I(2)*	I(2)*	I(0)*
	LCONS			LGNI		
Test options	ADF	PP	KPSS	ADF	PP	KPSS
Without constant or trend	I(1)*	I(1)*	-	I(1)*	I(1)*	-
With constant	I(0)*	I(0)*	I(1)*	I(2)*	I(1)*	I(1)*
With constant and trend	I(1)*	I(1)*	I(0)*	I(2)*	I(2)*	I(0)*

Note: *significant at 5% level; I(0) – integrated of order zero (stationary series in level); I(1) – integrated of order 1 (stationary series after first differencing); I(2) – integrated of order 2 (stationary series after second differencing).

The results found in Table I are somehow contradicting comparing the results of the three tests mainly regarding the option including a constant and trend (the rarely used test option) but overall we can assume in the further analysis that the series CONS, GNI, LCONS and LGNI are integrated of order one by using a 5% significance level, also taking into account their evolution on the period considered revealed in Fig. 1 and Fig. 2..

For properly testing the AIH and PIH models without obtaining spurious results we took the first differences of the original (DCONS, DGNI) and log series (DLCONS, DLGNI) and estimated the four models by Ordinary Least Squares method.

The estimated results for verifying Keynes' consumption function are presented in Table II for model AIH I using original series and in Table III for model AIH II using the log-series.

In model AIH I (Table II) the estimated parameter of the DGNI was found to be statistically significant if we consider at 5% significance level, the overall performance of the model being validated by the low p-value associated to the F-test (0.00<0.05). The short-run marginal propensity to consume (MPC) is 0.564 meaning that a 1 bln.$ increase in income would incease consumption by 564 mil. $, the constant being positive thus validating Keynes' model assumptions.

TABLE II
ESTIMATED RESULTS FOR AIH I

Dependent Variable: DCONS
Method: Least Squares
Sample (adjusted): 1971 2013
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.087332	0.154086	0.566771	0.5740
DGNI	0.563670	0.086084	6.547926	0.0000

R-squared	0.511179	Mean dependent var	0.518605
Adjusted R-squared	0.499257	S.D. dependent var	1.290857
S.E. of regression	0.913452	Akaike info criterion	2.702223
Sum squared resid	34.21017	Schwarz criterion	2.784140
Log likelihood	-56.09780	Hannan-Quinn criter.	2.732432
F-statistic	42.87533	Durbin-Watson stat	1.995434
Prob(F-statistic)	0.000000		

For model AIH II with results revealed in Table III the estimated parameter of DLGNI is also highly statistically significant at 5% level with a value of 0.864 representing the elasticity of current consumption with respect to current income implying that in the short-run an increase of 1% in the current income would increase current consumption by 0.864%. This result shows the strong dependency of changes in current consumption due to changes in current income. The model's performance is also validated by the low p-value associated to the F-test (0.00<0.05).

TABLE III
ESTIMATED RESULTS FOR AIH II

Dependent Variable: DLCONS
Method: Least Squares
Sample (adjusted): 1971 2013
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.007373	0.007409	0.995196	0.3255
DLGNI	0.863523	0.116333	7.422836	0.0000

R-squared	0.573354	Mean dependent var	0.033044
Adjusted R-squared	0.562948	S.D. dependent var	0.064992
S.E. of regression	0.042966	Akaike info criterion	-3.411421
Sum squared resid	0.075689	Schwarz criterion	-3.329504
Log likelihood	75.34554	Hannan-Quinn criter.	-3.381212
F-statistic	55.09850	Durbin-Watson stat	2.065965
Prob(F-statistic)	0.000000		

In what concernes the Friedman's PIH the estimated results are exposed in Table IV for model PIH I using original series and in Table V for model PIH II using the log-series.

The results obtained by estimating model PIH I revealed in Table IV found the estimated parameter of DGNI to be the only one statistically significant at 5% level, the MPC being 0.593 meaning that an increase in income by 1 bln. $ would determine an increase by almost 593 mil. $ in consumption, the constant being positive and the lagged value of consumption being surprisingly negative as was found to be also in previous works of the author but both insignificant. Overall the model's performance is validated by the low p-value associated to the F-test (0.00<0.05).

TABLE IV
ESTIMATED RESULTS FOR PIH I

Dependent Variable: DCONS
Method: Least Squares
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.135198	0.161360	0.837868	0.4072
DGNI	0.593293	0.090951	6.523219	0.0000
DCONS(-1)	-0.115234	0.114932	-1.002629	0.3222

R-squared	0.526271	Mean dependent var	0.516667
Adjusted R-squared	0.501977	S.D. dependent var	1.306441
S.E. of regression	0.921965	Akaike info criterion	2.744131
Sum squared resid	33.15079	Schwarz criterion	2.868250
Log likelihood	-54.62675	Hannan-Quinn criter.	2.789626
F-statistic	21.66274	Durbin-Watson stat	1.720603
Prob(F-statistic)	0.000000		

Regarding model PIH II with the log-series the estimated results shown in Table V found the coefficient of DLGNI to be again the only one statistically significant at 5% level, the elasticity of current consumption with respect to current income being very high with a value of 0.931 meaning that an increase in income by 1% would determine an increase by almost 0.931% in consumption, the constant and the other coefficient being insignificant and with the same signs found for model PIH I. Again, the overall model's performance is validated by the low p-value associated to the F-test (0.00<0.05).

TABLE V
ESTIMATED RESULTS FOR PIH II

Dependent Variable: DLCONS
Method: Least Squares
Sample (adjusted): 1972 2013
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.009066	0.007806	1.161433	0.2525
DLGNI	0.930886	0.134135	6.939936	0.0000
DLCONS(-1)	-0.081627	0.113514	-0.719094	0.4764

R-squared	0.580722	Mean dependent var	0.031899
Adjusted R-squared	0.559221	S.D. dependent var	0.065339
S.E. of regression	0.043380	Akaike info criterion	-3.368907
Sum squared resid	0.073390	Schwarz criterion	-3.244788
Log likelihood	73.74705	Hannan-Quinn criter.	-3.323413
F-statistic	27.00853	Durbin-Watson stat	1.858465
Prob(F-statistic)	0.000000		

To evaluate and compare the models for testing AIH and PIH assumptions using the original and the log-transformed data we computed the results for the tests regarding the presence of heteroskedasticity (Breusch-Pagan-Godfrey - BPG), errors autocorrelation (Durbin-Watson - DW), the normal distribution of errors (Jarque-Bera - JB) and the determination coefficient (R^2).

Following the diagnostic test results revealed in Table VI regarding AIH models, we can observe that both have problems relating to heteroskedasticity, the null hypothesis of the BPG test being rejected at 5% level of significance. The AIH models do not present positive autocorrelation of the error terms, the values computed for DW being higher than the upper critical value of DW_U= 1.55773 and also do not show negative autocorrelation as the relation (4-DW) > DW_U is verified as well. JB test results fail to reject the null hypothesis according to which the errors are normally distributed so this condition for linear regression is also verified.

Taking into account these results and also the fact that AIH II model explains 57% of consumption variance compared to 51% explained by AIH I and along with the values for information criteria Akaike, Schwarz and Hannan-Quinn (Table II and Table III) which are lower for AIH II than for AIH I we can assert that the model using log-series performs better than the first one for estimating and validating Keynes' consumption function.

TABLE VI
MODEL DIAGNOSTIC TESTS

Test \ Model	AIH I	AIH II
Breusch-Pagan-Godfrey	16.24111 (p-value 0.0002)	13.24444 (p-value 0.0008)
Durbin-Watson*	1.995434 (43 obs.)	2.065965 (43 obs.)
Jarque-Berra	0.298254 (p-value 0.86146)	0.006331 (p-value 0.996839)
R^2	0.511179	0.573354
Test \ Model	**PIH I**	**PIH II**
Breusch-Pagan-Godfrey	7.039940 (p-value 0.0025)	6.522585 (p-value 0.0036)
Durbin-Watson**	1.720603 (42 obs.)	1.858465 (42 obs.)
Jarque-Berra	0.699271 (p-value 0.704945)	0.218181 (p-value 0.896649)
R^2	0.526271	0.580722

Note: *the critical values for DW with 43 obs. and 2 coeff. : DW_L= 1.46278 and DW_U= 1.55773; **the critical values for DW with 42 obs. and 3 coeff. : DW_L= 1.40730 and DW_U= 1.60608.

In what concerns PIH models, we can observe that both BPG test results reject the null hypothesis of homoskedasticity at 5% level of significance, this condition not being fulfilled even after the re-estimation of the models considering the heteroskedasticity problem. The PIH models do not present positive autocorrelation of the error terms, the values computed for DW being higher than the upper critical value of DW_U= 1.40730 and also do not show negative autocorrelation as the relation (4-DW) > DW_U is verified as well. JB test results fail to reject the null hypothesis according to which the errors are normally distributed so this condition for linear regression is also verified.

Considering these results and also the fact that PIH II model explains almost 58% of consumption variance compared to aprox. 53% explained by PIH I and along with the values for information criteria Akaike, Schwarz and Hannan-Quinn (Table IV and Table V) which are lower for PIH II than for PIH I we can state that the second model performs better than the first one for estimating Friedman's consumption function but nevertheless the coefficient of lagged consumption was found insignificant for both of the models therefore they are not suitable for forecasting purposes in the present form.

IV. CONCLUSIONS

Regarding the estimation of Keynes' AIH for the case of Romania, the results obtained indicated model PIH II as the one to better estimate the consumption function taking into account the model's diagnostic tests and overall performance. The estimated result shows the strong dependency of changes in current consumption due to changes in current income, assuming that in the short-run an increase of 1% in the current income would lead to an increase by 0.86% of current consumption.

From Table IV we computed the MPC with respect to permanent income as being equal to: c(2)/(1-c(3)), where c(2) is the estimated coefficient for DGNI and c(3) is the estimated coefficient for DCONS(-1) and respectively from Table V we computed the elasticity to consume with respect to permanent income as being equal to: c(2)/(1-c(3)), where c(2) is the estimated coefficient for DLGNI and c(3) is the estimated coefficient for DLCONS(-1).

Since in PIH I the short-run MPC is 0.59 and the long-run MPC is 0.53 along with the short-run elasticity of 0.59% and the long-run elasticity of 0.53% in PIH II we can say that is almost no difference between MPCs or elasticities to consume out of current income and the ones out of permanent income and therefore the PIH is not validated for the Romanian case.

By comparing the results for AIH models with the results for PIH models we can state that Romanian households' consumption is mainly influenced by changes in current income level, being sensitive to short-term economic changes related to income. A policy implication of this result may be that temporary fiscal policy changes that affect the income of consumers in Romania will have a significant impact on consumption expenditure. Therefore, to foster consumption in order to stimulate economic welfare and growth, government policies that aim at improving the disposable income and purchasing power of Romanian households must be designed on short or at most on medium term with the purpose of being effective.

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