

## REAL PRIVATE CONSUMPTION MODELING OF PAKISTAN

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**ABSTRACT.** *This study estimated the real private consumption model for Pakistan by using the annual data from 1971 to 2013. The Autoregressive distributed lag model is used to investigate the short run and long run relationship between private consumption, labor income, wealth, interest rate and unemployment rate. In the short run, current income, wealth, real interest rate and unemployment rate affected the real private consumption growth while in the long run labor income and wealth are significant. The numerical value of the coefficient of error correction model (ECM) is -0.58, which propose that Pakistan's real private consumption converge from disequilibrium in period (t-1) to equilibrium (t) on a high speed.*

**Keywords:** Real Private Consumption, Current Income, Wealth, Pakistan

1. **Introduction.** Historically, consumption remains the major growth driver of GDP in Pakistan. Of the total consumption, private consumption accounts for more than 75% share. Whereas in country's GDP private consumption expenditure claim for almost two third (63%) of the total. Thus private consumption expenditure is considered as a critical determinant of aggregate demand, output and employment in Pakistan. It is the key force amongst some other key determinants of GDP which can shape the business cycles and macroeconomic activities. Therefore it is essential to understand the consumption function particularly from research and policy point of view.

Saving function on the other hand is actually the counterpart of consumption function. Therefore, studying the consumption function also clarifies the saving dynamics and its importance in economic activities. Eventually, saving is the key determinant of capital formation in an economy. Thus both consumption function and saving function are important for policy makers and researchers.

The great depression in early 20<sup>th</sup> century has realized the importance of consumption. Since then a greater attention has been given beginning from Keynes "The General Theory of Employment Interest and Money" (1936), followed by significant contribution in the literature of consumption function by other economists and scholars. These include Kuznets (1942), Dusenbery (1948), Modigliani and Brumbergh (1955), Friedman (1954), Hall (1978), David et al. (1978) and Campbell and Mankiw (1992). These contributions provided

strong base for following empirical and non-empirical studies on consumption function. Amongst all literature contributions the most significant hypotheses are Absolute Income Hypothesis (AIH), Relative Income Hypothesis (RIH) and Life Cycle Hypothesis (LCH). In developing country like Pakistan consumers are facing low per capita income and liquidity constraints due to the absence of well developed financial markets; as a result of this, in Pakistan people have less opportunity for smoothing their consumption.

Consumption is very rich in literature but unfortunately in a case of Pakistan there is no significant study available, despite of Khalid (1992), he tests the validity of the Permanent income Hypothesis (PIH) on the basis of lag variable. Khan (2011) using Hall's Random Walk Hypothesis and Campbell and Mankiw model to test PIH for Pakistan. The results of his study supported AIH for Pakistan. The remaining of the study is organized as follows, section two and three presents methodology and results and discussion respectively while the final section of the study offers conclusion.

**2. LITERATURE ON CONSUMPTION MODELING :** The realization of consumption function begins from the Keynes's General Theory and since then several theories and models were introduced to determine the consumption behavior. These relationships termed more specifically as Absolute Income Hypothesis (AIH), Permanent Income Hypothesis (PIH), Life Cycle Consumption Hypothesis (LCH), Relative Income Hypothesis (RIH) and Rational Expectation Hypothesis (REH) etc. Further, there were several model adjustments like Life Cycle Permanent Income Hypothesis to test the consumer behaviors.

Duesenberry (1948) presented his theory of consumption, known as Relative Income Hypothesis (RIH). The theory states that consumption of individual responds to its relative income. Relative income is defined as income of individuals and group of individual in a society includes neighbor(s), friend(s), and relative(s). In the scenarios of constant relative income if absolute income of individual raises then individual cannot change his consumption and saving.

Hall (1978) developed an approach of Rational Expectation Hypothesis (REH) for testing the consumption behavior and the hypothesis. He concluded that current consumption which carries all related information of consumer behavior is enough for estimation of future consumption under Life Cycle Hypothesis (LCH). He also stated that current consumption have significant effect on future consumption and the future disposable income. However, it is not necessary always, so consumption follows a random walk.

Flavin (1981) by applying simple structural econometric model of consumption concluded that consumption gives response to both change in current income and permanent income. However, it is more responsive to current income rather than the permanent income. He termed the phenomenon as "excess sensitivity" of consumption.

Zeldes (1989) tested the borrowing constraint on Permanent Income Hypothesis through Euler equation. The Euler equation is violated for low wealth/income ratio set and vice versa due to liquidity constraints.

Campbell and Mankiw (1989) also tested the PIH and found fifty percent of individual's consumption choices are based on the PIH while the rest relies on their current income. The model based on the assumption that the fraction of individuals  $\lambda$  follows the "rule of thumb" i.e. consumption behavior is subject to current income and the remaining individuals  $(1 - \lambda)$  choices are based on PIH. Using the model of Campbell and Mankiw's, Rao (2005) tested the PIH for Fiji. He found that the existing consumption behavior in Fiji depends on current income, while where more than two third of consumers in Fiji also satisfied AIH.

Lavi (2003) in his study examines the per capita private consumption that can be forecasted on predictable income. A strong connection between private consumption and expected income was revealed. The result shows that almost 50% of the population responds to current income. While the remaining population sets their choices of consumption on PIH.

Singh (2004) presented model for the real private consumption expenditure. The main objective of the study is to find the key and important determinants of Fiji's private consumption expenditure. According to results

current income, wealth, real interest rate and net private transfers had significant effect on real private consumption growth in the short run. Wealth and current income are the basic determinants of consumption growth in long run. Habibullah et al. (2006) estimated effect of financial liberalization and liquidity constraints on consumption for 10 Asian countries on fraction of consumers who have liquidity constraints ranged between “0.20 to 0.98”. He concluded that financial liberalization could help in the relaxation of liquidity constraints particularly for South Korea, Sri Lanka and Taiwan.

## 2. METHODOLOGY AND DATA

**2.1. Specification of Consumption Function :** The mathematical form of the consumption function subject to Life Cycle Permanent Income Hypothesis (LCPH) can be written is as follow:

$$C_t = f(Y_t, W_t, X) \quad (1)$$

Where C is aggregate private consumption, Y is gross domestic product, W is wealth in period t and X is the vector of all other short run variables. The variables that can effect consumption in short run in case of Pakistan are real interest rate and unemployment rate.

**2 ARDL Model :** The study applies autoregressive distributed lag (ARDL) approach to estimate the aggregate private consumption function mentioned in equation (1). The ARDL have certain econometric advantages over other co-integration methods. Firstly, ARDL can applicable on variables regardless of order of stationary. Secondly, it estimated simultaneously both the long run and short run relationships. Thirdly, ARDL model includes larger number of variables as compare to other co-integration methods. The study uses the following equation to estimated ARDL model.

$$\begin{aligned} \Delta \log C_t = & \alpha_0 + \sum_{i=0}^j \alpha_{1i} \Delta \log Y_{t-i} + \sum_{i=0}^j \alpha_{2i} \Delta \log W_{t-i} + \sum_{i=0}^j \alpha_{3i} \Delta \log C_{t-i} + \sum_{i=0}^j \alpha_{4i} r_{t-i} + \\ & \sum_{i=0}^j \alpha_{5i} ur_{t-i} + \gamma_1 \log Y_{t-1} + \gamma_2 \log W_{t-1} + \gamma_3 \log C_{t-1} + \gamma_4 r_{t-1} + \gamma_5 ur_{t-1} + u_t \end{aligned} \quad (2)$$

All of the included variables are define before where real interest rate represents by ‘r’ and unemployment rate by “ur” in the above equation and at the end of equation is random error term, the coefficients  $\alpha_{1i}, \alpha_{2i}, \alpha_{3i}, \alpha_{4i}$  and  $\alpha_{5i}$  have short run while  $\gamma_1, \gamma_2, \gamma_3, \gamma_4$  and  $\gamma_5$  have long run information. To test null hypothesis i.e.  $H_0 = \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = 0$  while alternative hypothesis of co-integration is  $H_1 = \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq 0$ , for null hypothesis we used the bounds test to compare the computed F-statistic value with critical values provided in Pesaran *et al.* (2001). If the computed value of F-statistic larger than upper level values of the bound test then we will be rejected the null hypothesis. However if the calculated value of F-statistic lies below the lower level of bound or falls between the upper and lower bound then null hypothesis will not be rejected or result would be inconclusive respectively. If proof of co-integration is appears among variables of the model, then the following equitation will be estimated for long run relationships.

$$\begin{aligned} \Delta \log C_t = & \alpha_0 + \sum_{i=0}^j \alpha_{1i} \Delta \log Y_{t-i} + \sum_{i=0}^j \alpha_{2i} \Delta \log W_{t-i} + \sum_{i=0}^j \alpha_{3i} \Delta \log C_{t-i} + \sum_{i=0}^j \alpha_{4i} r_{t-i} + \\ & \sum_{i=0}^j \alpha_{5i} ur_{t-i} + u_t \end{aligned} \quad (3)$$

When we confirmed the co-integration then we estimates equation (4) of ECM.

$$\Delta \log C_t = \alpha + \lambda_1 \log Y_{t-1} + \lambda_2 \log W_{t-1} + \lambda_3 \log C_{t-1} + \lambda_4 \log r_{t-1} + \lambda_5 ur_{t-1} + \phi ECM + \mu_t \quad (4)$$

Besides, for stability of the model we used different diagnostic test to observe the problems of; functional form, heteroscedasticity, serial correlation and normality.

**2.3. Data :** Annual data from International Financial Statistics (IFS) was taken for variables of consumption, gross domestic product, unemployment rate and interest rate. The study uses the time series data for the period of about 40 years from 1971 to 2012. Real interest rate is calculated by detecting the change in CPI from discount rate.

### 3. EMPIRICAL ESTIMATION OF THE STUDY

**3.1. Tests of Stationary:** The ARDL test will be applied when variables of the model are integrated of order zero or one or both. Therefore before applying the ARDL, it is important to test the noise level of the data by using the ADF and PP test to avoid the possibility of biased estimators. Table 1 offers ADF and PP test results which reveals that all of the variables are integrated of order zero or one now we are able to apply the ARDL model to the data.

**Table 01: Results of ADF and PP Tests**

Variables	PP			ADF		
	1	2	3	1	2	3
Lags						
C	-2.07	-2.06	-2.04	-1.53	-1.03	-0.32
$\Delta C$	-8.52***	-8.20***	-8.52***	-4.95***	-5.42***	-3.91**
Y	-0.60	-0.67	-0.70	-0.73	0.59	-0.47
$\Delta Y$	-4.06**	-4.08**	-4.03**	-3.37*	-3.21*	-2.54
W	-2.90	-2.87	-2.75	-2.92	-2.56	-1.81
$\Delta W$	-6.58***	-6.64***	-6.91***	-5.13***	-5.73***	-3.54**
R	-3.43*	-3.41*	-3.33*	-3.26*	-3.01	-2.12
$\Delta r$	-7.00***	-7.12***	-7.35***	-5.40***	-5.97***	-5.47***
ur	-2.19	-2.18	-2.24	-2.22	-1.88	-2.37
$\Delta ur$	-5.99***	-5.99***	-5.99**	-4.91***	-3.31*	-3.31*

Note: \*\*\*p<0.01, \*\*p<0.05, \* p<0.10.

Table 2 offers the results of the ARDL model based on Schwarz Bchwarz Criterion (SBC) of co-integration which show that quasi money, real interest rate and labor income have significant effect on private consumption while the coefficient of unemployment rate is statistically insignificant.

**TABLE 2 Results of ARDL (1,1,1,0,1) Model**

Variables	$C_{t-1}$	$Y$	$Y_{t-1}$	$W$	$W_{t-1}$	$r$	$ur$	$ur_{t-1}$
Coefficients	0.43***	0.72***	-0.39*	-0.49**	0.75***	0.00083***	-0.00092	0.000074
T-Values	3.81	3.84	-1.86	-2.97	4.67	3.85	-1.01	2.33
$R^2$	0.98	AIC	-897	DW	2.1945	Adj: $R^2$	0.97	
F-Sat(7,32)	1452***	SBC	-904					

Note: \*\*\*p<0.01, \*\*p<0.05, \* p<0.10.

The critical values for the bound test at 1%, 5% and 10%, for lower bound is 2.425, 2.850 and 3.81 so the calculated F-statistics i.e. 8.0072 is greater from all of the critical values at 1%, 5% and 10%. Therefore the

null hypothesis is rejected and accepts the alternative hypothesis of co-integrated, that there is co-integration among the variables in the model.

Table 3 reports the ARDL coefficients for long run, it illustrates that unemployment rate and real interest rate are statistically insignificant while wealth and labor income are statistically significant moreover the coefficient of current income is three times larger than the coefficient of wealth, which indicates that current income plays an important role in determination of private consumption in Pakistan.

**Table 03: ARDL Long run Coefficients**

Variables	$Y$	$W$	$r$	$ur$
Coefficients	0.80***	-0.12*	-0.002	-0.001
T-Values	2.96	2.01	-0.58	0.67

Note: ARDL (0, 0, 1, 0, and 1) based on SBC and \*\*\*p<0.01, \*\*p<0.05, \* p<0.10.

Table 4 offered the results the ECM based on ARDL approach, it shows the without unemployment rate all of the variables in the model are statistically significant. The value of the coefficient of ECM is -0.58 which means that the deviation from equilibrium is corrected 58.00 percent over each year.

**Table 4. ARDL Model Error Correction Representation**

Variables	$\Delta Y$	$\Delta W$	$\Delta r$	$\Delta ur$	$ECM(-1)$
Coefficients	0.71***	-0.49***	0.000083***	-0.0000029	0.58***
T-Values	3.84	-2.96	3.58	-1.01	-5.364
$R^2$	0.75	AIC	-897	DW	2.1945
F-Sat(7,32)	24***	SBC	-904		

**Table 05 Diagnostic Tests the Model**

Test of Diagnostic	$\chi^2$	P-Values
LM test Serial Correlation	0.89	0.81
Ramsey's RESET Test for Functional Form	1.55	0.12
Test of Skewness and Kurtosis of Normality	1.78	0.41
White Test for Heteroscedasticity	2.56	0.23

The result of table 6 indicates that the ARDL model satisfying the entire test related to autocorrelation, normality, functional form and heteroscedasticity these are the standard diagnostic test for any model.

**4. CONCLUSION.** This study is an attempt to estimate consumption function for Pakistan by using the ARDL approach to find the short run and long run determinants of real private consumption for Pakistan. The results reveal that current income and wealth significantly effects the real private consumption in the long run. The coefficients of the current income and wealth in the long run are 0.80 and 0.12, respectively. It indicates that 80 percent of the consumers in Pakistan are taking their consumption decision subject to current income. While only 12 percent of consumers take their decisions on their existing and future wealth. In other words, it shows that the absolute income hypothesis is valid in case of Pakistan. As revealed from the estimations in the long run, income and wealth determines the real private consumption in Pakistan. However, in the short run, current income, wealth, real interest rate and unemployment rate are the key determinants of private consumption in Pakistan. Therefore, it can be stated that consumer consumption behavior is determined by all above significant variables in the short run in Pakistan. Consumers' decision are largely dependent on their current income, existing wealth, the prevailing interest rates and the employment opportunities. Moreover, ECM value is negative and quite high which suggest that Pakistan's consumption adjust to equilibrium from dis-equilibrium quite fast. Pakistan's economy is considered as consumption led economy. More than 60

percent of the economic activities are derived from consumption; therefore, the economic stability is very important in determining the consumption behavior in the country.

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