Aggregate Consumption Function of Bangladesh

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Abstract:

The study aims at finding the estimate of marginal propensity to consume (mpc)from time series data on aggregate consumption, gross disposable national income, liquid assets, population size, deposit rate of interest, and remittances. While the Keynes hypothesis on income and consumption has been studied in detail, the Friedman permanent income hypothesis and Hall's random walk model have also been briefly touched on. The study uses data available from the published materials of Bangladesh Bureau of Statistics, Bangladesh Bank and Ministry of Finance for the period 1995/96 to 2012/13. Under the Keynesian model the value of MPC was found to be 0.45 and under the Friedman model it was found to be 0.44. The value of APC exhibited decline with the rise in income under both Keynesian and Friedman model. The Coefficient of Lagged value of consumption under the Hall's random walk model was found to be 1.09. The estimated value of consumption by all the three methods were very close. The effect of liquid assets, deposit interest rate, remittances while adjusted for income was negative but insignificant. The effect of population size while adjusted for income was positive but insignificant. All the fitted models explained over 99 percent variation in real consumption expenditure and had desirable statistical properties.

Introduction.

The concept of a consumption function has had its genesis in J.M. Keynes' "The General Theory of Employment, Interest and Money" (1936). In the traditional view of consumer behavior the typical consumer bear on the allocation of a given income to various ends. In the simple dichotomy income is exhaustively divided between consumption on the one hand and saving on the other. The proportion may vary with the income level. The consumption function describe the relationship of consumption to income. In its simplest form one can present the consumption as

$$Ct = F(Yt).$$

In the simplest representation of the Keyenian model this is the only behavioural relation involved. It is supported by the identity

$$Yt = Ct + It$$

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Which indicates that apart from consumption there is only one other component of effective demand which is called investment. It is regarded as autonomous which simply means that It is not related to Ct or Yt. The important characteristic of the slope of consumption function is that the marginal propensity to consume (mpc) will be positive but less than unity. This results in low-consumption and high-saving conomy.

Review of Literature:

Alamgir (1972, 1974) using Bangladesh data for the period 1959/60 to 1969/70 found that aggregate disposable income, population and liquid assets have positive effects on aggregate private consumption. The value of marginal propensity to consume was found to be 0.84. Matin(1987) using Bangladesh data for the period 1972/73 to 1985/86 found that income, liquid assets, population size and lagged value of consumption have significant positive effect on consumption. The value of mpc was found to be 0.96. Islam (2012) using data for the period 1995/96 to 2005/06 found the value of mpc to be 0.46. The effect of Population size on consumption while adjusted for income was negative but insignificant. The effect of lagged value of consumption adjusted for income was positive but insignificant.

Methods and Materials.

The Keyenian Consumption function involves only income and consumption, further improvement was always attempted to obtain a better explanation of consumption expenditure. There are of course a number of variables whose effects can be included to the aggregate consumption function. In the present study in addition to income(measured by real gross disposable national income), we have included liquid assets, Population size, Deposit interest rate and remittances from abroad as important explanatory variables. In any particular model, the problem of choice of variables is always there.

The current statistics of the Bangladesh Bureeau of Statistics(BBs, 2013), Bangladesh Bank(2014) and Ministry of Finance(2014) are the main source of data. A brief definition of the variables and their operationalization are given below.

Aggregate Private Consumption(Ct).

The series on Aggregate Private consumption at current prices of base 1995/96 was converted to real values by deflating them with the Consumer Price Index(CPI) of base 1995/96=100. The figures are in Million Bangladesh Tk.

Gross National Disposable Income(Yt).

The series on Gross National Disposable income at current prices of base 1995/96 was converted to real values by deflating them with the GDP Deflator at base 1995/96=100. The figures are in Million Bangladesh Tk.

Liquid Assets(Lt).

The two principal components of wealth whose effects on consumption can be important are liquid assets and capital gains. Liquid assets seem to be an important determinant of various types of expenditures, though thay may also serve as proxy for wealth or reservoir for imminent purchase. The weight of the evidence so far available from empirical studies, however, is in favour of including liquid assets variable in a consumption function. For example , a decrease in consumer saving will result from the growth of accumulated assets. The estimates of liquid assets used in the present study are those of the Bangladesh Bank (2014). The liquid assets include currency outside Banks, scheduled banks demand deposits, post office saving deposit, and deposits of non-scheduled and cooperative Banks with the Bangladesh bank. We have also included the lagged value of the liquid assets($Lt-1$) as one of the explanatory variables to see the variation in aggregate private consumption.

Population (Pt).

Population growth can have significant impact on aggregate private consumption by affecting the growth in income in per capita terms and also o by affecting average family size(which has implications for economies of scale in family consumption). Introduction of Population variable into consumption function may be particularly justified where the growth of population is very high. For the period under consideration the rate of population growth has been found to be 1.52 per cent per annum. Estimates of Population size were available from Bangladesh Bureau of Statistics. The population figures used were in Million.

Remittances($REMITt$).

Remittances are considered as injection of resources into economy. It can influence key macroeconomic variable like consumption. It can improve the standard of living of the recipients and improve the distribution of income. It is thus worthwhile to include remittance(REMITt) to see its effect on consumption. The figures used are in Bangladesh Tk in million.

Model Specification and Estimation.

Keynes Consumption Model

Keynes (1936) postulated that consumption is a function of income and that marginal propensity to consume is positive but less than 1. His model can be expressed mathematically as:

$$Ct = \beta 0 + \beta 1 Yt + \varepsilon t$$

Where,
Ct = Aggregate Real Private Consumption in million BDTk in time period t
Yt = Aggregate Real Disposable Income in million BDTk in time period t
$\beta 0$, $\beta 1$ are parameters of the model.
εt is the random error term

The MPC ($\beta 1$) is positive but less than 1. As a result, Average Propensity to Consume (APC) would fall with successive increase in income. The consumption functions have been estimated by the Ordinary

Least Squares (OLS) method, where the aggregate private consumption is assumed to be a linear function of the explanatory variables. The Fitted Consumption Function under Keynes hypotheses are presented in Models 1-8 in Table 1.

Apart from real disposable national income, we have included other variables such as Income squared, lagged value consumption, Liquid assets, Population size, Deposit Interest rate and Remittances from abroad.

Friedman's Permanent Income Hypothesis

Friedman (1957) argued that consumption is a function of permanent income.

$$Ct = \beta 1 YPt + \varepsilon t$$

Where,
Ct = Aggregate Real Consumption in time t.
YPt = Permanent Income.
$\beta 1$ = Parameter of the model
εt = Random error term.

He argued that APC would not fall and consumption would be smooth. We have also fitted consumption function under the Friedman's Permanent income hypothesis. The permanent income has been estimated by taking 3-year moving average of the disposable national income as a proxy for permanent income. The Ordinary Least Squares method has been applied to estimate the parameters. The fitted model under Friedman's permanent income hypothesis is shown in model 9 in table 1.

Hall's Random Walk Hypothesis.

Hall (1978) presented a simple life cycle-permanent income model of consumption decision according to which consumption expenditures are predicted to follow a random walk with trend , that is:

$$Ct = \beta 1 Ct\text{-}1 + \varepsilon t \quad , \quad \beta 1 > 1.$$

where,
Ct = Aggregate Real Consumption in time period t.
$Ct-1$ = Aggregate Real Consumption in time period t-1.
$\beta 1$ = Parameter of the model
εt = Random error term

A consumption function has also been estimated under Hall's random walk model hypothesis and is presented as model 10 in table 1. The Ordinary Least Squares method has been applied to estimate the parameters.

Findings:

Keynesian Consumption Fuunction.

The findings on the various consumption function estimated under the Keynesian hypothesis are presented as models 1- 8 in table 1. Interpretation of the models follows.

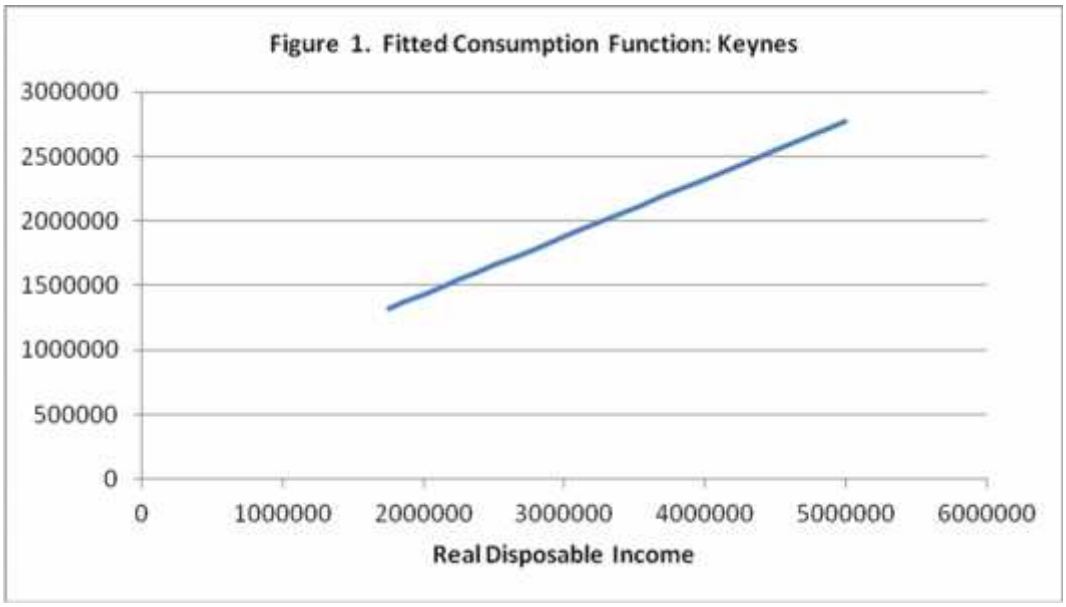
Model 1.

This model represents the simplest for of aggregate private consumption function where the effect of aggregate disposable income only(Ydt) on consumption has been investigated. The value of marginal propensity to consume is found to be 0.44 and is statistically highly significant ($P < .001$). The value of coefficient of determination is also very high($R^2 = .997$). This implies that if disposable income rises by Tk 1 million then Tk 0.44 million will be spent on consumption, other things remaining same. The estimate of the mpc appears to be low. The model has the desirable statistical properties as depicted by the values of coefficient of determination(R^2), Standard error of regression, F-statistic, D-W statistic and model P values. The fitted consumption function under model 1 is shown in figure 1. We also tried a model by including the square term of the income in this model to see effect of non-linearity. The coefficient of the square term was negative but too low to report and was statistically insignificant.

Table 1. Consumption Functions-Regression Results.1996-2013

Keynes' Consumption Function		R^2	SER	F	P	D-W	d.f
Model 1	C_t = 545631.20 + 0.44Ydt (29.55) (76.31)	0.997	23903.64	5824.18	.000	1.279	1,16
Model 2	C_t = 197549.16 + 0.20Ydt + 0.61C_{t-1} (2.50) (3.59) (4.23)	0.999	16110.19	5857.98	.000	a/	2,14
Model 3	c_t = 5110.43 + 0.39y_{dt} (30.28) (50.87)	0.994	180.39	2587.48	.000	1.00	1,16
Model 4	lnC_t = 3.96 + 0.70lnY_{dt} (21.55) (56.80)	0.995	0.0167	3226.73	.000	0.622	1,16
Model 5	C_t = 575446.39 + 0.42Y_{dt} - 0.01L_t (10.07) (13.45) (.63)	0.997	24363.68	2803.35	.000	1.24	2,15
Model 6	C_t = 84707.60 + 74.94y_{dt} + 1366.06 P_t (0.28) (14.93) (0.46)	0.997	24169.97	2833.72	.000	1.31	2,15
Model 7	C_t = 617857.95 +.45Y_{dt} - 11852.17DlRt (12.11) (70.78) (1.60)	0..998	22820.20	3196.45	.000	1.469	2,15
Model 8	C_t = 589772.00 + .41Y_{dt} - 0.09 $REMIT_t$ (9.11) (12.64) (0.78)	0.997	24198.86	2841.78	0.000	1.23	2,15
Friedman's Consumption Function							
Model 9	Ct= 546077.88 + 0.44Ypt (29.27) (73.93)	.997	20620.03	5464.98	0.000	1.217	1,16
Hall,s Consumption Function							
Model 10	Ct = -77689.86 + 1.09Ct-1 (3.10) (80.76)	.999	21580.84	6521.74	0.000	a/	1,15

a/ D-W statistic is not applicable for equation in which lagged value of dependent variable appears as a regressor.



Model 2.

In this model we have considered the effect of past-habit of consumption(lagged by one year Ct-1) and disposable income(Ydt) on consumption. The value of mpc has decreased to 0.20 from .44 in model 1. The coefficient of Ct-1 is 0.59. Both the coefficient are statistically highly significant. It turns out that past consumption habit is a good predictor of current consumption. The model had desirable statistical properties.

Model 3.

In this model we explore to find the effect of liquid assets(Lt) in addition to disposable income(Ydt) on consumption. The value of mpc slightly decreased to 0.42 from 0.44 in model 1. The coefficient of the variable liquid assets(Lt) had the expected negative sign but it wast statistically insignificant. The model had the desirable statistical properties.

Model 4.

In this model the effect of per capita disposable income(ydt) and population size(Pt) was regressed on aggregate private consumption(Ct). The coefficient of per capita income was found to be 74.94 and statistically highly significant. The coefficient of population size(Pt) though had the expected positive sign but it was statistically insignificant. The model had the desirable statistical properties.

Model 5.

This is an attempt to see whether the effect of disposable income on consumption in per capita

Increases the mpc in comparison to the total value in model 1. We obtain a lower value of mpc of 0.39 in per capita terms while compared to a value of 0.44 in model 1. The value of the mpc in per capita terms was statistically highly significant and the fitted model had the desirable statistical properties.

Model 6.

Under the logarithmic(natural) transformation of the model the value of coefficient of lnYdt was found to be 0.70 on lnCt and it was statistically highly significant. The model had the desirable statistical properties.

Model 7.

In this model we analyse the effect of deposit interest rate(DIRt) of Deposit Money Banks and disposable income(Ydt) on consumption(Ct). The value of mpc remains at the same level of 0.44 as in model 1.The coefficient of Deposit interest rate(DIRt) had the expected negative sign but was statistically insignificant.

Model 8.

In this model we introduce remittances from abroad(REMITt) in addition to aggregate disposable income(Ydt) to see their effect on consumption behavior(Ct). We have a slightly lower value of mpc of 0.41 while compared to its value of 0.44 in model. The effect of remittance(REMITt) on consumption was negative but statistically insignificant. The model had desirable statistical properties.

Friedman Consumption Function:

Model 9

The result of estimated Friedman Consumption function under permanent income hypothesis is given in model 9 of table 1. In the absence of data on permanent income, 3-yearly moving average of aggregate disposable income has been used as a proxy for permanent income. Here we estimate the effect of permanent disposable income(Ypdt) on aggregate consumption(Ct). The value of mpc is found to be same (mpc=0.44) as given in the model 1 under the Keynesian consumption function. The value of mpc was statistically significant and the various statistical properties were analogous to model 1.

Hall's Random Walk Consumption Function.

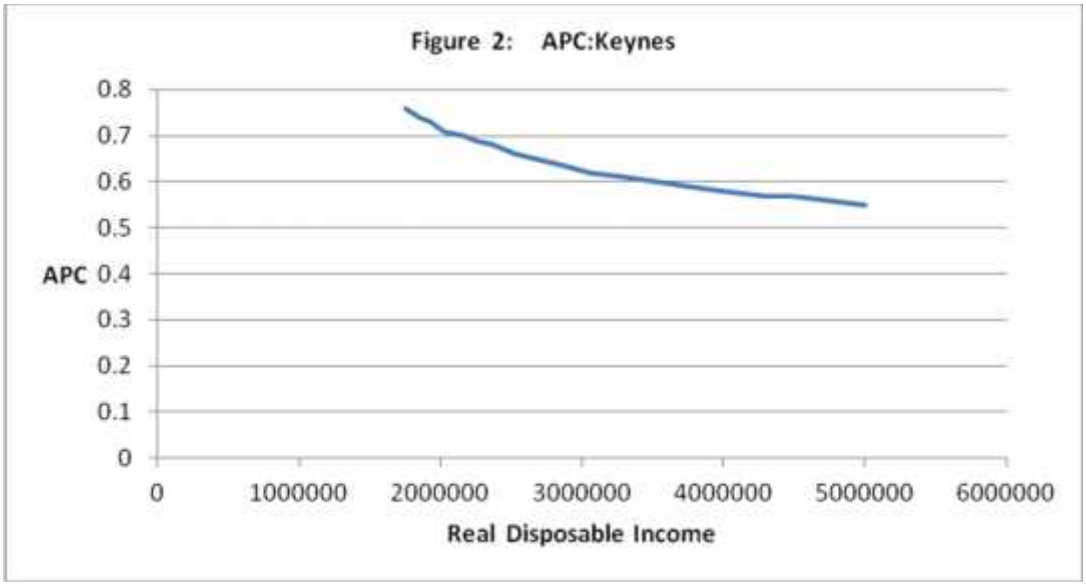
Model 10.

The result of estimated Hall Random Walk Consumption function under the life cycle permanent income hypothesis is given in model 10 of table 1. Here we study the effect of lagged value of consumption (Ct-1) on current consumption(Ct). The value of coefficient of the of lagged value of consumption(Ct-1) on current consumption(Ct) was found to be 1.09 and it was statistically highly significant. The model had the desirable statistical properties.

Average Propensity to Consume.

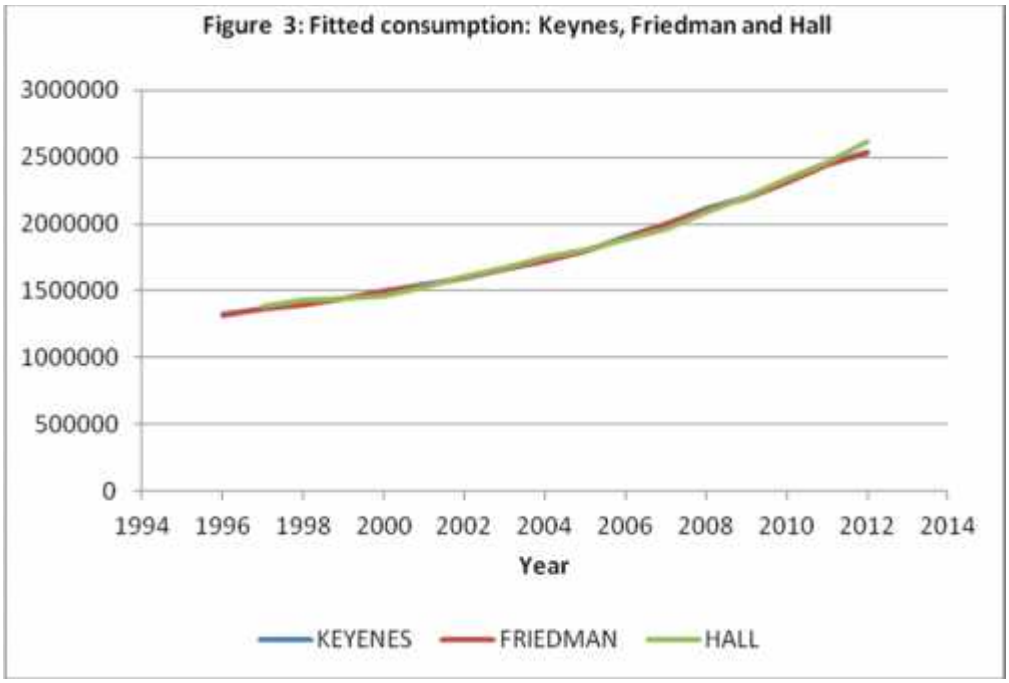
The value of average propensity to consume(APC) obtained from the estimated consumption function under keyenes model and Friedman model are similar, as it is the case with mpc. We find that along with the rise in aggregate disposable income, the value of apc decreases as indicated by Keyenes. Figure

2. At the real disposable income level of Tk 175000 million in1995/96 the value of APC was 0.76 which gradually decreased to 0.55 in 2012/13 at an income level l of Tk 5000000 million.



Estimated value of Consumption.

The estimated value of the Consumption under the three approach, namely Keynes consumption function, Friedman consumption function and Hall consumption function were more or less similar. Figure 3. We can see that they overlapping one another.



Conclusion:

The important findings of the study is that real disposable income and lagged value of consumption have a definite pattern of effects towards the contribution of consumption. All other variables; liquid assets, population size , deposit interest rate and remittances from abroad , included in the models along with disposable income had expected sign, but their effects were statistically insignificant. The average propensity to consume exhibited decline with the rise in income. The expected value of consumption figures obtained by the three approaches, namely Keynesian model, Friedman model and Hall random walk model were more or less similar.

References:

Ackley, G. 1961. Macroeconomic Theory. Pp 248-252. Macmillan, New York.

Alamgir, M. 1972. An Aggregate Consumption Function for Bangladesh. Research Report New Series No. 5. Bangladesh Institute of Development Studies. Dhaka

Alamgir, M. and L. J. J. B. Berlage. 1974. Bangladesh:National Income and Expenditure 1949/50 – 1969/70. Pp 92-103. Research Monograph No. 1. Bangladesh Institute of Development Studies. Dhaka.

Bangladesh Bank. Economic Trends. June 2014. Also other issues. Statistics Department. Bangladesh Bank. Dhaka

BBS. Statistical Yearbook of Bangladesh 2012. Bangladesh Bureau of Statistics. Ministry of Planning. Dhaka.

Cohen, M. 1954. Liquid Assets and Consumption Function. The Review of Economics and Statistics 36(2):202-211.

Daly, V and G. Hadjimatheou. 1981. Stochastic Implications of the Life-Cycle Permanent Income Hypothesis: Evidence for the U. K. Journal of Political Economy, Vol. 89(3): 596-599.

Friedman, M (1957). A Theory of the Consumption Function", Princeton University Press.

Hall, R (1978). Stochastic Implications of the Life-Cycle Permanent Income Hypothesis: Theory and Evidence. Journal of Political Economy, Vol. 86(6): 971-987.

Islam, N. 2012. An Aggregate Consumption Function for Bangladesh:An Econometric Analysis.Bangladesh Arthaniti Samity Samoyiki 2010 pp 969-982. Bangladesh Economic Association. Dhaka.

Keynes, J. M (1936). "The General Theory of Employment, Interest, and Money", New York: Harcourt Brace & World.

MoF. 2014. Bangladesh Arthanaitik Samikkha(Bangladesh Economic Review) 2014. Finance Division. Ministry of Finance. Dhaka.

Matin, K. A. 1987. Aggregate Consumption Function In Bangladesh:1972/73 To 1985/86. The Dhaka University Studies Part C 8(2):129-135.

Zellner, A. 1957. The Short-run Consumption Function. Econometrica 25(4):552-567.