Determinants of Real Private Consumption in Bangladesh

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Abstract

This paper uses time series techniques to estimate the real private consumption function for Bangladesh with data from 1974 to 2004. We found that income elasticity of real private consumption is about unity and the elasticity with respect to availability of consumer credit is significant and plausible. It is also found that the growth in expected inflation and Value Added Tax have temporary effects on private consumption in Bangladesh.

Keywords: Consumption, General to Specific Method, Johansen Maximum Likelihood Method and Availability of Consumer Credit.

1 Saten Kumar is a graduate student in the School of Economics.

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1. Introduction

The aim of this paper is to investigate if a long run real private consumption relationship exists for Bangladesh. We have estimated real private consumption function for Bangladesh using the time series methods of General to Specific (GETS) and Johansen’s Maximum Likelihood (JML) techniques. Our results indicate that the income elasticity is about unity and the elasticity with respect to availability of consumer credit is significant with the expected sign.

It is well known that the simple Keynesian function known as Absolute Income Hypothesis (AIH) is based on some fundamental psychological laws and not based on the optimization assumptions and therefore cannot explain some observed facts. Empirical evidence in the postwar period showed that this theory is unsatisfactory. Further, the AIH does not allow for current consumption decisions that depend on future income expectations. Friedman’s (1957) Permanent Income Hypothesis (PIH) criticized AIH as unsatisfactorily. Friedman argued that current consumption need not totally depend on current income but depends on what is expected to be received over lifetime. It suggests that change in permanent income will be small if consumers’ lifespan is large. It is generally known that a rise in current income will raise consumption only to the extent that it reflects a rise in permanent income. PIH argues that consumers have to assess their income based on the past actual incomes. This is a major limitation of PIH as Hall’s (1978) Random Walk Model (RW) claimed that there could be forecasting errors involved in this type of assessment.

Modigliani and Brumbergs (1954) Life- Cycle Hypothesis (LCH) is consistent with PIH that pattern of income is critical for savings. LCH argues that consumers are rational economic agents looking forward for an optimal lifetime pattern of consumption based on their income expectations over entire lifespan. Hall (1978) argued that PIH and LCH consumption functions are somewhat inadequate and do not satisfactorily explain consumption facts, unless further modifications are made. Hall has introduced rational
expectations of future income into LCH and PIH. In the past empirical works these income expectations were proxied with a weighted average of past incomes. This implies that errors in the formation of such expectations are correlated.

The motivation for the introduction of the rational expectations of future income is that both LCH and PIH imply that current income depends on lifetime income. Since one does not know what their incomes will be in the future periods, one can only form expectations about their future incomes. If one uses all the available information to form their expectations, then there should not be any systematic deviation of the actual future income from their today’s estimate of expected future income. Therefore, this error term should be a truly random variable.

Further, Hall argued that if LCH and PIH are correct and if future income expectations are rational, then consumption in the next period should be equal to consumption in the current period. Hall also argued that it is hard to explain all the observed changes in consumption with only changes in permanent income. Thus, the RW model implies that changes in consumption are unpredictable and there is no available data in current period that can be used to forecast consumption in the next period.

To limit the scope of this paper, we only examine the long run relationship of real private consumption in Bangladesh with the GETS and JML techniques. Needless to say our methodology can be easily used to analyse real private consumption in other countries. Our paper is organized as follows: Section 2 and 3 detail our specification and empirical results, respectively. Conclusion is stated in the final Section 4.

2. Our Specification

In what follows, we detail our specification for real private consumption:

\[
\ln C_t = \beta_0 + \beta_1 \ln YD_t + \beta_2 R_t + \varepsilon_t
\]  

(1)
where $C$ is real private sector consumption including durables, $YD$ is real private sector income net of income tax computed as $YD_t = Y_t (1-T_x) + RGNT_t$, where $T_x$ is the average direct rate and $RGNT_t$ is the sum of grants and current transfers received by the private sector deflated by GDP deflator, $R_t$ is availability of consumer credit proxy computed as the spread between nominal short-term and long-term interest rates and $\varepsilon_t$ is an error term. Our prior expectations are that income elasticity is around unity and the elasticity with respect to availability of consumer credit is expected to be positive and significant.

The important issue in consumption specifications is whether to include rate of interest as an explanatory variable. Following Rao (2005), if consumers are weak risk aversion that is the elasticity of inter-temporal substitution is high, financial variables will have significant effects on consumption and saving decisions. This would be the case in developed countries. However, in developing countries the elasticity of inter-temporal substitution is likely to be low and consumers have low and volatile per capita incomes. As a result, consumption is less likely to respond to changes in the interest rate. Microfit 4.1 of Pesaran and Pesaran (1997) is used for estimation. We used annual data from 1974-2004.

3. EMPIRICAL RESULTS: THE GETS APPROACH

We first tested for the presence of unit roots in our variables. The Augmented Dicky-Fuller test (ADF) is used for testing for the order of the variables. The time trend is included because it is significant in the levels and first differences of the variables. The computed test statistics for the levels and first differences of the variables are given in Table 1 below:
Table 1

ADF test for Unit Roots:

<table>
<thead>
<tr>
<th>Variable</th>
<th>G</th>
<th>Test Statistic</th>
<th>95% CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln C</td>
<td>0</td>
<td>-3.352</td>
<td>-3.573</td>
</tr>
<tr>
<td>Δln C</td>
<td>3</td>
<td>-5.930*</td>
<td>-3.573</td>
</tr>
<tr>
<td>ln YD</td>
<td>4</td>
<td>-0.840</td>
<td>-3.573</td>
</tr>
<tr>
<td>Δln YD</td>
<td>0</td>
<td>-3.882*</td>
<td>-3.580</td>
</tr>
<tr>
<td>R</td>
<td>4</td>
<td>-2.498</td>
<td>-3.573</td>
</tr>
<tr>
<td>Δ R</td>
<td>1</td>
<td>-4.001*</td>
<td>-3.562</td>
</tr>
</tbody>
</table>

Notes: G is the lag length of the first differences of the variables. * indicates significance at 5% level. The sample period is 1974-2004.

The null hypothesis of unit root cannot be rejected at the 5% level for the level variables of ln C, ln YD and R, but the null that their first differences have unit roots is clearly rejected. It is well-known that the ADF test has a low power against the null. Therefore, since our ADF tests clearly indicate that the variables in their first differences are stationary, there is no need for conducting alternative tests that have more power against the null. The definitions of variables and sources of data are in the appendix.

Now we detail our results obtained with the GETS approach. The consumption equation was estimated with a lag structure of 4 periods and later reduced to parsimonious versions as reported in Table 2. The growth in expected inflation (Δ² lnP) and the dummy variable VAT seems to have temporary negative effects on private consumption.²

In Table-2, the equation GETS(1) is the initial parsimonious version. The implied income elasticity in GETS(1) is unity and the elasticity with respect to availability of consumer credit at its mean rate of 9.27% is about 0.15. These two estimated values imply that the

² The VAT dummy is constructed as 1 in 1991 and zero in other periods. It captures the effects of Value Added Tax on real private consumption in Bangladesh.
long-run elasticities for income and the availability of consumer credit are significant with expected signs and expected magnitudes. When we tested for the constraint of unit income elasticity, the Wald test computed $\chi^2(1)$ test statistic with $p$-value in the parenthesis is 1.0381 (0.308) is insignificant and the restriction could not be rejected. The equation GETS(2) is with this constraint. Its $X^2$ summary statistics indicate that there is no serial correlation, functional form misspecification, non-normality and heteroscedasticity in the residuals. Our preferred equation is GETS(2) and is tested for temporal stability. Neither the CUSUM nor CUSUM SQUARES test showed any instability. The CUSUM SQUARES stability test results are given by Figure 1.

THE JML APPROACH

Here we detail our results obtained with the JML approach. The optimum lag length of the VAR was tested with a 4th order model. The Akaike Information Criteria (AIC) and Schwartz Bayesian Criteria (SBC) criteria were used to select the lag length of the VAR. The AIC and SBC reached a maximum of 104.319 and 79.097 for the 4th order, respectively. The test for determining the number of cointegrating vectors is conducted with the Johansen maximum likelihood procedure in Microfit 4.1. The restricted intercept and no trend options are used where the maximal eigenvalue and trace test statistics for the null that there is no cointegration are 66.172 and 87.125, respectively. The 95% critical values, respectively, are 22.040 and 34.870. For the null that there is one cointegrating vector, the corresponding computed values, with the critical values in the parentheses are 15.402 (15.870) and 20.953 (22.860), respectively. Therefore, the null hypothesis that there are no cointegration is rejected but the null that the number of cointegrating vectors is one is not rejected. The implied cointegrating vector normalized on $\ln C$ is given below.

$$\ln C_t = 3.091 + 0.984 \ln YD_t + 0.010 R_t$$

(3.94)* (3.30)* (3.94)*

(2)
The implied income elasticity of consumption is about unity. The elasticity with respect to availability of consumer credit is also significant and plausible. These are consistent with our GETS equilibrium results in Table 2.

We proceeded further to estimate dynamic consumption equation. Adopting the lag search procedure used in the GETS approach in the second stage, we arrived at the parsimonious JML equations reported in Table 2. The \( \chi^2 \) summary statistics of JML equations in Table 2 are reasonable. The coefficients of the lagged error term have expected negative sign and implies the presence of negative feedback mechanism. Further, we tested if the coefficients of \( \Delta^2 \ln P_{t-3} \) and \( VAT \) in JML(1) are close. The null was accepted as the Wald computed \( \chi^2 (1) \) statistic (with p-value in parenthesis) of 1.076 (0.300) was insignificant. Therefore, JML(2) are our preferred estimates with these restrictions. Our preferred JML(2) equation was tested for temporal stability neither the CUSUM nor CUSUM SQUARES test showed any instability. The CUSUM SQUARES stability test results are given by Figure 2.

The identification and endogeneity tests were also conducted for real private consumption and found to be satisfactorily. The procedure used to conduct the identification and endogeneity tests are in Rao (2006). Further, consistent and close estimates of the GETS and JML indicate that endogeneity problem is not serious.
### TABLE 2: Results obtained with GETS and JML

<table>
<thead>
<tr>
<th></th>
<th>GETS(1)</th>
<th>GETS(2)</th>
<th>JML(1)</th>
<th>JML(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda )</td>
<td>-0.325</td>
<td>-0.122</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.56)*</td>
<td>(2.53)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-1.002</td>
<td>-1.550</td>
<td>-0.038</td>
<td>-0.045</td>
</tr>
<tr>
<td></td>
<td>(5.96)*</td>
<td>(13.51)*</td>
<td>(1.53)</td>
<td>(1.92)**</td>
</tr>
<tr>
<td>( \ln YD_{t-1} )</td>
<td>0.956</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(19.82)*</td>
<td>(c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R_{t-1} )</td>
<td>0.016</td>
<td>0.030</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.26)*</td>
<td>(2.43)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ECM_{t-1} )</td>
<td></td>
<td>-0.681</td>
<td>-0.813</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.35)*</td>
<td>(5.11)*</td>
<td></td>
</tr>
<tr>
<td>( \Delta \ln C_{t-1} )</td>
<td>0.440</td>
<td>0.449</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.18)*</td>
<td>(3.25)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta \ln YD_{t} )</td>
<td>1.652</td>
<td>1.804</td>
<td>1.720</td>
<td>1.765</td>
</tr>
<tr>
<td></td>
<td>(7.52)*</td>
<td>(8.25)*</td>
<td>(6.24)*</td>
<td>(6.47)*</td>
</tr>
<tr>
<td>( \Delta \ln YD_{t-1} )</td>
<td></td>
<td>-0.835</td>
<td>-0.883</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.54)*</td>
<td>(2.71)*</td>
<td></td>
</tr>
<tr>
<td>( \Delta \ln YD_{t-2} )</td>
<td>-0.995</td>
<td>-1.188</td>
<td>-0.999</td>
<td>-1.090</td>
</tr>
<tr>
<td></td>
<td>(4.53)*</td>
<td>(5.68)*</td>
<td>(3.86)*</td>
<td>(4.45)*</td>
</tr>
<tr>
<td>( \Delta R_{t-3} )</td>
<td>0.008</td>
<td>0.009</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.78)**</td>
<td>(1.89)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta^2 \ln P_t )</td>
<td>-0.047</td>
<td>-0.043</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.83)**</td>
<td>(1.71)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta^2 \ln P_{t-3} )</td>
<td></td>
<td></td>
<td>-0.056</td>
<td>-0.030</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2.09)*</td>
<td>(3.17)*</td>
</tr>
<tr>
<td>( VAT )</td>
<td>-0.018</td>
<td>-0.021</td>
<td>-0.022</td>
<td>-0.030</td>
</tr>
<tr>
<td></td>
<td>(1.81)**</td>
<td>(2.09)*</td>
<td>(1.77)**</td>
<td>(c)</td>
</tr>
<tr>
<td>Adjusted ( R^2 )</td>
<td>0.768</td>
<td>0.779</td>
<td>0.714</td>
<td>0.714</td>
</tr>
<tr>
<td>SEE</td>
<td>0.025</td>
<td>0.024</td>
<td>0.021</td>
<td>0.021</td>
</tr>
<tr>
<td>( X^2_{sc} )</td>
<td>(0.264)</td>
<td>(0.266)</td>
<td>(0.815)</td>
<td>(0.921)</td>
</tr>
<tr>
<td>( X^2_{ff} )</td>
<td>(0.134)</td>
<td>(0.418)</td>
<td>(0.100)</td>
<td>(0.127)</td>
</tr>
<tr>
<td>( X^2_{n} )</td>
<td>(0.861)</td>
<td>(0.901)</td>
<td>(0.365)</td>
<td>(0.380)</td>
</tr>
<tr>
<td>( X^2_{hs} )</td>
<td>(0.572)</td>
<td>(0.593)</td>
<td>(0.493)</td>
<td>(0.133)</td>
</tr>
</tbody>
</table>

3 Absolute t- ratios for coefficients and p- values for \( X^2 \) tests are in parentheses. * and ** indicate significance at 5% and 10% levels, respectively. \( \lambda \) is the speed of adjustment and (c) is constraint variable.
Figure 1: Stability test for equation GETS(2)

Plot of Cumulative Sum of Squares of Recursive Residuals

Figure 2: Stability test for equation JML(2)

Plot of Cumulative Sum of Squares of Recursive Residuals
4. Conclusion

In this paper, we have used time series approaches based on GETS and JML to estimate the real private consumption for Bangladesh for the period 1974-2004. The estimated income and availability of consumer credit elasticities are well determined and their signs and magnitudes are consistent with prior expectations. Our estimates show that income elasticity is around unity and the availability of consumer credit elasticity is positive and significant. The growth in expected inflation and Value Added Tax seems to have temporary negative effects on real private consumption in Bangladesh. Our results with GETS and JML imply that there is a well determined and stable real private consumption function in Bangladesh from 1974 to 2004. We hope that our work would be useful for further work on Bangladesh.
Data Appendix

$C_t = \text{Nominal private consumption expenditure including durable and non-\,durables deflated by GDP deflator. Source: International Financial Statistics (IFS-2005) and Asian Development Bank (ADB) database (2005).}$

$P_t = \text{Real GDP deflator. Source: (IFS-2005) and ADB database(2005).}$

$YD_t = \text{Real private sector disposable income. } YD_t \text{ is computed as: } Y_t * (1-T_x) + RGNT_t$, where $Y_t$ is the real GDP at factor cost, $T_x$ is the average direct rate and $RGNT_t$ is the sum of grants and current transfers received by the private sector deflated by GDP deflator. Source: (IFS-2005) and ADB database (2005).

$R_t = \text{Availability of consumer credit proxy computed as the spread between the nominal short-\,term interest rate and the long term interest rates. Source: (IFS-2005).}$

$VAT_t = \text{Temporary } VAT \text{ dummy for the introduction of Value Added Tax in Bangladesh. Data constructed as 1 in 1991 and zero in other periods.}$
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