Testing the 'Surprise' Consumption Function: A Comparative Study among the members of Gulf cooperation council

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Abstract

The purpose of this paper is to estimate the 'surprise' consumption function for the four member countries of the Gulf Cooperation Council which are Saudi Arabia, Oman, Kuwait and United Arab Emirates (UAE) and to compare the sensitivity of the rate of change in consumption to the innovation in the income-generating process among these member-states. The results of the autoregressive generating equation shows that the income generation process in Saudi Arabia and UAE are on similar pattern showing higher lags whereas for Oman and Kuwait there is only one time period lag. Further, the rate of change in consumption in Saudi Arabia and Oman is a function of higher lags of innovation in income generating process whereas for Kuwait and UAE, the larger lags are significant.

Keywords: Surprise Consumption, Income.

I. Introduction

The consumption expenditure constitutes the largest component of output/ income. The marginal propensity to consume (MPC) determines the size of the multiplier and the dynamic effects of shocks to the economy. For larger value of the multiplier, fluctuations in the economy will be larger and vice-versa. An economy having low per capita income (PCI) and encompassing poverty is likely to have higher MPC and hence larger value of the multiplier, putting the economy frequently to a larger degree of fluctuation. On the same reasoning, the developed countries are not supposed to face the fluctuations in their economy so frequently and widely.

Consumption represents in a true sense the final state of any economic activity. It is not only concerned with the individuals trying to get optimal satisfaction of their needs with limited and destructive resources, but it also deals in the context of cohesion coming out of group existence within set social structures.

It is, therefore, entirely natural that economists have had since long been concerned over the problems of consumption. How and why do people consume? Seeking an answer to this question has led people to meet first a demand for knowledge and then a need for the systematizing, forecasting and planning of the mechanisms that govern social life in our societies. It is in this perspective that the concept of aggregate consumption finds its position.

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Improved living standard, the main object of forward movement of any economy, determine the baselines of the country's economic development for a long-term period ahead, laying down the basic plan proportions, and the distribution and use of society's productive resources.

The purpose of this paper is to estimate the 'surprise' consumption function for the four member countries of the Gulf Cooperation Council which are Saudi Arabia, Oman, Kuwait and United Arab Emirates (UAE) and to compare the sensitivity of the rate of change in consumption to the innovation in the income-generating process among these member-states. The entire paper is divided into five segments. The first one is introductory. The second part talks about the review of literature. The third segment is given to methodology. The penultimate section interprets the result and the final one gives the concluding observations.

II. A REVIEW OF THE LITERATURE

An econometric study on the relationship between consumption expenditure and income has been of great interest from the time Keynes's General Theory focused on the structural relationship between income and consumption. Friedman's permanent income hypothesis and Modigliani's life-cycle hypothesis have just put a suggestion that how income variables could enter the consumption function. Their main concern was that temporary changes in income should have less impact on consumption than the permanent changes. Among the earlier studies, Duesenberry (1949) emphasised the effect of cyclical factors incorporated in his Relative Income Hypothesis (RIH). He went for empirical modelling of time-series aggregates on quarterly basis. In the RIH, the ratio of current saving to current income depends on the ratio of current income to past peak income, Y0,

$$S_t/Y_t = \alpha + \beta(Y_t/Y_0) + u_t \text{ ------------------ } (1)$$

Where St = current savings, Yt = current disposable income and Y0 = previous peak disposable income.

From here two distinguished hypotheses emerges out of Duesenberry's RIH: there is proportionate relationship between saving and income ($Y_t = \gamma Y_0$) in the long-run and in the short-run, the proportion of income saved (and consumed) depends (asymmetrically) on cyclical factors (Yt = or < Y 0).

While examining the cross-sectional data on family income and consumption, Friedman (1957) made consumption a distributed lag of current and past income. To resolve short and long–run behaviour of the observed consumption function, Friedman (1957) proposed the theory of "permanent income hypothesis" (PIH). In this outline, the level of consumption depends on current and expected future income stream, that is,

$$C_t = \theta Y_{pt} + \mu_t \quad \text{-----------------------------------} (2)$$

Where μ_t is independent of Ypt and has finite variance, and where Y_{pt} is "permanent income". The approximation of Y_{pt} presented by Friedman (1957) was $(1-\lambda L)\ Y_{pt} = (1-\lambda)\ Y_t$, and substituting this in Equation-(2), we get:

$$C_t = \theta(1-\lambda)(1-\lambda L)_{-1} Y_t + \mu_t \quad \text{-----------------} (3)$$

The wealth effect on the consumers' expenditure was also introduced in this literature after the pioneering work of Ando and Modigliani (1963). Often, this effect has been analysed as the life-cycle hypothesis (LCH) exposited by Modigliani (1975) in which private consumption is modeled as:

$$C_t = \alpha Y_t + (\delta - r) A_t \quad \text{-------------------------------} (4)$$

Where A_t is the end period private wealth, ∂ is the marginal rate of asset consumption and r is the rate of return on assets. If capital gains and interest are included in income A_t is defined as:

$A_t = A_{t-1} + Y_{t-1} - C_{t-1}$; replacing in (4) and reordering,

$$C_t = \alpha Y_t + (\delta - r - \alpha) Y_{t-1} + (1 - \delta + r) C_{t-1} \quad \text{-----} (5)$$

Which produces (similarly to Friedman's PIH) an autoregressive-distributed lag model of Ct and Yt.

In testing the permanent income hypothesis five alternatives have been proposed with respect to the consumption function. In the first case, the marginal propensity to consume is assumed to be equal to the average propensity to consume. In the second case, the adaptive expectation scheme is adopted. In the third case, a compound of adaptive expectation and habit persistence scheme is employed. In the fourth case, the rational expectations model introducing lags into the consumption function has been used (Hall, 1978). In the fifth case, the rate of change of consumption is determined by the innovation in the income-generating process (Muellbauer, 1983). This final case refers to the examination of the 'surprise' consumption function associated with Hall's (1978) rational expectations version of the permanent income hypothesis. Hall (1978) proposed -and opened the way for- an alternative econometric approach to the study of the life cycle–permanent income hypothesis. Modelling an intertemporal consumption decision by a "representative consumer" with "rational expectations", he showed the stochastic implication of the LC-PIH: no variable apart from the same consumption lagged one period should be of any value in predicting current consumption. To evaluate this hypothesis (for the US) some equations were estimated including as regressors, apart from lagged values of consumption, real per capita disposable income, whose coefficients on lagged terms were found to be insignificant. With these results Hall concluded that the evidence supports a modified version of the LC-PIH in which the consumption follows an approximate random walk as derived from the Euler equations (first order conditions of the consumers' maximisation problem) in the simplest model.

Athanasios Manitsaris (2006) examined the consumption function under the permanent income hypothesis based on annual data covering the period from 1980 to 2005 for selected 15 European Union member-states. The results show strong support for the hypothesis, supporting thus the consumption function under the permanent income hypothesis and the adaptive expectations model.

Eleni Katsouli (2006) tested the hypothesis that the rate of change in consumption is determined by the innovation in the income-generating process. He made a study based on annual data covering the period from 1980 to 2005 for the initial 15 European Union member-states using Muellbauer's (1983) version of Hall's (1978) 'surprise' consumption function. His results show strong support for the hypothesis, supporting thus the Muellbauer's version of Hall's 'surprise' consumption function.

III. Methodology:

Islam (1996) used the following two equations for estimating the surprise consumption function:

In the first step income autoregressive generating equation was estimated by using the following equation:

$$\log y_t = \alpha + \sum_{i=1}^{m} \alpha_i \log y_{t-i} + \lambda T + \mu_t \qquad \text{------------------------ (I)}$$

where, Y_t is income in time period t and T is time trend.

In the second step 'Surprise consumption function' was estimated by using the following equation:

$$d\left[\log(c_t)\right] = \beta + \sum_{j=0}^{n} \beta_j I_{t-j} + \delta T + \varepsilon_t \qquad \text{-------- (II)}$$

Where, C_t is consumption in time period t and $d\left[\log(c_t)\right] = log\ (C_t)\ -\ log\ (C_{t-1})$ gives the rate of change in consumption. $I_{t-j} = \log(y_{t-j}) - \log\hat{(y}_{t-j})$ Where $\log(\hat{y}_{t-j})$ is the predicted value of $\log(y_{t-j})$ as obtained in the first step. This shows the innovation in the income generating process.

For estimating equations-I and II, annual datas for Gross Domestic Product at constant prices (Year- 2000) and household final consumption expenditure at constant prices (Year-2000) during the period 1973 to 2007 have been used. The source of data is World Bank Indicators-2008 published by World Bank. The countries used in the study are Saudi Arabia, Oman, Kuwait and United Arab Emirates. Results were obtained by using the E-Views statistical software. Due care was taken in selecting the model having larger values of Akaike info criterion (AIC) and Schwarz Bayesian criterion (SBC), apart from Adjusted R^2 value (As simple R^2 can't be used as a means of comparing two different equations containing different numbers of explanatory variables, the adjusted R^2 takes into account the number of explanatory variables included in each model). The AIC developed by Akaike (1974) and SBC developed by Schwarz (1978) are different methods-apart from adjusted R^2 – for model comparison in assessing the goodness of fit after allowing for the number of explanatory variables to change. Residual tests for normality were performed by applying Jerque-Bera (JB) test of normality. If the computed p-value of the JB statistic in an application is sufficiently low, which will happen if the value of the statistic is very different from zero, one can reject the hypothesis that the residuals are normally distributed. But if the p-value is reasonably high, which will happen if the value of the statistic is close to zero, the normality assumption is not rejected.

Autocorrelation or serial correlation occurs in data when the error terms of a regression model are correlated. The correlation among the error terms may lead to several problems. First, the estimates of the regression coefficients no longer have the minimum variance property and may be inefficient. Second, the variance of the error terms may be greatly underestimated by the mean square error value. Third, the true standard deviation of the estimated regression coefficient may be seriously underestimated. Fourth, the confidence intervals and tests using the t and F distributions are no longer strictly applicable. To detect autocorrelation, apart from taking help from most common Durbin-Watson d-statistic (As this test has got its own limitations), Breusch-Godfrey Serial Correlation LM Test of first order was applied and to resolve the problem AR(1) and MA(1) models were applied.

As the problem of heteroscedasticity leads to an increase in the standard error, detecting it and resolving the problem in a regression analysis is must. For this Lagrange multiplier (LM) test for autoregressive conditional heteroskedasticity (ARCH) in the residuals (Engle 1982) were applied. This particular specification of heteroskedasticity was motivated by the observation that in many financial time series, the magnitude of residuals appeared to be related to the magnitude of recent residuals. ARCH in itself does not invalidate standard LS inference. However, ignoring ARCH effects may result in loss of efficiency. Another test for heteroskedasticity (White heteroskedasticity with no cross terms) was done to know the precision of the OLS estimator. This is a test for heteroskedasticity in the residuals from a least squares regression (White, 1980). Ordinary least squares estimates are consistent in the presence of heteroskedasticity, but the conventional computed standard errors are no longer valid. In case of evidence of heteroskedasticity, we should either choose the robust standard errors option to correct the standard errors or we should model the heteroskedasticity to obtain more efficient estimates using weighted least squares.

Finally, to examine whether the parameters of the model are stable across various subsamples of your data or not, Ramsey RESET (Regression Specification Error Test) model specification test was done to know the stability of the model. Output from the test reports the test regression and the F-statistic and log likelihood ratio for testing the hypothesis that the coefficients on the powers of fitted values are all zero. A study by Ramsey and Alexander (1984) showed that the RESET test could detect specification error in an equation which was known *a priori* to be misspecified but which nonetheless gave satisfactory values for all the more traditional test criteria—goodness of fit, test for first order serial correlation, high t-ratios.

IV. Interpretation of the Results:

The results of the two equations in four gulf co-operation council countries are given in the following Tables-1 and 2.

In the tables given below, the following terms are used:

Adj. R^2	= adjusted for degrees of freedom determination coefficient
DW	= Durbin – Watson statistic for autocorrelation
LM (1)	= Lagrange multiplier statistic of order one for autocorrelation
JB	= Jarque – Bera statistic for normality
WH	= White heteroskedasticity statistic
RESET (1)	= Reset statistic of order one for miss-specification
ARCH (1)	= Autoregressive conditional heteroskedasticity statistic of order one

Table-1 gives the results for model given by equation-I. The outcome for the four countries show that up to a maximum lag of order three appear to characterize the income generating process among all these countries. The coefficients of the lagged values of log (Y_t) were highly significant as reflected by their large t-values and almost negligible p-values. Further, the sums of these coefficients for all the four countries were found to be positive and less than one which reflects that the income generating process was not explosive.

Table-1: Regression results for equation-(I):

Country →	Saudi Arabia	Oman	Kuwait	UAE
Constant	7.62 (.013)	5.78 (0.025)	12.91 (0.000)	4.08 (0.098)
Trend (T)	.012 (.054)	0.018 (0.054)	0.026 (0.015)	0.013 (0.080)
Log (y_{t-1})	0.89 (.000)	0.74 (0.000)		0.981 (0.000)
Log (y_{t-2})			0.444 (0.003)	
Log (y_{t-3})	-0.201 (0.064)			-0.156 (0.068)
AR (1)		-0.559 (0.022)		
MA (1)	0.96 (0.000)	0.974 (0.000)	0.997 (0.000)	
Adj. R^2	0.962	0.977	0.861	0.963
DW	1.85	1.908	1.74	1.86
JB	0.464	0.233	0.504	0.612
LM (1)	0.810	0.681	0.338	0.793
ARCH (1)	0.411	0.561	0.018	0.493
WH	0.249	0.570	0.949	0.346
RESET(1)	0.057	0.114	0.257	0.048

Table-II: Regression results for Equation (II):

Note: The terms in bracket shows the exact significance level of the coefficients. For the diagnostic tests, the exact significant levels are given.

Country →	Saudi Arabia	Oman	Kuwait	UAE
Constant	24.289 (0.000)	21.722 (0.000)	22.533 (0.000)	21.68 (0.000)
Trend(T)	0.028 (0.000)	0.028 (0.022)	0.037 (0.000)	0.094 (0.000)
I_t				
I_{t-1}		0.847 (0.008)	0.203 (0.054)	0.278 (0.004)
I_{t-2}	0.164 (0.221)		0.308 (0.013)	0.319 (0.002)
I_{t-3}	0.269 (0.126)			0.202 (0.024)
I_{t-4}	0.223 (0.084)		0.303 (0.000)	
AR(1)	0.599 (0.013)	0.872 (0.000)		
MA(1)	0.935 (0.000)	0.939 (0.000)	0.947 (0.000)	0.642 (0.000)
Adj. R^2	0.943	0.962	0.924	0.996
DW	1.94	1.84	1.87	2.11
JB	0.362	0.701	0.800	0.157
LM(1)	0.702	1.00	0.842	0.303
ARCH(1)	0.188	0.490	0.831	0.533
WH	0.810	0.311	0.074	0.386
RESET(1)	0.024	0.388	0.049	0.009

Similarly, Table-2 presents the results for the surprise consumption function. The end result of the model given by equation-II confirms that 'surprise consumption function' of the four GCC countries is well represented by a lag up to the order of four. The lagged values of I_t which stands for the innovation in the income generating process are highly significant and the sum of the coefficients are positive and less than one showing that the process is not explosive.

V. Conclusions and Implications:

The results of the autoregressive generating equation as given in table-1 shows that income generation in Saudi Arabia is chiefly determined by one year lag with elasticity factor being 0.89 whereas three year lag puts a negative impact. The small but negative three year lag for income generation shows the weak memory effect of the people in KSA i.e. they don't put efforts in maintaining their income on the basis of distant past income and the result is a decline in income. The business implication of this is that in order to know the consumption of people in KSA (as consumption is a function of income), they have to concentrate on their immediate past income for positive impact as well on three year lag for negative impact. The marginal impact of trend is 0.012 which shows that only 1.2% of the income generation process is explained by the trend factor. In Oman the income generation is largely determined by one time period lag, the elasticity of income in current period with respect to previous period is 0.74 and the marginal impact of trend factor is only 1.8%. The income generation in Kuwait is a function of two time period lag with the elasticity value of 0.44 only. The immediate income lag factor is not significant. This shows that people are less concerned in maintaining their income in the light of their past income. This factor is highest for UAE, the immediate income lag being the only important factor in the income generation process with an elasticity value of 0.981. The three year lag has some negative, though marginal, impact. So the income generation process in Saudi Arabia and UAE are on similar pattern showing higher lags whereas for Oman and Kuwait there is only one time period lag. This is the reason that it is easy to predict the income and hence consumption pattern of people in these countries and as a result the inflow of investment in non-oil sector in these countries are also larger as compared to KSA.

The results as presented in table-2 explain that the rate of change in consumption in Saudi Arabia is a function of higher lags of innovation in income generating process. The implication of this for business class is that they have to study more about the past income of people in this country in order to know the changes in their consumption level. In Oman the same is a function of only one time period lag. Again for Kuwait and UAE, the larger lags are significant. The marginal impacts of trend factor for the four countries are 2.8%, 2.8%, 3.7% and 9.4% respectively.

Comparing the long-run equilibrium effect of surprise consumption function in four GCC countries by adding the coefficients of the surprise consumption function as given by equation-II, the sensitivity of the rate of change in consumption to the innovation in the income-generating processes is given in order:

Oman (0.902) > UAE (0.838) > Saudi Arabia (0.701) > Kuwait (0.470).

To conclude, it can be said that the results obtained for the four GCC countries reinforces Muellbauer's (1983) version of Hall's (1978) 'surprise' consumption function.

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