

## **Empirical Evidence on Keynes Consumption function and attempts to resolve the controversy regarding short run non-proportionality and long run proportionality of aggregate c-y ratio**

Keynes' consumption function hypothesis was based neither on an extended chain of reasoning from a priori postulates nor upon any statistical study. It was neither a good example of inductive nor of deductive reasoning. Yet there were certain statistical data available to Keynes which appears to be consistent with all aspects of his hypothesis.

At various times over the past 100 years and in various countries, comparative studies have been made of family budgets. For a group or "cross-section" of families at a given time, data have been collected regarding income and spending. These data have been used to support the empirical hypothesis, often called "Engel's Law". These data also ordinarily reveal the total expenditure on all objects of the families covered by the study. Almost without exception budget studies show a relationship between family income and total family consumption like that which Keynes postulated for the total economy low income families typically dissave; high-income families typically spend less than income. As one moves along the distribution from lower to higher incomes, consumption rises, but by less than income; the higher the income the less the rise in consumption from a further increment of income. Thus the MPC is positive, less than one and declines as income rises. And therefore,  $APC > MPC$ .

But question arose, whether it is legitimate to transfer estimates based on budget study data to the aggregate consumption function in which Keynes was interested. At best, it is a highly questionable procedure. The data show how consumption differs as income differs as between families at different income levels. But Keynes' hypothesis relates to how consumption changes as income changes and on the aggregate not the individual family level. To go from the former to latter requires some rather drastic assumptions about behaviour that we have no obvious reason to make.

In the first place, there is the aggregation problem. Even if we had no such problem, it will not be legitimate to transfer data about income differences to the situation of income change. From the empirical studies another fact is revealed that although the MPC derived from budget studies is always considerably below the APC, the APC for all families included in a budget study is strikingly similar for studies taken as much as 50 or more years apart, in which period average income has increased more than two times.

Finally, Budget study data do not provide us evidence on the relationship of aggregate consumption to aggregate income directly. Fortunately for Keynes' hypothesis time series data of national income can be used to establish the relationship. The result obtained from such analysis shows that not merely had Keynes guessed correctly that there existed a general tendency for consumption to follow income but it appeared that the relationship was most precise.

Although the budget study data by and large supported the Keynes' absolute income hypothesis there still exist some unsolved problems. Apart from statistical involved in measuring the real disposable income from GNP some conceptual questions also remain to be resolved. But one of the most debated problems in this regards arose from the empirical study made by Kuznets. In 1946, Kuznets published the time series estimates of national income and national product for the US, for the overlapping decades from 1869 to 1938. According to his findings the APC stayed relatively stable over a very large growth of total income. But when the post war II data were analysed (by Friedman) a non proportional relation between consumption and income was obtained. Some reconciliation of the two sets of data was obviously required and it has been argued that perhaps there exist a long run proportional relationship along with a short run non-proportional consumption function where  $MPC < APC$ .

One of the first attempts reconciliations was provided by Arthur Smithies. He reasoned that what might have happened was that the consumption function basically a non proportional response of consumption to fluctuations in income- had been drifting slowly upward over the decades as income had slowly grown and that upward drift of the function had just happened to offset the tendency for the APC to decline as income grew (see the figure). To Smithies, it was a mere coincidence that the upward drift of the consumption function from CF1 to CF2 to CF3 had just about exactly offset what would otherwise have been a decline in the APC as a result of income growth (from  $y_1$  to  $y_2$  to  $y_3$ ). Thus, according to Smithies this debate can be resolved merely by taking into account the shift factors, which he himself verified empirically.

Duesenberry, a student of Smithies, was not satisfied with this explanation which made the basic consumption function non-proportional. Contrary to that he advocated that the basic relationship between consumption ( $c$ ) and income ( $y$ ) is one of proportionality and it is not at all a coincident.

Using the budget study data Duesenberry showed that consumers adjust their consumption to previous income, particularly to previous peak income. Therefore,  $c$  depends on the standard of living acquired during the previous boom and not on the current disposable income. In other words there exist a "ratchet" in consumption that is when income falls consumption falls less than proportionally cutting the saving rate. But when income rises  $c$  automatically starts to adjust with the new peak income level. Thus, due to existence of time lag in the consumption function an apparent non-proportional relation is obtained from the budget study data in the short run and a proportional relation in the long man.

Duesenberry also analysed the secular and cyclical trends obtained from time series data. He argued that  $c$  of an individual does not depend on his absolute income rather it depends on his relative position in the entire income strata of the society. He explained that when income of an individual increases, initially he finds himself richer both in absolute and relative terms and he starts to save. Thus, APC falls in the short run. But as soon as he finds out that his relative position in entire society has not changed he starts to follow the consumption pattern of

immediate higher income group and his saving starts to fall. As a result  $c$  &  $y$  become proportionate Duesenberry termed this as “demonstration effect.”

Like Duesenberry, Friedman also tried to resolve the debate in his own way. According to him current consumption depends on current income as well as on the anticipated future income. Friedman, showed that both  $y$  &  $c$  have two components : permanent and transitory. This means  $y = y_p + y_t$  and  $c = c_p + c_t$ . While there exist a strictly proportional relation between  $c_p$  and  $y_p$  there exist no such relation between  $c_p$  and  $y_t$ ,  $y_t$  and  $c_t$  or  $y_p$  and  $c_t$ . In the long run positive and negative transitory incomes ( $y_t$ ) balance each other and proportional relationship between  $c$  &  $y$  becomes pronounced. But in the short run inclusion of either positive or negative  $y_t$  in actual income ( $c$ ) of that period generates a nonproportional relationship between  $c$  &  $y$ .

On the other hand in order to justify short run non-proportionality and long run proportionality between  $c$  and  $y$  Modigliani and Brumberg developed an independent theory of consumption behaviour which makes  $s/y$  a function of life time average income. The theory may be summarized as follows. Consumption of a person used to spread over his entire life time and that depends on his total expected income of his entire life. Incomes in the initial and late stage of life are usually low while earning is expected to be high in the middle stage. Consumption expenditure, on the other hand, is likely to be more or less stable. So when  $c$  is related to the current disposable income we get a non proportional relation while the long-run relationship comes out to be proportional in aggregate terms.

To conclude the discussion we must admit that each theory has its own logic and argument and we shall not choose any one explanation as “true”. But one thing is clear that there exist severe disagreement regarding consumption function and no unanimous decision in this regards is likely to emerge in near future.

## Relative-Income Hypothesis

J. Duesenberry

1. Duesenberry did not find the proportional relationship between consumption and income as a coincident. Unlike his teacher Smithies he advocated that the basic relation between consumption and income in one of proportionality and non-proportionality arises due to existence of time lag in the (cross section) data

2. Consumers adjust their consumption, according to Duesenberry, to the previous income, particularly previous peak income rather than present disposable income therefore consumption depends on the standard of living acquired during the previous boom. c.f ( $y_0$ )

3.  $S_t/y_t = a y_t/y_0 + b$ .  $y_t$  – current period,  $y_0$ - previous peak income

4. When income falls consumption falls less than proportionally cutting the saving rate. Out income rises consumption automatically follows it. This means as consumption function shifts from  $CF_1$  to  $CF_2$  the consumption level starts to adjust with the new peak income level  $y_1$  (instead of  $y_0$ )

N.P. When C moves along  $CF_1$  or  $CF_2$   $MPC < APC$  and relationship is one of non-proportional

5. Duesenberry argued that this pattern of consumption arises due to the demonstration effect

6. He pointed out that income does not grow smoothly upward but there are ups and downs. Once peak income shifts from one to another ( $y_0$  to  $y_1$ ) consumption is adjusted such as APC remains constant  $c = y(b-c) + \bar{c}y$  SR  $\rightarrow C = C_a + C_y$

$$LR \rightarrow C = by$$

So according to him short run cyclical movement creates the situation of non proportionality

7. Interpretation of CROSS SECTION observations. Consumption level of an individual does not depend on his own income but on percentile of his income with respect to the total income.  $u = u(C_1/R_1, C_2/R_2, \dots)$   $R_1, R_2$  average consumption made by others.

8. When initially income increases individual perceives that his position in entire economy has move upward (i.e. others income have not increased/changed) and so he

starts to save more and consume less with respect to his present income. As  $c/y$  falls the consumption functions depicts a non-proportional relation

9. But as soon as he finds out that others income have also increased and his relative position has not changed (assuming income distribution constant) he will spend more to reach the standard of living corresponding to his income group and  $c/y$  rises to the previous level.

### **Ratchet Effect**

We know that Keynesian consumption function is summarized as  $c=c(y)$ . As  $y$  increases  $c$  increases. But this functional relationship does not work in reverse direction, i.e, as  $y$  falls  $c$  does not fall at the same proportion (if at all falls). This phenomena is called ratchet effect on consumption. Actually for a long period of time Keynesian  $y$  and  $c$  relationship was accepted without much challenge. But Kuznets empirical findings put the Keynesian consumption function analysis under a controversy. He showed that  $c$  &  $y$  are proportionally related in the long run (Time series) and non-proportionally related in the short run (cross section). Smithies reconciled this contradiction by assuming shifts in short run consumption functions as peak income changes.

*Compiled by Dr. Debjani Sengupta*

## Permanent Income Hypothesis

M. Friedman

Permanent income is the amount that can be spent without depleting the wealth.

According to Friedman current consumption depends on current income and anticipated future income, which he termed as permanent income ( $y_p$ )  $y_p$  is weighted average of current and past income, higher weight for current and lower for past income.

(i)  $y = y_p + y_t$  and  $C = C_p + C_t$  where p denotes permanent and t denotes transitory.

(ii)  $C_p = n y_p$  and  $0 < n < 1$

(iii) There is no relationship between (a)  $y_p$  and  $y_t$  (b)  $C_p$  and  $C_t$  or (c)  $y_t$  and  $c_t$ . This implies MPC to  $y_t$  is zero. It should be noted that Friedman explained that windfall gain ( $y_t$ ) tends to create consumer durables which he treated as INVESTMENT.

Based on above three propositions Friedman concluded that in the long run positive and negative transitory incomes balances each other and proportional relationship between consumption and income becomes pronounced. But in the short run inclusion of either positive or negative transitory income in that period makes the relationship between actual consumption and actual income non-proportional

When business cycle is at its peak  $y > y_p$ ;  $y_t > 0$  as MPC to  $y_t = 0$  c is less than proportional to y this produces a point(B) on short run consumption function (SCF) which is below corresponding point (B) on the long run consumption function (LCF).

Conversely, when business cycle is at trough,  $Y < y_p$ ;  $y_t < 0$  but MPC to  $y_t$  being zero permanent consumption will not fall so actual consumption will be at previous level (A) on the LCF the corresponding point on SCF is A. Actual income being y instead of  $y_p$ , consumption income relation becomes nonproportional again.

According to Friedman since  $c_p$  depends on  $y_p$  which is also relatively stable. But on the other hand actual income fluctuates due to  $y_t$  and this leads to a non proportional relation in the short run.

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## Life Cycle Hypothesis: Ando – Modigliani

The typical individual has an income stream which is relatively low at the beginning and end of his life, when his productivity is low and high during the middle of his life. On the other hand, the individual might be expected to maintain a more-or-less constant, or perhaps slightly increasing level of consumption assuming the expected life time. This is shown in the figure. Now total life time is T. Consumption cannot exceed total life time income. In initial period individual is net borrower as his consumption is greater than income. In middle years, he saves to repay debt and provides for retirement. And in last stage he dissaves. Due to thus be having high income groups has relatively low average propensity to consume (c/y) and low income groups has relatively high average propensity to consume (c/y). This leads to  $APC > MPC$  (in cross section – data).

Ando-Modigliani begin with explicit assn that observed consumer behaviour is the result of an attempt by rational consumers to maximize utility by allocating a life time stream of earning to an optimum lifetime pattern of consumption. We start with individual utility  $f_n$   
 $U = U(c_0, c_1, c_2 \dots c_t) \dots$  (1) Where lifetime utility  $u$  is a  $f_n$  of his real consumption  $c$  in all time pd up to T. (his expected life pd). Consumer maximizes (life time) utility s/t income constraint. In other words utility is maximized when the present value of consumption stream

$$C_0 + \frac{c_1}{(1+r)} + \frac{c_2}{(1+r)^2} + \dots + \frac{c_t}{(1+r)^t} = \sum_0^I \frac{c_t}{(1+r)^t} \dots\dots\dots (2a)$$

is equal to his present value of income stream

$$y_0 + \frac{y_1}{(1+r)} + \frac{y_2}{(1+r)^2} + \dots + \frac{y_t}{(1+r)^t} = \sum_0^T \frac{y_t}{(1+r)^t} \text{ Where } r \text{ is the discount rate}$$

$$\sum_0^I \frac{c_t}{(1+r)^t} = \sum_0^T \frac{y_t}{(1+r)^t} \dots\dots\dots (3)$$

We, begin with two pd 0 and 1  $U = V(c_0, c_1)$  is maximum  $v$

$$C_0 + \frac{c_1}{(1+r)} = y_0 \frac{y_1}{(1+r)} \text{ [PV of } C \text{ at } 0 = \text{PV of } y \text{ at } 0]$$

We also assume that the capital market is at equilibrium so when  $c$  is adjusted with  $y$  at any pd of time by either lending or borrowing.  $S_0 = y_0 - c_0 =$  money lent in pd 0 when  $y_0 > c_0$  By lending  $S_0$  at pd he receives  $S_0(1+r)$   $S_0 = y_1 - c_1$ . This means  $c_1 > y_1$ . Dividing the expression for  $S_1$  by that for  $S_0$  yields the tradeoff between present and future consumption.

$$S_1/S_0 = \frac{-S_0(1+r)}{s_0} = \frac{y_1 - c_1}{y_0 - c_0}$$

Or,  $y_1 - c_1 = - (1+r) (y_0 - c_0)$

In this figure,  $y_1 > y_0$  he borrows  $(c_0 - y_0)$  in period 0 at  $r$  int. rate. In pd1, he pays back  $y_1 - c_1 = (1+r) (c_0 - y_0)$ . Thus, the pattern of individual's consumption (including present consumption  $C_0$ ) is determined by his budget line and indiff.

$C_t = f(PV_t)$  Where  $f' > 0$

$$PV_t = \sum \frac{y_t}{(1+r)^t} \dots\dots (4)$$

Extending this two period model to expected lifetime (T) pd. For individual where  $k_i$  is MPC to  $y_i$   $k_i$  depends on the shape of Indiff curve and int. rate ( $r$ ). If population  $dn$  by age & income is relatively const and laste betn present 2 future are stable through time, we can add up all the indl consumption fns to a stable aggregate consumption fn.

$$C_t = k (PV_t) \dots\dots (5)$$

In order to obtain an operational consumption fn from above eqn a series of assumption was made by Ando-Modigliani First they divided into income from labour ( $y^L$ ) and income from asset or property ( $y^P$ ). Thus,  $PV_0$  is summation of two income streams.

$$PV_0 = \sum_0^T \frac{y_t^L}{(1+r)^t} + \sum_0^T \frac{y_t^P}{(1+r)^t} \dots\dots\dots (6)$$

Second, capital markets are reasonably efficient, so the present value of the income from an asset is equal to the value of the asset itself, measured at the beginning of the current pd. Thus,

$$\sum_0^T \frac{y_t^P}{(1+r)^t} = a_0 \dots\dots\dots (7)$$

Where  $a$  is real household net worth at the beginning of the pd. Now present labour income (known) is separated from future (unknown or expected) labour income thereby

$$PV_0 = y_0^L + \sum_1^T \frac{y_t^L}{(1+r)^t} + a_0 \dots\dots\dots (8)$$

Fourth, there is an average expected labour income  $y_0^e$

$$y_0^e = \frac{1}{T-1} \sum_1^T \frac{y_t^L}{(1+r)^t}$$

Where (T-1) the remaining expected life period or,

$$\sum_1^T \frac{y_t^L}{(1+r)^t} = (T-1) \cdot y_0^e$$

Finally, average expected labour income ( $y_0^e$ ) is multiple of present labour income ( $y_0^L$ ). That is  $y_0^e = \beta y_0^L$ , where

$$y_0^e = \beta y_0^L = f(N/L) \text{ where } f' > 0$$

N – employment, L – lab our force's size.

But Ando – Modigliani took the simplest ar<sup>n</sup> as the data they used well fitted in this eqn. Thus,

$$\begin{aligned} PV_0 &= y_0^L + (T-1) \cdot \beta y_0^L + a_0 \\ &= [1 + (T-1)\beta] y_0^L + a_0 \end{aligned}$$

Now substituting this for consumption we get

$$C_0 = k [1 + \beta (T-1) y_0^L] + ka_0$$

This is Ando-Modigliani's formulation of consumption  $f_n$  which is graphically shown in the figure the intercept of the  $C_n f_n$  is set by the level of assets, at, the slope is MPC to  $Y^L$ . In short run with assets remaining fairly constant due to cyclical fluctuation in income  $C/Y$  will vary. But over long run as savings causes assets to rise the  $f_n$  shifts up as  $ka_t$  increases.

Thus, overtime we may observe a set of points such as along the OX line.

Now we find that this model explains that (a)  $MPC < APC$  as a result of cross-section budget studies by the LCH. (b) It provides and explanation for short run variability and cong run constancy by  $c$  and  $y$ . (c) In addition it explicitly includes assets as an explanatory variable in the consumption function.

The LCH does not only explains why  $c$  and  $y$  are non-proportional in SR but proportional in the LR it explicitly includes assets as an explanatory variable in  $c_n f_n$ .

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