The Digital Economist

Lecture 5 – Aggregate Consumption Decisions

*Of the four components of aggregate demand, consumption expenditure **C** is the largest contributing to between 60% and 70% of total expenditure. For this reason, a detailed examination of the factors that affect household spending decisions is important and necessary/ This category of expenditure includes private spending on **durable goods**, **non-durable goods**, and **services**.*

INDIVIDUAL CONSUMPTION and SAVINGS DECISIONS

Before we study the factors that affect aggregate consumption decisions, we must look at the micro-foundations of this type of behavior – that of the individual consumer.

Models of individual consumption behavior begin with the notion of an individual maximizing his or her level of satisfaction (utility) from present consumption C_o and from future consumption C_f:

$$\textit{max} \quad \mathbf{U} = f(C_o, C_f)$$
$$= \mathbf{U}(C_o) + \Sigma_L U(C_t)(1+\rho)^{-t}$$

Into the future this utility from consumption is discounted at some rate 'ρ' the **rate of time preference** for a given individual. Higher values for this rate of time preference imply less satisfaction from future consumption relative to current consumption spending.

This consumption pattern is constrained by current and (expected) future levels of income Y_o & $E[Y_f]$. In this model, the expectation of future levels of income are based on individual skills and talents, and ownership of income producing assets W_o. In addition, consumption patterns are constrained by the prevailing, market determined, real interest rate 'r' which represents a payment (or reward) for foregoing current consumption.

The two- period model is developed as follows:

$$\textit{max} \quad U = f(C_o, C_f)$$

$$\textit{subject to} \quad [Y_o - C_o](1+r) + W_o = C_f - Y_f$$

Current Savings '$[Y_o - C_o]$' multiplied by an interest rate factor '$(1+r)$' will allow for future consumption in excess of future income. Solving for future consumption as a function of current consumption allows us to write the constraint in intercept-slope form as:

$$C_f = \{Y_o(1+r) + E[Y_f] + W_o\} - (1+r)C_o$$

In the diagram below, the curves IC_o and IC_1 represents levels of satisfaction (or utility) received from combinations of present and future consumption activity. Each point on a given curve, known as an indifference curve, represents equal levels of satisfaction from different combinations of consumption in the present and future. The position of an indifference curve (above or below point 'ω' -- the endowment point) depends on the individual's own rate of time preference 'ρ'. The constraint or budget line, in the diagram below, represents the possible levels of consumption in the two periods given the individual's level of present income, future expected income and the prevailing interest rate 'r'. This budget line has a slope equal to -(1+r) and must pass through point 'ω' denoting the fact that if current consumption equals current income then future consumption and income must also be equal.

Figure 1a -- Net-Savers

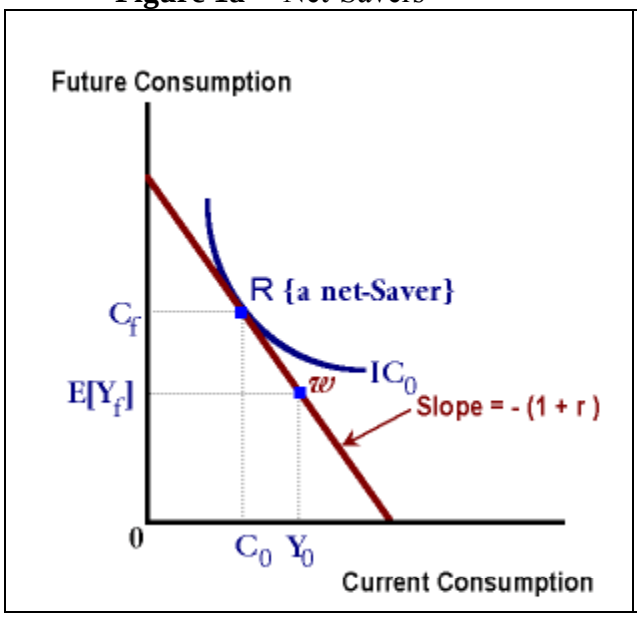


Figure1b -- Net-Borrowers

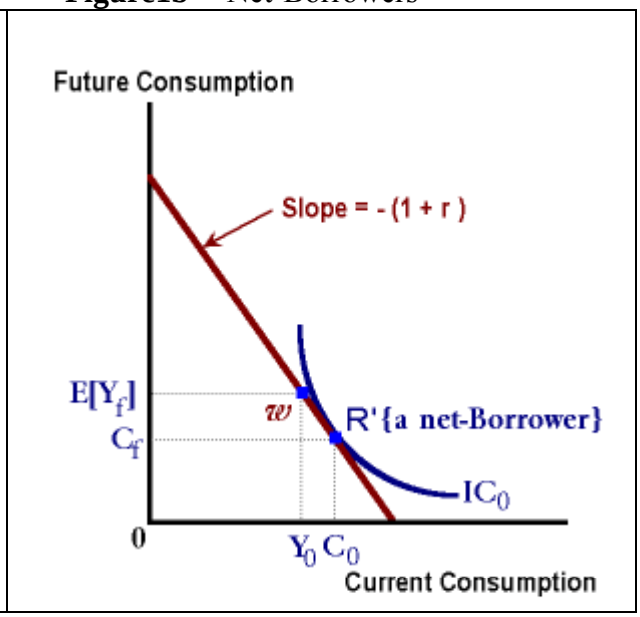


Figure 1a above (left) represents the behavior of a net-saver (an individual with strong preferences for future consumption relative to current consumption) in the current time period -- current income exceeds current consumption. For this individual, these savings along with an interest payment may be used for future consumption in excess of future income. Figure 1b above (right) represents the behavior of a net-borrower (an individual with strong preferences for current consumption). Funds are borrowed from the future at an interest rate 'r' to allow for current consumption in excess of current income.

As in all indifference curve models, a tangency between an indifference curve and the budget line represents an equilibrium position for the individual. Within the two-period consumption model, it is interesting to look at the effect of changes in the interest rate and future expected income on consumption patterns and on savings or borrowing activity.

An increase in the interest rate will cause a clockwise rotation in the budget line as shown in the next diagram (Figure 2 a & b). This increase makes savers better off (they will be on a higher indifference curve) and borrowers worse off. When the interest rate increases, current consumption becomes relatively more expensive (*the interest rate represents the "price" of current consumption*) thus the individual will tend to substitute away from current consumption. This movement is known as the **substitution effect**. However, assuming that present and future consumption are both *normal goods*, an increase in the interest rate will increase relative income leading to what is known as the **income effect**. For a net-saver this increase in relative income will thus induce him to "buy" more current consumption.

Figure 2a -- An Increase in the Interest Rate (*strong Substitution Effect*)

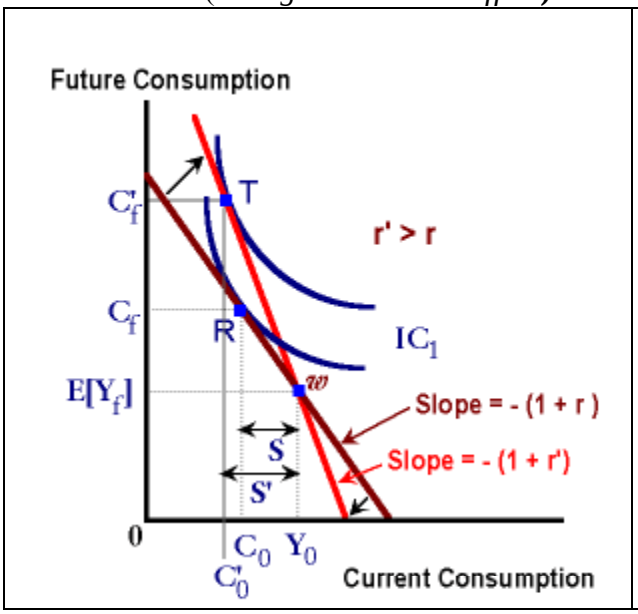
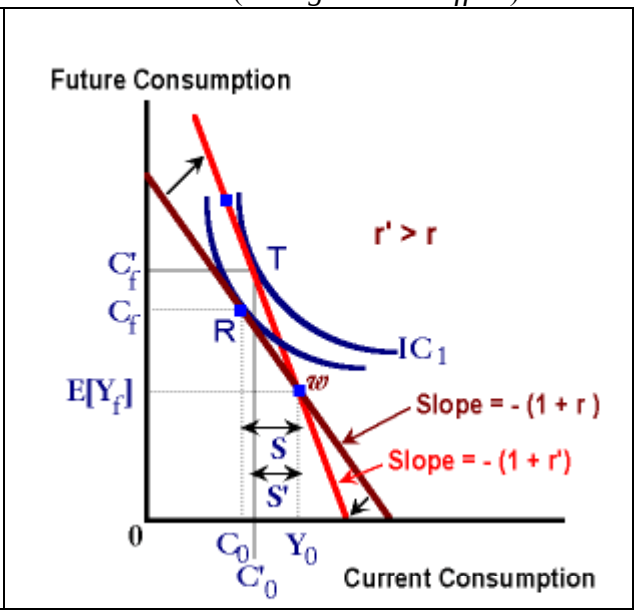


Figure 2b -- An Increase in the Interest Rate (*strong Income Effect*)

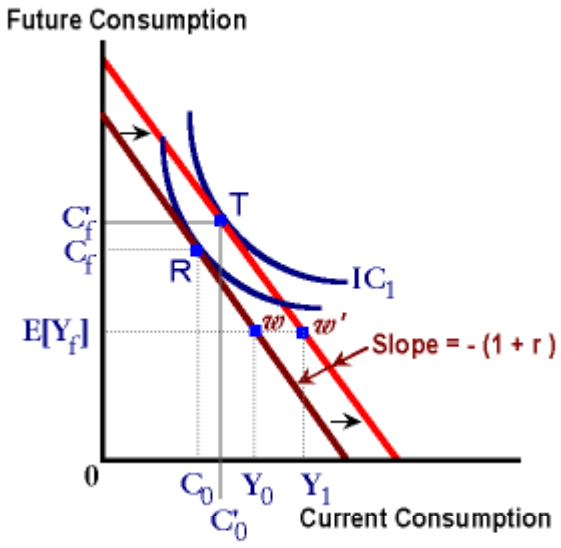


The substitution and income effects work in opposite directions for the net- saver. Therefore, the effect of changes in the interest rate on savings behavior depends on the relative size of the two effects. If the substitution effect is greater than the income effect then the individual saver reacts strongly to an increase in real returns on savings (or increase price of current consumption). An increase in the interest rate will lead to an increase in savings and a reduction in current consumption (see Figure 2a). If the substitution effect is smaller than the income effect (the individual reacts strongly to an increase in purchasing power of interest income). This type of individual is known as a threshold saver whereby an increase in real interest rates leads to less savings in the present and the same level or more consumption in all time periods (Figure 2b).

For a net borrower, the two effects complement each other. An increase in the interest rate will always lead to a reduction in present consumption as borrowing from the future become more expensive.

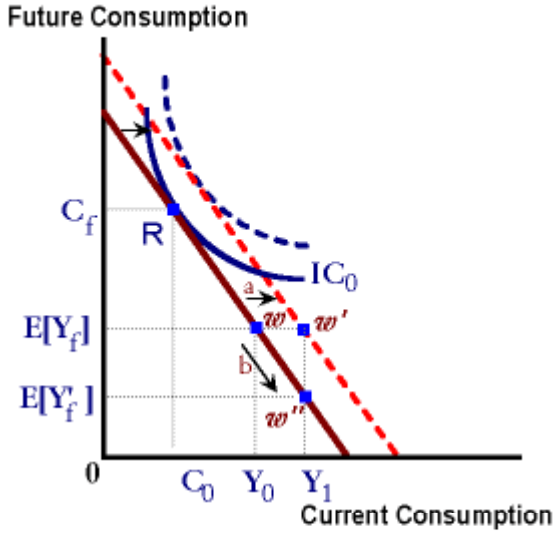
Changes in current income or expected future income can also affect consumption activity in the two time periods. For example suppose that current income is expected to increase perhaps due to an inheritance. This can be shown in a repositioning of the endowment point '**ω**' directly to the right of its initial position in the next diagram. This change in expected income might induce the individual to change her or his consumption pattern over the two periods. This individual might desire to use some of this increase in expected income to allow for increases in both current and future consumption. In a similar manner an expected increase in future income (the endowment point shifts straight up) cold also lead to greater levels of present and future consumption expenditure. It is important to note that in this example, expectations about the future have a direct and real impact on current economic activity through changes in consumption behavior.

Figure 3 -- An increase in current income (Y)



The impact of changes in income taxes may be examined as well. However the reaction of the individual depends on how these tax changes are perceived. If, a tax cut in the current time period is deemed *permanent* by the individual (such that taxes will not be adjusted upwards at some point in the future) he will react with the expectation that current disposable income will be greater and thus alter his consumption plans (an outward shift in the budget constraint **ω** to **ω'**).

Figure 4 -- A tax cut



If, however, the tax cut is deemed *transitory* (the individual realizes that tax cuts lead to budget deficits in the future -- deficits that must be financed with future tax increases), he will use the tax cut to save for the expected future tax increase. The result is a movement of the endowment point along the budget constraint ($\omega \rightarrow \omega''$) with no corresponding change in consumption spending.

AGGREGATE CONSUMPTION

Early aggregate (*Keynesian*) models of the consumption function related current consumption expenditure to current levels of income or disposable income. These models took the form of:

$$C = a + bY_d$$

where

C = *Consumption Expenditure*

a = *Autonomous consumption -- consumption expenditure independent of the level of income.*

b = *the Marginal Propensity to Consume '**MPC**' , which represents the fraction of each additional dollar of income devoted to consumption expenditure.*

and

Y_d = *Current Disposable Income.*

Several theoretical results can be developed by taking the ratio of consumption expenditure to the level of disposable income. This ratio known as the 'APC' the average propensity to consume eliminates the need to convert nominal values into their real counterpart in that changes in the price level cancel out:

$$APC = \frac{\text{Real Consumption}}{\text{Real Income}}$$

$$= \frac{\text{Nominal Consumption / P}}{\text{Nominal Income/P}} = \frac{\text{Nominal Consumption}}{\text{Nominal Income}}$$

Thus the APC can be computed by dividing both sides of the Keynesian consumption function by disposable income:

$$APC = C/Y_d = a/Y_d + b(Y_d/Y_d)$$

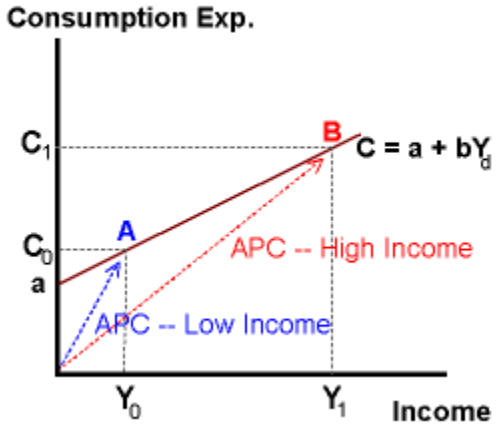
or

$$APC = a/Y_d + \mathbf{MPC}.$$

Given this final result we can look at the theoretical implications of the Keynesian consumption function over a different income groups (*the cross- section*) and over time (*a time series*). For the cross-section we would expect that **lower-income** groups would consume a greater proportion of their income relative to **high-income** groups (by definition: $Y_{d,low} < Y_{d,high}$):

$$APC_{low\ income} > APC_{high\ income}$$

Figure 5, The Keynesian Consumption Function



With time series data we would expect that over time and as disposable income increases ($Y_{t+1} > Y_t > Y_{t-1}\ldots$) the APC should decline:

$$APC_{t+1} < APC_t$$

In empirical studies, the APC is observed to be smaller for higher income groups relative to low income groups. However, over time the APC is observed to be constant independent of growth in aggregate measures of income. This failure led to the development of alternative theories of the consumption function one of which is the Permanent Income Hypothesis or 'PIH'.

THE PERMANENT INCOME HYPOTHESIS (PIH)

The PIH begins to explain consumption behavior by first redefining measures of income. Observed values of aggregate income 'Y' can be divided up into two separate components: 'Y^p' **Permanent** (*or projected levels of*) **Income** and 'Y_t ' **Transitory** (*or unexpected changes in*) **Income**. Thus:

$$Y = Y^p + Y^t.$$

The transitory component has an expected value of zero ($E[Y_t] = 0$) reflecting the notion that over time transitory gains are offset by future transitory losses and vice-versa. Thus, in the long run, observed levels of income 'Y' are equal to permanent income 'Y^p'.
With income clearly defined, consumption expenditure is treated as being proportional to permanent income:

$$C = \mathbf{k}Y^p$$

such that the parameter '**k**', a constant, represents both the (long run) average propensity to consume and the marginal propensity to consume. This consumption function (as shown with the blue line below) is described more accurately as a long run consumption function consistent with the observed long run results of consumption behavior.

Observed short run behavior is explained through the value of transitory income for different income groups. Specifically, transitory income for **low income** groups is assumed to be negative reflecting the notion that over time transitory losses exceed transitory gains for this group of individuals:

$$Y^T_L < 0 \Rightarrow Y_L < Y^p_L$$

For **middle income** groups the value of transitory income is equal to zero over time such that observed and permanent income take the same value:

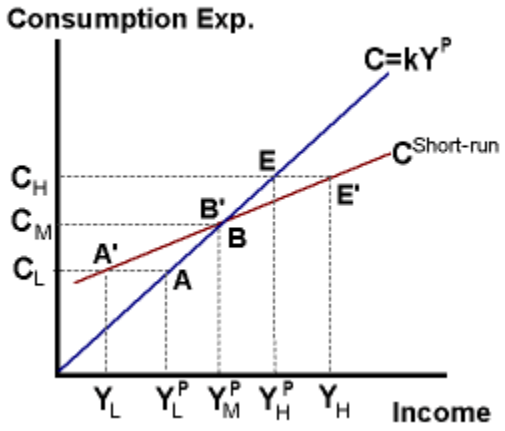
$$Y^T_M = 0 \Rightarrow Y_M = Y^p_M$$

Finally, for **high income** groups, transitory gains exceed transitory losses such that transitory income is on average positive over time or:

$$Y^T_H > 0 \Rightarrow Y_H > Y^p_H$$

The impact of this transitory component can be used to develop a short run (observed) consumption function (the red line) as shown in the diagram below:

Figure 6, The PIH Consumption Function



The blue line in the above diagram in known as the long-run (actual) consumption function reflecting the notion that consumption decisions are based purely on expected (permanent) levels of income.

LIFE CYCLE DECISIONS and the LIFE CYCLE HYPOTHESIS

An extension to the two-period consumption model is that of the **Life-Cycle Hypothesis** or LCH model. The LCH model defines individual behavior as an attempt to smooth out consumption patterns over one's lifetime somewhat independent of current levels of income. This model states that early in one's life consumption expenditure may very well exceed income as the individual may be making major purchases related to buying a new home, starting a family, and beginning a career. At this stage in life the individual will borrow from the future to support these expenditure needs. In mid-life however, these expenditure patterns begin to level off and are supported or perhaps exceeded by increases in income. At this stage the individual repays any past borrowings and begins to save for her or his retirement. Upon retirement, consumption expenditure may begin to decline however income usually declines dramatically. In this stage of life, the individual dis-saves or lives off past savings until death.

In the first stage of the life-cycle, the individual will borrow based on expected levels of wealth and income in the future. This wealth is defined as human wealth--the individual's ability to generate or earn income in the future (based on anticipated skills, talents, and initiative) in addition to non-human wealth--ownership of income producing assets. The desire to borrow from one's future will depend on the faith the individual has about his or her ability to repay these debts and to the degree to which an individual discounts future activity. Specifically, a greater faith in the future earning power is consistent with a lower rate of time preference (where the individual discounts the future less and relates future activity to be almost as important as current activity). Less faith in future earning power results in higher rates of time preference and a greater discounting of future activity. In this second case, current consumption depends heavily on current income.

The Life-Cycle Hypothesis is based on the following model:

$$max\ \mathbf{U}_t = \Sigma_{[t = 1, L]}[U(C_t)(1+\delta)^{-t}]$$

"maximize the utility from consumption over time"

s.t.

$$\Sigma_{[t = 1, L]}C_t(1+r)^{-t} = \Sigma_{[t = 1, N]}Y_t(1+r)^{-t} + W_o$$

"*lifetime consumption must equal income*"

where $U(C_t)$ is the satisfaction received from consumption in time period 't', C_t is the level of consumption, Y_t is income, 'δ' is a rate of time preference (a measure of individual preference between present and future activity) and W_o is an initial level of income producing assets. Life-cycle decisions become necessary because the time span of consumption ('L' years until death) exceed the individual's remaining working years ('N').

Given this formulation, the following questions are suggested:

1. *If a particular individual "lives for today", will his/her rate of time preference be higher or lower than someone who "plans for the future"?*

(hint: look at the model for only two time periods where t = 0 corresponds to the present and t = 1 corresponds to the future)

In a two period model the equations would be:

$$max\ U(C_o)(1+\delta)^{-0} + U(C_1)(1+\delta)^{-1}$$ *(the objective function)*

s.t.

$$C_0(1+r)^{-0} + C_1(1+r)^{-1} = Y_0(1+r)^{-0} + Y_1(1+r)^{-1}$$ *(the constraint)*

or the objective function would be:

$$U(C_o) + U(C_1)(1+\delta)^{-1} \quad \text{since } (1+\delta)^{-0} = 1$$

as 'δ' (the rate of time preference) increases, the value of the satisfaction from future consumption '$U(C_1)$' decreases (*is discounted*) relative to the value of satisfaction from current consumption. Thus a person with a *high rate of time preference* discounts the future more or tends to "live for today".

2. *This rate of time preference is like an interest rate for a particular individual. If that individual's rate of time preference is higher than the current market interest rates 'r_m', will that individual more likely be a net- saver or net-borrower?*

If an individual's rate of time preference is greater than the market interest rate, then this individual discounts the future more than the market (or society as a whole). It is very likely that this individual will borrow funds (at current market interest rates) from those

individuals that have a rate of time preference lower than the market rate. This borrowing will come at the expense of future consumption to support current consumption.

3. *A primary result of the life-cycle hypothesis is that current consumption is based on lifetime labor-income (human-wealth) and non- labor income (non-human wealth). This is in contrast to the Keynesian consumption function that states that current consumption is strongly related to current disposable income. Therefore if an individual has a low rate of time preference, is that individual more likely to follow a life-cycle pattern of consumption (current consumption largely unrelated to current income) or a Keynesian pattern of consumption (where current consumption is strongly related to current income)? Why?*

An individual with a low rate of time preference will value the future much like the present. Consumption for this person will be based on lifetime wealth and earnings rather than current labor income. This individual's lifetime pattern of consumption would follow that implied by the Life-Cycle hypothesis. Someone with a high rate of time preference would base her/his consumption on current income much like that implied by the Keynesian consumption function.

4. *How do changes in expectations about future wealth affect current consumption behavior?*

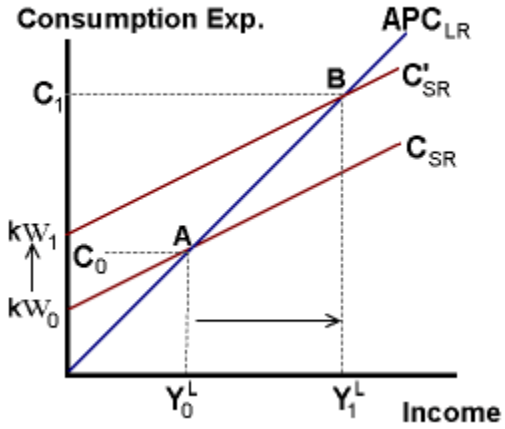
A short run LCH consumption function can be defined by assuming that the constraint in the above optimization problem is satisfied:

$$C_o = kW_o + k(1+N\alpha)Y^L$$

where C_o represents current consumption, W_o represents current levels of income producing assets (*non-human wealth*) and Y^L represents the current level of labor income and a proxy for future earnings and earning ability (human wealth). The parameter 'k' represents the marginal propensity to consume and the factor '$(1+N\alpha)$' relates future labor income (over 'N' working years) to current consumption.

The effect of changes in expectations of the non-human wealth component will act as a shift parameter with respect to current consumption as shown in the diagram below:

Figure 7, Life-Cycle Decisions and Changes in Wealth



In summary we can state that consumption decisions are based on much more than current disposable income. From the two-period model, we find that consumption changes can occur due to changes in the real rate of interest (although in the aggregate, the results are ambiguous) and expected future levels of income. The Permanent Income Hypothesis redefines current and expected future income into the concept of permanent income – a proxy for the earning ability of the individual. The Life-Cycle Hypothesis takes this earning ability one step further by separating income from human wealth (i.e., the earning ability of the individual) and income from non-income wealth (income producing assets owned by the individual). Both the PIH and LCH are extensions of the two-period model.

Thus we will write the aggregate consumption function as follows:

$$C = f(Y_{current}, E[Y_{future}], r, W_o)$$

Be sure that you understand the following concepts and terms:

- Consumption Expenditure
- Durable Goods
- Non-durable Goods
- Services
- Disposable Income
- Rate of Time Preference
- Real Interest Rate
- Preferences
- Savings
- Indifference Curves
- Autonomous Consumption
- Marginal Propensity to Consume
- Average Propensity to Consume
- Permanent Income
- Transitory Income
- Observed Income