CONSUMPTION, INCOME AND LIQUIDITY CONSTRAINTS: THE CASE OF TURKISH ECONOMY

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ABSTRACT

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The aim of this thesis study is to enlighten the economic relationship among consumption, income and liquidity constraints in Turkish Economy. For this aim, generalized instrumental variables estimation technique (GIVE) is used to estimate reduced-form consumption equations derived by Hall (1978) and improved by Campbell and Mankiw (1989). Estimations are realized for two separate periods of Turkish Economy. For the sub-period of 1987 to 1995, it is observed that a significant part of households consume their current disposable income. It is thought that the presence of liquidity constraints forced households to determine their consumption simply according to their current disposable income. However, it is observed that the dependence of households to disposable income decreased substantially, when analyzed for the overall period of 1987 to 2002. Financial deepening in the economy and the rise of real credit volume contributed to the decline of the level of liquidity constraints and enabled households to allocate their income across subsequent periods evenly. Thus, it is concluded that private consumption behavior is consistent with the Permanent Income / Life-Cycle Consumption theory for 1987 to 2002 period in Turkish Economy.

Keywords: Consumption, Income, Liquidity Constraints

ÖZ

TÜKETİM, GELİR VE LİKİDİTE KISITI: TÜRKİYE ÖRNEĞİ

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Bu çalışmada, Türkiye Ekonomisi için tüketim, gelir ve likidite kısıtı arasındaki ekonomik ilişkinin aydınlatılması amaçlanmıştır. Bu doğrultuda, genelleştirilmiş araç değişken tahmin yöntemi (GIVE) Hall (1978) tarafından elde edilen ve Campbell ve Mankiw (1989) tarafından geliştirilen indirgenmiş tüketim fonksiyonlarını tahmin etmek için kullanılmıştır. Türkiye Ekonomisi'nin iki ayrı dönemi için tahmin yapılmıştır. Hanehalkının önemli bir kesiminin, 1987 yılından 1995 yılı sonuna kadar olan alt dönemde, tüketimlerini cari dönemde elde ettikleri harcanabilir gelire göre belirledikleri gözlenmiştir. Likidite kısıtının varlığının hanehalkının yalnızca cari dönemde elde ettiği harcanabilir geliri tüketmesine olanak verdiği düşünülmektedir. Buna karşın, 1987 yılından 2002 yılı sonuna kadar olan dönem incelendiğinde, tüketim ile harcanabilir gelir arasındaki ilişkinin önemli ölçüde zayıfladığı görülmektedir. Ekonomideki mali derinleşme ve reel kredi hacminin yükselmesi likidite kısıtının seviyesinin azalmasına ve hanehalkının gelirini dönemler arasında eşit bir biçimde dağıtmasına olanak sağlamıştır. Türkiye Ekonomisi'nin 1987 yılından 2002 yılının sonuna kadar olan dönemi incelendiğinde özel tüketim davranışının Daimi Gelir teorisinin temel ilkeleri ile uyumlu olduğu sonucuna varılmıştır.

Anahtar Sözcükler: Tüketim, Gelir, Likidite Kısıtı

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as reqired by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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CHAPTER I

INTRODUCTION

Private consumption expenditures constitute by far the greatest demand component of gross national income around 70 % in Turkish Economy. Its significant share in gross national income makes private consumption expenditures the primary source of demand in the economy. Therefore, understanding the private consumption behavior is significant to the macroeconomic policy-making.

Private consumption demand is defined as private consumption expenditures for consumption goods less of expenditures for durable goods (Branson, 1989). Therefore, private consumption demand is household demand for consumption goods, which show only flow variable property, including expenditures for food, services, transportation etc… All sub-items of private consumption demand have the common characteristic property that they are consecutively renewed in subsequent time periods.

However, expenditures for durable goods, a sub-item of private consumption expenditures, are evaluated as a form of household saving. Moreover, expenditures for durable goods show stock variable property, since utilization

periods of these products, changing from 5 to 10 years, are much longer compared to other consumption goods. Therefore, expenditures for durable goods are also more volatile compared to other consumption goods.

On the other hand, expenditures for durable goods, especially consumption demand for cars and houses, are considered as a mean for household saving. Durable goods do not only provide utility from consumption, but also provide source for a profitable investment, since they can store wealth and be realized into cash in case of necessity. Therefore, expenditures for durable goods are considered as household saving. Moreover, it is observed that saving behavior in the form of durable goods is more common in developing countries, especially when financial markets are not deep and interest rates for savings are low.

Thus, private consumption demand should be the main economic variable in the analysis of consumption behavior of households. The economic relationship of private consumption demand with income and interest rates will provide insight for how households determine their consumption patterns over time periods.

Modern consumption theory assumes that households are rational individuals, who determine their consumption expenditures according to their lifetime income rather than simply consuming their current income. Thus, it is thought that there is a stable economic relationship between private consumption demand and permanent income in the long run. In this respect, it is observed that private consumption demand is smoother compared to current income.

However, it is observed that the presence of liquidity constraints might lead to deterioration in the long run relationship between consumption and income. Households are no longer able to allocate their lifetime income over subsequent periods if they face liquidity constraints. Thus, households have to simply consume their current income under the presence of liquidity constraints.

Households increase their savings and accumulate wealth against future labor income uncertainty. Moreover, the presence of liquidity constraints leads to a rise in the demand of households for wealth especially in the form of financial assets. In addition to these, the effect of interest earnings on private consumption demand becomes stronger, since interest earnings make higher contributions to disposable income due to the rise in the accumulated wealth of households. Therefore, wealth accumulation becomes a significant determinant of private consumption demand (Özdemir, 1988).

Therefore, there are three main objectives of this thesis study:

(i) First, to find out how households determine their private consumption demand in the long run in Turkish Economy,

(ii) Second, to analyze the development of liquidity constraints and its influence over private consumption demand during the period of analysis and

(iii)Third, to estimate the effects of the real interest rate on the growth of consumption in Turkish Economy.

CHAPTER II

LITERATURE SURVEY

II.1. Consumption Theory

Macroeconomic relationship between consumption, income and interest rates has been a major research field in economics. Thus, the advance in consumption theory provides an excellent illustration of the development of knowledge in economics.

According to Keynes (1936), current consumption expenditure is a fairly stable function of current income, but short-run marginal propensity to consume (MPC) will be smaller than long run marginal propensity to consume. Consumption expenditure will be steady over periods, since consumers' habits and consumption patterns does not change in the short-run. Therefore, the rise of income in the long run will lead to the increase of saving, which implies that short-run marginal propensity to consume will be smaller than average propensity to consume, i.e. MPC < APC.

> But, apart from short-period changes in the level of income, it is also obvious that a higher absolute level of income will tend, as a rule, to widen the gap between income and consumption. For the satisfaction of the immediate primary needs of a

> man and his family is usually a stronger motive than the motives towards accumulation, which only acquire effective sway when a margin of comfort has been attained. These reasons will lead, as a rule, to a greater proportion of income being saved as real income rises.

Nevertheless, subsequent empirical studies following Keynes did not reveal a stable relationship between current consumption expenditures and current income. Simon Kuznets published a study in 1946, which included consumption and saving data for United States economy beginning from their Civil War period. His observation of consumption and saving data revealed two important points about consumption behavior. First, it is observed that the ratio of consumption expenditure to income, (c/y) or APC, did not show a downward trend, which indicates that marginal propensity to consume equaled average propensity to consume as income rose in the long run. Secondly, it is also observed that the ratio of consumption expenditure to income (c/y) stays below average during boom periods and the ratio of consumption expenditure to income (c/y) exceeds average during recession periods (Branson, 1989).

The theories developed by Friedman and Modigliani *et al.* contemporaneously to explain the macroeconomic relationship between consumption expenditure and income were actually founded upon microeconomic observations. Both, Friedman and Modigliani explicitly assumed that the consumer is a rational individual, who aims to maximize utility gained from consumption by allocating lifetime income across periods for an optimum pattern of lifetime consumption.

Friedman (1957) claims that consumption expenditure is mainly determined by permanent income, which is defined as the present value of the consumers' total wealth. Wealth (*W*) is composed of human capital – such as future labor income stream – and nonhuman capital, while multiplying wealth with a rate of return *r* equals to permanent income, (y_p).

$$y_p = rW \rightarrow (2.1)$$

According to the Permanent Income theory, permanent consumption is proportional to permanent income, however the ratio between them is independent of the size of the permanent income. The ratio of permanent consumption to permanent income (c_p) depends on the interest rate (*r*), the ratio of nonhuman wealth to income (*w*) and consumers' tastes and preferences (*u*), which determine the shape of the utility function.

$$c_p = k(r, w, u)y_p = k(r, w, u)rW \rightarrow (2.2)$$

According to Friedman, measured income in a given period is composed of two components, permanent income and transitory income. Transitory income is considered as the random component of income, which should be treated as accidental or chance occurrences. Similarly, consumption is also composed of permanent and transitory components. Transitory components of income and consumption are assumed to be uncorrelated with each other and with permanent components of income and consumption.

$$y = y_p + y_t \rightarrow (2.3)$$

$$c = c_p + c_t \rightarrow (2.4)$$

$$\rho y_t y_p = \rho c_t c_p = \rho y_t c_t = 0 \rightarrow (2.5)$$

As permanent income is in fact a theoretical concept, which is not possible to observe, Friedman defines permanent income as a weighted average of past values of measured income, where weights are decreasing exponentially. Since permanent consumption is defined as a fraction of permanent income, $c_{pt} = ky_{pt}$, permanent consumption can be substituted for permanent income in the equation.

$$y_p(T) = \beta \int_t^T e^{(\beta-\alpha)(t-T)} y(t) \partial(t) \rightarrow (2.6)$$

$$c_p(T) = k\left(\beta \int_t^T e^{(\beta-\alpha)(t-T)} y(t) \partial(t) \right) \rightarrow (2.7)$$

In the above equations (2.6) and (2.7), y_p and y represent permanent income and measured income as defined before and α is the estimated growth rate, while β is the adjustment coefficient between measured income and expected income. Weights for measured income decline exponentially and permanent consumption equals to a fraction of the summation of the past values of the measured income.

$$c_{pt} = k \sum_{i=0} \lambda^i y_{t-i} \rightarrow (2.8) \text{ where } \lambda = e^{(\beta-\alpha)}$$

We lag permanent consumption one period, multiply by λ and then subtract from the above equation. Permanent consumption is found to be a fraction of permanent income and its ratio to permanent income depends on the interest rate (*r*), the ratio of nonhuman wealth to income (*w*) and the consumers' tastes and preferences (*u*) as in equation (2.10).

Although, permanent consumption is found to be a fraction of permanent income, the relation of permanent consumption with wealth is not observed explicitly in this formulation of the Permanent Income theory. However, it is thought that the lagged value of consumption in the equation (2.10) incorporates the influence of wealth over consumption according to this approach.

$$c_{pt} - \lambda c_{pt-1} = k y_{pt} \rightarrow (2.9)$$

$$c_{pt} = k y_{pt} + \lambda c_{pt-1} \rightarrow (2.10)$$

The Life-Cycle theory of consumption was originally formulated by Brumberg and Modigliani (1954) and later developed by Ando and Modigliani (1963). As the Permanent Income theory, the Life-Cycle theory also assumes that the representative consumer aims to smooth consumption over periods throughout her life. According to this theory, the consumer is expected to have lower income in the early periods of her life, but her income rises substantially in the middle years and then declines gradually through the retirement years. However, consumption is expected to increase steadily over periods as her income continues to rise by age. Therefore, the consumer is assumed to borrow in the early years of

her life and then save substantially during the middle years to repay debt and provide for the retirement period.

According to the theory, the consumer receives utility only from present and future consumption, where utility function is maximized subject to the budget constraint. Utility function (U) is assumed to be additively separable over time and homogeneous of any positive degree in consumption, which indicates that any increase in income will be allocated over periods evenly, as shown in equation (2.11). The consumer is able to accumulate assets and consume assets in subsequent periods of her life. The interest rate as well as the price level is assumed to be constant over the lifetime of the consumer to simplify the consumption function.

$$U = U\left(c_t, c_{t+1}, c_{t+2}, ..., c_L, a_{L+1}\right) \rightarrow (2.11)$$

In the budget constraint, N represents the earning span of the consumer, while L represents the lifetime of the consumer. Income, y_t, is labor income other than interest earnings, while c_t and a_t are consumption and assets at the beginning of period t, respectively.

$$a_t + \sum_{\tau=t}^{N} \frac{y_T}{(1+r)^{T-t}} = \frac{a_{L+1}}{(1+r)^{L+1-t}} + \sum_{\tau=t}^{L} \frac{c_t}{(1+r)^{T+1-t}} \rightarrow (2.12)$$

Therefore, according to the Life-Cycle theory, consumption is proportional (Ω) to lifetime resources of the consumer. The ratio of consumption to total resources depends on the consumers' tastes and preferences, which determine the specific form of the utility function and on the rate of return of assets as in the Permanent Income theory. The aggregate consumption function in Ando and Modigliani (1963) is formulated as follows:

$$c_t^T = \Omega_t^T v_t^T \rightarrow (2.13),$$

$$\text{where } v_t^T = a_{t-1}^T + y_t^T + \sum_{\tau=T+1}^{N} \frac{y_t^{eT\tau}}{(1+r_t)^{\tau-T}} \rightarrow (2.14).$$

In this formulation, v_t is present value of the total resources of the consumer and the expression T represents age groups. Moreover, $y_t^{eT\tau}$ is the expected income of the consumer at age T, other than interest earnings, for the τ^{th} year. The individual consumption function is formulated using the definition of expected income.

$$y_t^{eT} = \frac{1}{N-T} \sum_{\tau=T+1}^{N} \frac{y_t^{eT\tau}}{(1+r_t)^{\tau-T}} \rightarrow (2.15)$$

$$c_t^T = \Omega_t^T y_t^T + \Omega_t^T (N-T) y_t^{eT} + \Omega_t^T a_{t-1}^T \rightarrow (2.16)$$

However, it is assumed that the value of Ω_t^T is same for all consumers in a given age group. Thus, the aggregate consumption function for a given age group

T becomes as given below at equation (2.17), where upper case letters represent corresponding aggregates of the economic variables for the age group T.

$$C_t^T = \Omega_t^T Y_t^T + \Omega_t^T (N - T) Y_t^{eT} + \Omega_t^T A_{t-1}^T \rightarrow (2.17)$$

The formulation of marginal propensity to consume out of wealth, Ω_t^T, in the consumption function for age group T separately, implies that different age groups may have different values of marginal propensity to consume. Age structure provides for a plausible explanation for the phenomenon that marginal propensity to consume in the short-run is smaller than average propensity to consume in the long run. To illustrate, younger consumers may have lower propensity to consume out of wealth compared to older consumers, since they have to save more for their retirement years.

The aggregate consumption function for all consumers in the economy, under certain assumptions about age structure and income distribution of the population, is presented as follows:

$$C_t = \alpha_1' Y_t + \alpha_2' Y_t^e + \alpha_3' A_{t-1} \rightarrow (2.18),$$

where C_t is consumption expenditure, Y_t is current labor income, which does not include interest earnings from assets, Y^e_t is expected income and A_{t-1} denotes assets. However, since expected income is not a measurable variable, Ando and Modigliani (1963) suggest three hypotheses for measurement of expected labor

income. According to Hypothesis I, expected income is assumed to be a certain fraction of labor income, as in equation (2.19).

$$Y_t^e = \beta Y_t \rightarrow (2.19)$$

Secondly, expected income is assumed to be an exponentially weighted average of past values of labor income, weights adding up to one, similar to the formulation of Friedman. However, this proposed formulation is not empirically estimated due to the difficulty in determination of weights. According to the third proposition, Hypothesis II, expected income is assumed to be a certain fraction of labor income and also affected by the ratio of total labor force (L) to the number of people employed (E).

$$Y_t^e = (\beta_1 - \beta_2) Y_t + \beta_2 \frac{L_t}{E_t} Y_t \rightarrow (2.20)$$

Consequently, under Hypothesis I, aggregate consumption function becomes:

$$C_t = \alpha_1 Y_t + \alpha_3 A_{t-1} \rightarrow (2.21).$$

In this equation, α_1 is the marginal propensity to consume out of income, which incorporates the combined effect of both current labor income and expected income. However, this approach is criticized on the grounds that according to

equation (2.21), except wealth of the consumers, current income becomes the main determinant of consumption.

Consequently, both the Permanent Income theory and the Life-Cycle theory propose that the consumer determines her consumption expenditures according to her total lifetime resources. Furthermore, the Life-Cycle theory acknowledges the significance of wealth in the determination of consumption explicitly.

II.2. Rational Expectations Approach

Nevertheless, Lucas (1976) claims that consumption functions, which assume adaptive expectations for consumer behavior, cannot be useful in the analysis of consumption behavior. The fundamental idea behind the Lucas critique is that the relation between consumption, income and interest rate depends on the broader macroeconomic context and may not be stable over time. Thus, there may not be a stable structural consumption and savings function, even though the consumer is always trying to maximize her utility subject to the budget constraint (Hall, 1988).

According to Friedman (1957) permanent consumption is determined as a fraction of permanent income and in this respect permanent income is also assumed to be a weighted average of past values of measured income. However, under rational expectations assumption consumers will respond to economic policy

changes or economic news that affect permanent income instantaneously. Nevertheless, permanent income, if defined as a weighted average of past values of measured income, will not include any economic information that emerges in the current period. Therefore, a structural consumption function, which does not consider new economic information, will not be useful in the forecasting of consumption expenditures even tough the Permanent Income theory is in fact valid.

Although, both the Permanent Income and the Life-Cycle theories provide plausible explanations for consumer behavior, since permanent income is an unobservable variable and needs to be approximated, empirical verification of consumption theories becomes difficult. On the other hand, Hall in his seminal paper (1978) provided an alternative econometric approach for testing Permanent Income theory under rational expectations assumption in line with the Lucas critique.

Hall (1978) discusses the optimization problem of the consumer by solving the life-cycle consumption model under uncertainty. The consumer maximizes her expected utility from consumption with respect to the budget constraint.

$$\max\ E_t = \sum_{\tau=0}^{T-t} (1+\delta)^{-\tau} u(c_{t+\tau}) \text{ subject to } \sum_{\tau=0}^{T-t} (1+r)^{\tau} (c_{t+\tau} - w_{t+\tau}) = A_t \text{ where}$$

E_t = mathematical expectation condition on information available in t

δ = subjective rate of time preference

r = real rate of interest, which is assumed constant over time and $r \geq \delta$

T = length of economic life

$u(\ )$ = one period utility function, which is strictly concave, $\left(\frac{\partial u}{\partial c} > 0\right)$ and $\left(\frac{\partial^2 u}{\partial c} < 0\right)$

c_t = consumption

w_t = earnings

A_t = assets apart from human capital

The first-order conditions of the life-cycle consumption model reveal a direct relationship between current and expected marginal utility of consumption. Thus, the inter-temporal consumption equation provided by the first-order conditions can be used to forecast consumption for period *t+1* once consumption for period *t* is available.

$$E_t u'(c_{t+1}) = [(1+\delta)/(1+r)]u'(c_t) \rightarrow (2.22)$$

Thus, marginal utility obeys the regression relation presented as below provided that ε_{t+1} is a true regression disturbance, i.e. $E_t \varepsilon_{t+1} = 0$. The exact formulation of the regression depends on the definition of the utility function.[1]

[1] Hall (1978) actually provides three different specifications for the utility function. First, the utility function is assumed to be quadratic, $u(c_t) = -\frac{1}{2}(\bar{c} - c_t)^2$, where $\bar{c}$ is the bliss level of

The benefit of the Hall approach is that it reaches directly to the reduced-form forecasting equation rather than structural equations. Moreover, the inter-temporal consumption equation can also be discussed in terms of Permanent Income theory under rational expectations approach.

$$u'(c_{t+1}) = \gamma u'(c_t) + \varepsilon_{t+1} \rightarrow (2.23) \text{ where } \gamma = (1+r)/(1+\delta)$$

The consumer uses all available information in period *t* to determine the optimum level of consumption in that period. In other words, if the expectations of the consumer are rational as assumed to be in the theory, then consumption in period *t* will already be determined for the best estimate of permanent income. Therefore, once consumption in period *t* is known, no economic variable should contribute to the forecast of consumption in period *t+1* such as current disposable income or lagged values of consumption and disposable income.

Hall (1978) econometrically tested the validity of Permanent Income hypothesis under rational expectations approach and found out that lagged values of consumption and current disposable did not contribute to the prediction of consumption. However, he also observed that an index of stock prices was

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consumption. Secondly, it is assumed that the utility function has the constant elasticity of substitution form, $u(c_t) = c_t^{(\sigma-1)/\sigma}$, then consumption behavior is determined by the equation, $c_{t+1}^{-1/\sigma} = \gamma c_t^{-1/\sigma} + \varepsilon_{t+1}$. Thirdly, it is assumed that the change in marginal utility from one period to the next is small; since the interest rate is close the rate of time preference and the stochastic change is small. Then, consumption is a random walk apart from trend, $c_{t+1} = \lambda_t c_t + \varepsilon_{t+1}/u''(c_t) +$ higher order terms, and where $\lambda_t = \left(\frac{1+\delta}{1+r}\right)^{u'(c_t)/c_t u''(c_t)}$.

statistically significant in the prediction of consumption. Therefore, Hall (1978) concluded that a modified version of Permanent Income hypothesis was valid for the United States economy.

Nevertheless, succeeding empirical studies such as Flavin (1981) found significant evidence against the Permanent Income hypothesis revised by Hall (1978) under rational expectations assumption. Flavin (1981) defined *excess sensitivity* as the response of consumption to current income beyond that attributable to the role of current income in signaling changes in permanent income.

On the other hand, Campbell and Deaton (1989) argued that smoothness of consumption stems from the fact that consumption responds to changes in income with a lag. Contrary to common understanding, Campbell and Deaton (1989) argued that measured income is smoother compared to permanent income. Therefore, Campbell and Deaton (1989) considered smoothness of consumption as evidence against the Permanent Income theory. Flavin (1993) reconciled excess sensitivity and excess smoothness concepts and observed that consumption is too smooth, again rejecting the Permanent Income theory.

Hayashi (1982) estimated and tested the Permanent Income theory under rational expectations by using the instrumental variables technique. Hayashi (1982) associated Permanent Income theory with the basic assumptions that (i) the household's planning horizon is infinite, (ii) the utility function is additively

separable and has a constant relative degree of risk aversion; $u(c) = (1/\beta)c^{\delta}$, where ($\beta < 1$), (iii) the expected real rates of return from assets are constant and finally (iv) expectations are formed rationally.

According to Hayashi (1982) consumption is determined as a fraction of total wealth, which is composed of real nonhuman and human wealth as shown in equation (2.24). A_t is the real nonhuman wealth and H_t is the real human wealth, which is defined as the present discounted value of expected future real labor income. The propensity to consume out of total wealth is denoted by α and is a function of the expected real rates of return from nonhuman wealth and the subjective rate of time preference.

$$c_t = \alpha(A_t + H_t) + \varepsilon_t \rightarrow (2.24)$$

Hayashi (1982) assumed that there are two types of households in the economy, the wealth-constrained and the liquidity-constrained households. The liquidity-constrained households simply consume their disposable income, while wealth-constrained households determine their consumption according to their total wealth holdings over the lifetime. Therefore, aggregate consumption is a linear function of total wealth of the wealth-constrained households and disposable income of the liquidity-constrained households, which is given as equation (2.25).

$$c_t = \alpha(A_t + H_t) + \lambda YD_t + \varepsilon_t \rightarrow (2.25)$$

In order to test the Permanent Income hypothesis, consumption function is generalized and estimated by nonlinear instrumental variables, where YD_t represents aggregate disposable income and λ is the liquidity-constrained households' share of disposable income. In this specification of the consumption function, α is the product of the propensity to consume out of wealth and of the ratio of wealth-constrained households' total wealth to aggregate total wealth. Hayashi (1982) observed that a significant portion of the households is liquidity-constrained and acknowledged this observation as evidence against the Permanent Income theory.

Moreover, Campbell and Mankiw (1989) claimed that consumption behavior is better understood if analyzed by two separate types of consumers as in the seminal paper of Hayashi (1982). Campbell and Mankiw (1989) asserted that part of the consumers is *forward-looking consumers*, who determine their consumption as a fraction of their permanent income. However the rest of the consumers are assumed to follow the *rule of thumb* and simply consume their current income.

$$E_t = \sum_{s=0}^{\infty} (1+\delta)^{-s} U(C_{t+s}) \rightarrow (2.26)$$

The representative consumer maximizes the utility function subject to the budget constraint, where C is consumption, δ is subjective rate of discount and E_t is the expectation conditional on information available at time t. If the

representative consumer can borrow and lend at the real interest rate *r*, then the first-order condition implies that marginal utility in the current period and in the next period are proportional to each other, which is previously shown in Hall (1978) in (2.22).

$$E_t U'(C_{t+1}) = \left(\frac{1+\delta}{1+r}\right) U'(C_t) \rightarrow (2.22)'$$

The current consumption expenditure becomes the best forecast of consumption expenditure in the next period. Moreover, if it is assumed that r = δ and also marginal utility is linear, then the growth of consumption becomes a random walk.

$$\Delta C_t = \varepsilon_t \rightarrow (2.27)$$

According to this alternative consumption model, λ fraction of income goes to individuals, who consume their current income, while (1-λ) of income accrues to individuals who consume their permanent income. If the incomes of the two groups are Y_{1t} and Y_{2t}, then the aggregate income is determined as $Y_t = Y_{1t} + Y_{2t}$. The first group receives λ of total income, $Y_{1t} = \lambda Y_t$, and the second group receives (1-λ) of total income, $Y_{2t} = (1-\lambda)Y_t$. Agents in the first group consume their current income, $C_{1t} = Y_{1t}$, which implies that $\Delta C_{1t} = \Delta Y_{1t} = \lambda \Delta Y_t$. On the other hand, consumers from the second group consume their permanent income, $\Delta C_{2t} = (1-\lambda)\varepsilon_t$. Thus, the aggregate consumption function becomes the

linear summation of the consumption functions of these two separate household groups, which is shown in equation (2.29).

$\Delta c_t = \mu + \lambda \Delta y_t + \varepsilon_t \rightarrow (2.29)$, where all variables are in logarithmic forms.

The empirical observations of Campbell and Mankiw (1989) revealed that more than half of the consumers in the United States economy are actually forward-looking and consume their permanent income, but are extremely reluctant to substitute their consumption inter-temporally. However, Campbell and Mankiw (1989) also found out that the rest of the consumers follow the rule of thumb of consuming their current income.

Campbell and Mankiw (1991) performed similar empirical observations for six developed countries (U.S., U.K., Canada, France, Japan, Sweden) and found out that although λ coefficient, which denotes the ratio of the rule of thumb consumers, changes across economies, it is generally significant in all analyzed countries, except Japan.

In addition to these, empirical observations for developing countries revealed that usually the percentage of liquidity-constrained consumers is significantly high (Haque and Montiel, 1989). Rossi (1988) estimated that the ratio of liquidity-constrained consumers to total consumers was in the range of 70 – 80 % for low-income countries, while the ratio was observed in a broader range of 20 – 80 % for middle-income countries. Moreover, subsequent empirical studies

reached similar results for various developed and developing countries. Wirjanto (1991) found out moderate evidence against Permanent Income theory and observed that λ varies from 13 % to 23 % for Canadian economy, while Roche (1995) observed that the fraction of λ is around 50 % for Irish economy.

Furthermore, Hatzinikolaou (1999) estimated the fraction of rule of thumb consumers for Greek economy using annual data. Hatzinikolaou (1999) observed that rule of thumb approach explains a significant fraction of total consumers, between 39 % and 71 %, in the Greek economy. However, Hatzinikolaou (1999) also claimed that if alternative model specifications were utilized, then the estimates of λ could decrease substantially.

Akçin and Alper (1999) investigated the validity of Permanent Income theory for Turkish Economy using Campbell and Mankiw approach. Their investigation revealed that approximately 40 % of income goes to individuals, who consume their current income. Therefore, Akçin and Alper (1999) concluded that empirical observations demonstrated convincing evidence against the validity of the Permanent Income theory.

In addition to this, Özmen and Yavan also (1999) observed that more than half of the consumers in Turkish Economy do not determine their consumption against the Rational Expectations Permanent Income Hypothesis (REPIH). Özmen and Yavan (1999) used Generalized Instrumental Variables Estimation (GIVE) technique to estimate the log-linear Euler equation proposed by Campbell and

Mankiw (1989) to understand consumption behavior of households in Turkish Economy.

II.3. Alternative Views of Consumption

The Permanent Income / Life-Cycle Consumption theory basically acknowledge saving as future consumption (Romer, 1996). The allocation of income between consumption and saving in a given period is mainly determined by preferences for current and future consumption and information about future consumption prospects. However, future income uncertainty also leads to rises in savings through precautionary motives.

Moreover, the Permanent Income / Life-Cycle Consumption theory assume that consumers are able to borrow at the same interest rate at which they can save. However, it is observed that consumers pay a higher interest rate to their borrowings than they receive for their savings. Moreover, a significant part of the consumers are unable to borrow more at any interest rate.

There are two main reasons of liquidity constraints in the form of banks' reluctance to lend for consumption against repayment out of future income (Branson, 1989). First, consumers hesitate to borrow, while banks are unwilling to lend due to the uncertainty about consumer's future income. Secondly, the default risk of the borrower causes banks to bring credit limits on consumers. Thus, consumers cannot borrow freely against future income.

The presence of liquidity constraints may lead to the excess sensitivity of consumption to income changes as shown by Hayashi (1982) and Campbell and Mankiw (1989). Consumers may choose not to borrow to smooth their consumption if they face higher interest rates than they receive for their savings. Moreover, if consumers are unable to borrow, when their resources are low, then their consumption will be low as well. Therefore, current income becomes more important to consumption expenditure in the current period more than proposed by Permanent Income theory under liquidity constraints.

Liquidity constraints can raise savings in two ways. First, consumer will have to consume less than she would like to do, whenever a liquidity constraint is binding. Secondly, even if the liquidity constraints does not bind in the current period, the fact that they may bind in the future forces consumer to decrease current consumption and increase saving.

Thus, Carroll (2001) argues that the effects of precautionary saving and liquidity constraints on consumption and saving are often indistinguishable. Households tend to increase their savings and accumulate wealth to compensate for future labor income uncertainty. In other words, households use savings as a buffer against fluctuations in future labor income. Moreover, the accumulation of wealth enables households to overcome liquidity constraints. Thus, the effect of interest earnings on private consumption rises according to this view of consumption.

II.4. Real Interest Rates

Modern theories of consumption are compatible with either positive or negative effects of real interest rates on saving, depending on the reciprocal influence of income and substitution effects (Agénor and Montiel, 1999). The proposed empirical methodology in order to find out the effects of real interest rate changes on savings is to econometrically estimate inter-temporal elasticity of substitution directly through the Euler equation.

The Euler equation – presented previously as equation (2.22) – connects the growth of consumption to the difference between the real interest rate and the rate of time preference with a factor of proportionately equal to the inter-temporal elasticity of substitution under the assumption of constant relative risk aversion property for the utility function. A negative interest rate effect on consumption requires that the elasticity is sufficiently large to generate a substitution effect that dominates the positive income effect of higher interest rates on net savers (Agénor and Montiel, 1999).

Hall (1988) realized estimation of inter-temporal elasticity of substitution for United States economy using aggregate data for consumption and real interest rate adjusted for taxes. The elasticity is measured by the response of the growth of the consumption to changes in the expected real interest rate as shown in equation (2.30). Empirical observations using instrumental variables technique revealed that

inter-temporal elasticity of substitution is close to zero, not significantly positive, contrary to expectations.

$$\Delta c_t = \mu + \sigma r_t + \varepsilon_t \rightarrow (2.30)$$

Moreover, according to Campbell and Mankiw (1989) the case of *rule of thumb* consumers should also be considered in the analysis of the relation between the growth of consumption and the changes in the expected real interest rate. Equation (2.31) represents the analysis of the inter-temporal elasticity of substitution including the case of rule of thumb consumers, who simply consume their current income.

$$\Delta c_t = \mu + \lambda \Delta y_t + \theta r_t + \varepsilon_t \rightarrow (2.31) \text{ where } \theta = (1-\lambda)\sigma$$

Campbell and Mankiw (1989) also observed that inter-temporal elasticity of substitution of forward-looking consumers, who consume their permanent income, is close to zero. Moreover, the elasticity is also found out to be close to zero, when analyzed under the presence of rule of thumb consumers.

Nevertheless, empirical studies that estimate Euler equations to find out inter-temporal elasticity of substitution for developing countries reached to the conclusion that the increases in real interest rates have weak, but positive effects on consumption. Giovannini (1985) estimated the effect of the changes in the real interest rate on the growth of consumption for 18 developing countries using

instrumental variables technique. However, he observed that the coefficient of the real interest rate was significant in only 5 of the analyzed countries, interestingly including Turkey.

Akçin and Alper (1999), which analyses the validity of the Permanent Income hypothesis for Turkish Economy, found out strong evidence against this hypothesis. Moreover, the investigation of Akçin and Alper (1999) revealed that inter-temporal elasticity of substitution is negative and weak, although it is statistically significant.

However, Özmen and Yavan (1999) found out inter-temporal elasticity of substitution positive and around unity for forward-looking consumers, who consume their permanent income. Özmen and Yavan (1999) interpreted positive interest elasticity of consumption as evidence against McKinnon and Shaw hypothesis for Turkish Economy. In other words, the analysis of Özmen and Yavan (1999) revealed that positive income of real interest rates was stronger than its negative substitution effect on the growth of consumption. Thus, Özmen and Yavan (1999) concluded that any decrease of the real interest rates might lead to a decline on the growth of consumption, too.

On the other hand, Hahm (1998) investigated inter-temporal elasticity of substitution for United States economy using aggregate data for the post-war period. Hahm observed that the inter-temporal elasticity of substitution was

statistically significant and could be as high as 0.8 if Campbell and Mankiw model was adopted as an appropriate method for the analysis of consumer behavior.

CHAPTER III

TURKISH ECONOMY

Turkish Economy experienced a highly volatile growth period between years from 1987 to 2002. It is observed that the economy was highly vulnerable against domestic and international shocks, especially against negative developments in the financial markets. In this respect, Turkish Economy suffered from a series of economic crises, which stemmed from different sources, but all resulted in the serious contraction of domestic demand and gross national income. Private consumption expenditures and specifically, expenditures for durable goods were even more volatile throughout this period rising substantially in growth years and decreasing considerably in contraction years. Unfortunately, adverse shocks to the economy and following serious contraction periods marked their negative influence over all macroeconomic variables during the period of analysis.

Nevertheless, it is observed from selected macroeconomic variables that Turkish Economy was also subject to structural changes as well as serious contraction periods following the experienced economic and financial crises. Significant developments took place in financial markets following almost all crises periods and in addition to that economic policy-making changed seriously

after crises compared to previous periods. To illustrate, economic agents in the economy admitted that they underestimated the importance of the developments in the financial markets after 1994 financial crisis. Possibly, it can be argued that economic agents needed a learning period to live with liberalized financial markets. However, Turkish Economy suffered from an even more serious crisis in 2001 due to the breakdown of exchange rate based stabilization program, which aimed primarily to decrease inflation rates to single digit levels.

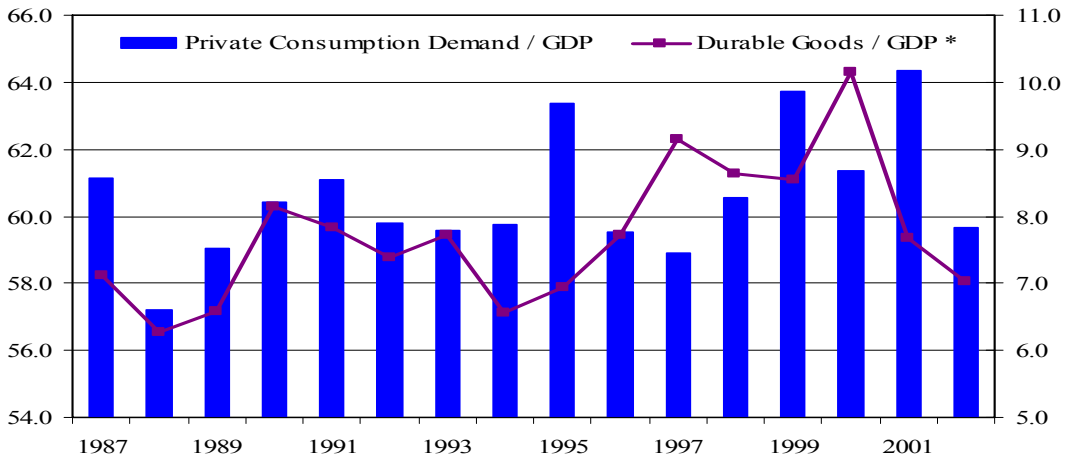

Figure III.1 – Shares of Private Consumption and Durable Goods in GDP (%)
Source: SIS

The ratio of private consumption expenditures to GDP averaged to around 70 % between the years of 1987 and 2002 in Turkish Economy (Figure III.1). On the other hand, the share of private consumption demand (excluding expenditures for durable goods) was around 60 % of GDP during this period. In other words, private consumption demand constituted the greatest demand component in the economy even though expenditures for durable goods were not included. Moreover, it is observed that the share of private consumption demand in GDP

remained stable except for recovery and contraction years. However, the share of expenditures for durable goods were relatively unstable compared to private consumption demand as expected during the period of analysis in Turkish Economy.

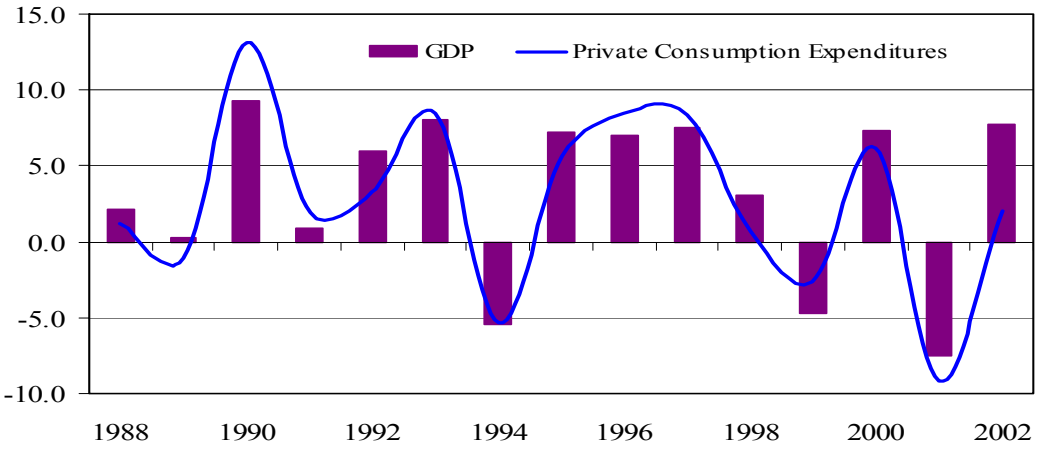

Figure III.2 – Private Consumption and GDP (annual % change)
Source: SIS

It is observed that there is a direct and strong relationship between the growth rates of private consumption expenditures and GDP during the period of analysis (Figure III.2). Obviously, the strong and direct economic relationship stems from the fact that private consumption expenditures are the greatest component of gross national income.

Private consumption expenditures are composed of six main expenditure sub-groups: food and beverage, durable goods, semi-durable goods, energy-transportation-communication, services and ownership of dwellings.

Table III.1 – Selected Economic Indicators

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
GNP [1]	1.5	1.6	9.4	0.3	6.4	8.1	-6.1	8.0	7.1	8.3	3.9	-6.1	6.3	-9.5	7.8
GDP [1]	2.1	0.3	9.3	0.9	6.0	8.0	-5.5	7.2	7.0	7.5	3.1	-4.7	7.4	-7.5	7.8
Private Consumption Expenditures [1]	1.2	-1.0	13.1	1.9	3.3	8.4	-5.3	5.6	8.5	8.4	0.6	-2.6	6.2	-9.2	2.0
Durable Goods [1]	-10.4	-2.1	48.1	3.3	9.4	23.2	-29.3	1.6	35.6	33.6	-0.8	-0.3	27.4	-30.4	2.1
Private Investment Expenditures [1]	12.6	1.7	19.4	0.9	4.3	35.0	-9.1	17.9	12.1	11.9	-8.3	-17.8	16.0	-34.9	-7.2
WPI [1]	67.9	62.3	48.6	59.2	61.4	60.3	149.6	64.9	81.9	90.6	51.4	66.5	32.1	88.1	31.5
CPI [1]	77.1	64.3	60.4	71.1	66.0	71.1	125.5	78.9	76.5	99.2	68.4	67.0	39.3	67.9	29.5
M2Y / GDP (%)	25.7	26.2	23.1	26.6	27.7	26.9	30.5	30.2	35.1	37.8	38.7	51.8	43.6	58.2	48.7
Credit Volume / GDP (%)	18.5	17.3	17.6	16.9	17.9	18.3	16.3	18.5	22.1	26.2	22.4	21.9	22.0	19.0	12.5
Consumer Credit / Durable Goods [2] (%)	-	-	-	-	-	22.7	9.4	11.1	13.9	16.4	15.5	15.2	36.4	17.1	16.1
Real Credit Volume (1987=100) [3]	82.0	82.3	90.3	81.1	89.6	97.4	75.0	95.3	122.9	142.8	131.6	114.1	132.1	97.6	76.5
Nominal Interest Rates (%)	63.9	59.0	52.8	78.9	85.6	87.5	158.1	124.2	132.2	106.3	115.5	104.0	36.3	99.9	63.5
Real Interest Rates (%)	-7.3	-2.5	-4.7	8.0	9.0	13.3	26.6	14.2	29.4	12.2	16.8	24.9	-12.1	32.3	12.0

Source: SIS, CBRT, Treasury

(1) Annual % change.

(2) Sub-group of private consumption expenditures, current prices.

(3) Credit volume of deposit money banks is divided by Consumer Price Index (1987=100) to express in real terms.

Food and beverage is the greatest sub-group of private consumption expenditures, while ownership of dwellings is the smallest expenditure sub-group, which is actually formed by rent that households pay to houses and land for accommodation purposes (Table III.2).

Table III.2 – Shares of Sub-Groups in Private Consumption Expenditures (%)

	Food	Durable	Semi-Durable	Energy-Trans.-Comm.	Services	Ownership of Dwellings
1987	41.1	10.4	18.0	12.6	8.4	9.4
1988	39.1	9.9	18.7	14.5	9.9	7.8
1989	40.4	10.0	17.2	15.3	10.9	6.2
1990	39.9	11.9	19.1	14.0	9.7	5.4
1991	38.4	11.4	19.2	15.3	9.9	5.9
1992	36.9	11.0	17.9	17.5	10.5	6.1
1993	38.5	11.5	17.3	16.7	10.4	5.6
1994	38.4	9.9	15.7	19.0	11.6	5.4
1995	41.6	9.9	16.8	16.0	10.8	5.0
1996	37.8	11.5	16.1	17.9	11.9	4.8
1997	36.3	13.5	15.1	18.0	12.5	4.7
1998	39.3	12.5	13.7	16.9	12.3	5.3
1999	38.7	11.8	13.8	18.0	11.0	6.7
2000	36.6	14.2	13.8	17.7	10.7	7.0
2001	35.6	10.6	14.2	21.1	11.3	7.1
2002	34.7	10.5	14.7	21.6	12.0	6.3
Average	**38.3**	**11.3**	**16.3**	**17.0**	**10.9**	**6.2**

Source: SIS

Turkish Economy experienced two significant developments in the financial markets throughout the period of analysis. First, credit volume extended to households by deposit money banks increased substantially since 1993, when consumer credit and credit cards emerged in the economy. Secondly, rising real interest rates led to the postponement of private consumption expenditures and also contributed to the increase of disposable income due to high interest earnings.

It is thought that both positive developments in the financial markets decreased the level of liquidity constraints in the economy.

Table III.3 – Sectoral Breakdown of Deposit Money Banks Credit (%)

	Private Sector	Households	Consumer Credit	Credit Cards
1987	79.6	3.1	-	-
1988	77.2	0.6	-	-
1989	78.1	0.8	-	-
1990	79.6	0.9	-	-
1991	81.8	0.8	-	-
1992	86.2	1.2	-	-
1993	86.0	12.9	9.6	1.3
1994	83.8	6.1	3.8	1.1
1995	89.2	6.6	4.2	1.5
1996	92.9	8.0	4.9	2.3
1997	92.2	10.3	5.7	3.4
1998	91.9	12.7	6.0	5.5
1999	90.7	13.1	5.9	6.7
2000	93.4	25.0	16.8	7.9
2001	90.6	14.5	6.9	7.5
2002	92.8	21.8	9.1	12.6

Source: CBRT

Although, it is acknowledged that development in the financial markets has not been completed yet, it is observed that financial deepening in the economy strengthened after the 1994 financial crisis (Table III.1). The ratio of credit volume to GDP continued to increase throughout this period, until it was sharply cut by the serious contraction in 2001 as a result of the economic crisis. Moreover, the emergence of consumer credit by deposit money banks contributed to the rise of credit volume. The expansion of consumer credit and credit card utilization in the economy increased the financial opportunities of households to overcome liquidity constraints. Therefore, it is thought that financial deepening and the rising credit

volume contributed to the change of private consumption behavior in Turkish Economy.

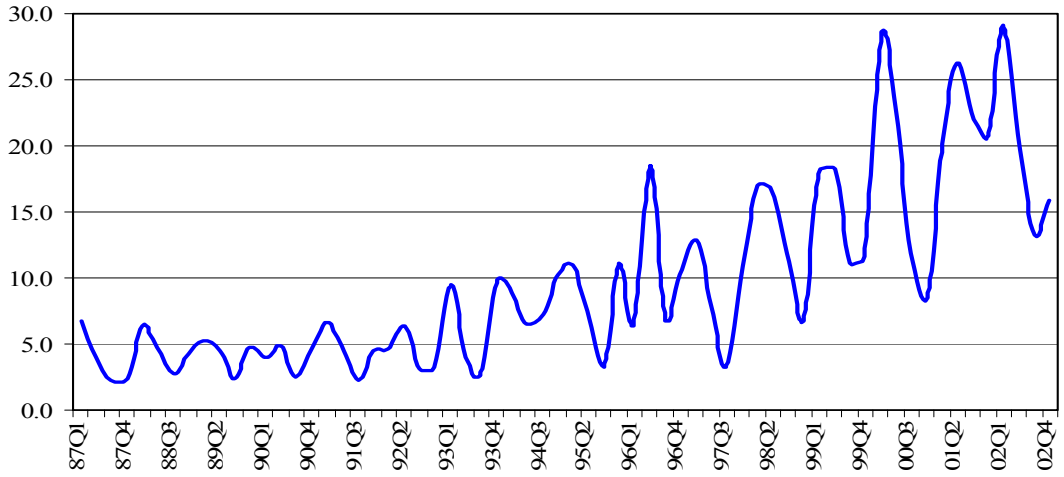

Figure III.3 – The Ratio of Interest Payments in Total Disposable Income (%)
Source: SIS, Treasury

Moreover, significant changes were seen in both fiscal and monetary policy throughout the period of analysis. Domestic borrowing policy was adopted as the major response to finance the consolidated budget debt following the 1994 financial crisis. It is observed that real interest rates increased substantially since the implementation of domestic borrowing policy until the stabilization program in 2000, when declined to negative levels, but real interest rates jumped to high levels again after 2001.

Uygur (1993) performed a comprehensive analysis of the performance of Turkish Economy after financial liberalization. However, Uygur (1993) carried out his empirical analysis for mainly 1965-1990 period using annual macroeconomic variables. Uygur (1993) found out that the response of private saving to the real

interest rates was positive, but statistically insignificant and considered this observation as evidence against the validity of McKinnon and Shaw hypothesis for Turkish Economy. However, it can be argued that real interest rates were actually negative during that period of analysis. Moreover, Turkish Economy experienced major fiscal and monetary policy changes after 1994 financial crisis.

According to the consumption literature, the effect of the real interest rates on the growth of private consumption demand depends on the reciprocal influence of positive income effect and negative substitution effect. However, it is thought that real interest rates led to the postponement of private consumption demand during this period, since real interest rates were extremely high compared to previous periods. On the other hand, the rise of real interest rates to extremely high levels led to the increase of disposable income due to the surmount of interest earnings (Figure III.3). Therefore, it is thought that high real interest rates contributed to the financial wealth accumulation, which decreased the level of liquidity constraints that households suffer from.

The credit volume extended to the private sector by deposit money banks increased substantially throughout the period of analysis. Although, the share of credit volume extended to the private sector was the single largest component of total credit volume, credit extended to households, as a sub-item of private sector, was relatively small throughout the period. The ratio of credit volume extended to households to total credit volume began to rise substantially after consumer credit and credit cards emerged in the financial system since 1993. The rise of household

credit volume became evident in 2000, when consumer credit reached its record level during the implementation of exchange rate based stabilization program (Table III.3).

Moreover, it is observed that the share of durable goods in GDP increased parallel to the rise of consumer credit extended to households by deposit money banks, especially in 2000. The econometric analysis of Çimenoğlu and Yentürk (2002) also proved that the rise of credit volume and credit card utilization increased household expenditure for durable goods in Turkish Economy. In addition to this, credit cards utilization by households continued to increase extensively, since credit cards became available in the economy. Therefore, it is thought that the rise of credit volume extended to households contributed to the decline of the level of liquidity constraints that households suffer from considerably. Consequently, it is thought that the decline of liquidity constraints and also wealth accumulation enabled households to change their consumption behavior remarkably in Turkish Economy.

CHAPTER IV

EMPIRICAL OBSERVATIONS

IV.1. Data

All data for this study will be utilized as quarterly data covering the 1987:01-2002:04 period. Private consumption demand excluding expenditures for durable goods in current prices is analyzed in the study. Unfortunately, State Planning Organization produces disposable income data only on annual basis, since income data for public sector is available only for annual basis. Consequently, disposable income data in current prices for quarterly period is produced for this study using DİE (1994) as the main source. Akçin (1996) also produced disposable income data for his study by a similar method. Disposable income data is provided at the appendix (Table A.3).

As the first step, both private consumption (excluding durable goods) and disposable income are divided into Consumer Price Index (1994=100) to express them in real terms. In the second step, private consumption and disposable income are also divided into overall population to find out real per capita private

consumption demand and disposable income. The population data is taken from the Household Labor Surveys of State Institute of Statistics.

Both, real per capita private consumption and disposable income are deseasonalized in Demetra software using Tramo-Seats model as the final step (Atuk and Ural, 2002). It is possible to eliminate the seasonal influence of national and religious holidays, which does not need to show a deterministic pattern, from national income variables using Demetra software. It is observed that national and religious holidays lead to significant changes in consumption expenditures in Turkish Economy. Therefore, it is thought that to eliminate all types of seasonal effects from national income variables will contribute to the analysis of consumption behavior.

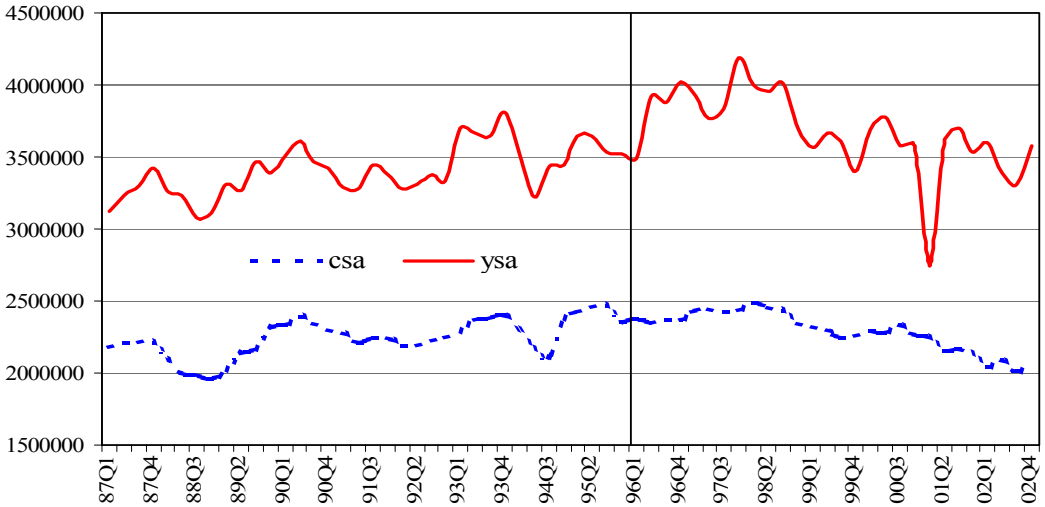

Figure IV.I – Real Per Capita Private Consumption Demand and Disposable Income (seasonally adjusted)

Primarily, it is observed that real per capita private consumption is significantly smooth compared to real per capita disposable income for the entire

period. The economic crises suffered in Turkish Economy had serious negative effects on the real per capita disposable income. It is observed that real per capita disposable income decreased substantially during crises periods. Moreover, real per capita private consumption accompanied the decline of real per capita disposable income especially during the 1994 financial crisis.

Moreover, it is also observed that real per capita consumption had a direct and strong economic relationship with real per capita disposable income during 1987Q1-1995Q4 period. Akçin and Alper (1999) exactly cover this sub-period of Turkish Economy in their analysis. Thus, it is not surprising that their empirical results showed that a significant portion of consumers in Turkish Economy follow the rule of thumb behavior and consume their current income.

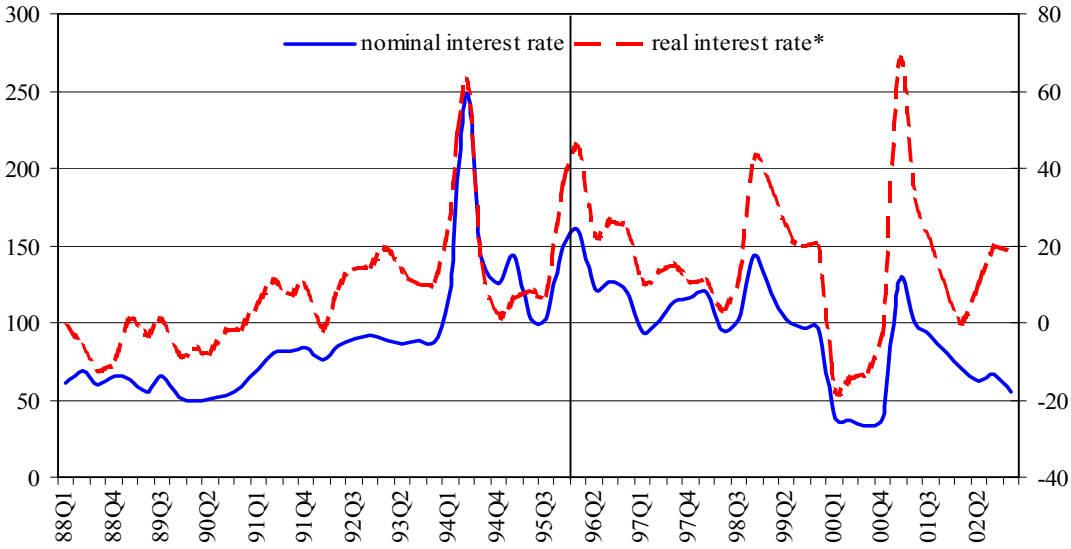

Figure IV.2 – Nominal and Real Interest Rates

However, it is also observed that real per capita private consumption followed a more stable pattern during the 1996Q1-2002Q4 period. Real per capita

disposable income showed a volatile pattern during this period and the negative consequences of the 2001 economic crisis were severely felt. Nevertheless, it is observed that the strong and direct relationship observed between real per capita private consumption and disposable income disappeared during the 1996Q1-2002Q4 period.

The nominal interest rate for the Treasury bills and bonds is considered as the reference interest rate for Turkish Economy. The nominal interest rate is deflated by annual percentage increases of Consumer Price Index (1994=100) to calculate real interest rates.

Real interest rates, shown in the right axis of Figure IV.2, were negative until the end of 1980s and stood at a low level until the beginning of 1990s. However, real interest rates increased sharply during the 1994 financial crisis and remained high thereafter. Turkish Economy experienced negative real interest rates once more during the exchange rate based stabilization program in 2000. Nevertheless, both real and nominal interest rates increased significantly after the 2001 economic crisis.

Real interest rates were relatively higher since the second half of 1990s compared to the 1987Q1-1995Q4 period. Therefore, it is thought that substitution effect of real interest rates on the growth of consumption should have been stronger during the second half of 1990s and early 2000s. Unfortunately, the

financial and economic crises distorted economic variables extensively, which made understanding Turkish Economy more complicated.

IV.2. Methodology

However, it is not possible to estimate equations, which analyze the influence of rule of thumb consumers and the increase of real interest rates on the growth of private consumption demand, $\Delta c_t = \mu + \lambda \Delta y_t + \varepsilon_t \rightarrow (2.29)$, $\Delta c_t = \mu + \sigma r_t + \varepsilon_t \rightarrow (2.30)$ and $\Delta c_t = \mu + \lambda \Delta y_t + \theta r_t + \varepsilon_t \rightarrow (2.31)$ directly by Ordinary Least Squares (OLS) technique. Consumption and income are determined simultaneously in national income accounting, which obviously leads to simultaneity problem in the equations. Since, both consumption and income have statistical power to explain each other, the error term from the estimation of the consumption function will be correlated with income in an OLS equation.

Instead, the estimation of these equations can be realized using Instrumental Variable (IV) technique pioneered by Hansen and Singleton (1982). The instruments must be correlated with the variables in the equations in order to be valid instruments, which will contribute to the explanatory power of the equations. Moreover, the instruments also must be orthogonal to the error term in order to eliminate the bias, which might stem from the simultaneity problem.

Lagged values of the stationary variables are considered as possible instruments, such as lagged growth rates of consumption and income or lagged

values of the changes in nominal and real interest rates. However, the instruments must be lagged for at least two periods in order to eliminate serial correlation from the equations (Hall, 1988).

All the variables used in the equations are in stationary forms and their unit root tests are presented at the appendix (Table A.2). Estimations of the equations are carried out using MFIT 4.0 software and Generalized Instrumental Variable Estimation (GIVE) methodology is used in the estimation of previously presented equations (2.29), (2.30) and (2.31).

IV.3. Estimation Results

The estimations are carried out for the overall 1987Q1-2002Q4 period and for its 1987Q1–1995Q4 sub-period separately. Although, estimation periods are different, estimation methodology and estimated equations are exactly the same in order to be able to compare different periods of Turkish Economy.

The estimation results for both periods are presented below in the tables from Table A.4 to Table A.9. The first three tables, Table A.4 to Table A.6, present the econometric results for the sub-period of 1987Q1-1995Q4, while the following three tables, Table A.7 to Table A.9, present the econometric results for the overall period of 1987Q1-2002Q4. Unfortunately, no estimation is realized for the sub-period of 1996Q1-2002Q4, since the number of observations is

insufficient, especially considering that lagged instruments decrease the degree of freedom further.

In the tables provided at the appendix – from Table A.4 to Table A.9 – the second column presents the instruments used in the estimated equations. The third and fourth columns show the *adjusted* R^2 statistics for OLS regressions of Δc_t, Δy_t and Δr_t on the instruments. The values in the parentheses are the probability values for a Wald test of the hypothesis that the coefficients other than the intercept term are zero. The fifth and sixth columns present the instrumental variables estimates of the coefficients – (λ, θ, σ) – with the standard errors in parentheses.

The instruments should be orthogonal to the error terms from equations in order to be valid instruments, if the instrumental variables estimation technique is going to be used. Therefore, the last column gives the results of the Sargan Test, which is already provided by MFIT 4.0 software, in order to find out whether the instruments used in the equations are valid. The critical values for Sargan Test according to Chi-Square distribution are provided in the last column, where in parenthesis are probability ratios.

IV.3.a. Estimation Results for the Sub-Period of 1987Q1-1995Q4

It is observed from Table A.4, which presents the estimation results of equation $\Delta c_t = \mu + \lambda \Delta y_t + \varepsilon_t \rightarrow (2.29)$ that the ratio of rule of thumb consumers'

to change from 50 % to 70 % for the sub-period of 1987Q1-1995Q4 as expected from the analysis of raw data. Moreover, Table A.4 indicates that overidentifying restrictions hold that the instruments are orthogonal to the error terms in the equations. The econometric results support the claim that consumption is excessively sensitive to current income during the sub-period of the economy. Akçin and Alper (1999) analyzed the same period of the Turkish Economy using instrumental variables technique and observed that the ratio of rule of thumb consumers constituted more than 40 % of total consumers.

The ratio of consumers, who follow the rule of thumb and simply consume their current income, is significantly high for the sub-period of 1987Q1-1995Q4. Thus, it is concluded that a significant portion of consumers suffered from liquidity constraints during this sub-period.

In addition to this, it is also observed that 1-point increase in the growth of current income led to 0.70-point increase in the growth rate of consumption during this sub-period. In other words, the income elasticity of the growth of consumption was around 70 % for this period.

The effect of the increase of real interest rates on the growth rate of consumption is found to be as negative, but considerably small for the sub-period of 1987Q1-1995Q4. The Table A.5 presents estimation results of equation $\Delta c_t = \mu + \sigma r_t + \varepsilon_t \rightarrow (2.30)$. It is observed from Table A.5 that the inter-temporal elasticity of substitution was between –0.0020 and –0,0025 for the sub-period of

the analysis. This interesting observation indicates that the negative substitution effect of the real interest rates was considerably strong to dominate the positive income effect during the sub-period. However, it is observed that the increases in the real interest rates have negative, but very limited power on the growth of consumption.

On the other hand, Table A.6 presents the results of the equation $\Delta c_t = \mu + \lambda \Delta y_t + \theta r_t + \varepsilon_t \rightarrow (2.31)$, where the effects of the growth of the current income and the increase of the real interest rates on the growth of consumption are jointly estimated. The effect of the increase of the real interest rate on the growth of consumption is observed within the range of –0.0019 to –0.0028 for this period. However, the ratio of rule of thumb consumers to total consumers was around 40 %, but statistically insignificant according to

this equation for the sub-period of 1987Q1-1995Q4.

IV.3.b. Estimation Results for the Overall Period of 1987Q1-2002Q4

The subsequent tables present the econometric results of the same equations for the overall period of 1987Q1-2002Q4. It is observed from Table A.7, which presents the estimation results of $\Delta c_t = \mu + \lambda \Delta y_t + \varepsilon_t \rightarrow (2.29)$, that the ratio of rule of thumb consumers to total consumers declined to around 10 % levels, but the coefficients are not statistically significant. The effect of the growth of current income on the growth of consumption declined substantially, which is also observed from the raw data after the end of 1995. Therefore, it is thought that

the ratio of consumers, who face liquidity constraints decreased since the end of 1995 and a higher portion of consumers became able to smooth their consumption over periods in Turkish Economy.

The Table A.8 presents the estimation results of the equation $\Delta c_t = \mu + \sigma r_t + \varepsilon_t \rightarrow (2.30)$ for the overall period of 1987Q1-2002Q4. It is observed from Table A.8 that the inter-temporal elasticity of substitution declined to –0.0007 to –0.0008 levels, which indicates that the increase of real interest rates had almost no influence on the growth of consumption, when analyzed for the overall period. The effect of the increase of the real interest rates on the growth of consumption again found to be negative and statistically significant.

Nevertheless, the negative value of the inter-temporal elasticity of substitution reveals that negative substitution effect was strong enough to dominate the positive income effect of the real interest rates for the overall period. However, the decline of the effect of the real interest rates on the growth of consumption compared to the sub-period of 1987Q1-1995Q4 also indicates that positive income effect gained strength during the 1996Q1-2002Q4 period, possibly due to the substantial rise of the real interest rates.

On the other hand, Table A.9 presents the results of the equation $\Delta c_t = \mu + \lambda \Delta y_t + \theta r_t + \varepsilon_t \rightarrow (2.31)$, where the effects of the growth of the current income and the increase of the real interest rates on the growth of consumption are jointly estimated for the whole period. The coefficient of real interest rates was

statistically significant and economically meaningful in the estimated equations. However, Table A.9 presents inconsistent results for the ratio of rule thumb consumers to total consumers.

CHAPTER V

CONCLUSION

Consumption behavior of households and how private consumption demand is determined in Turkish Economy are analyzed in thesis study. Previous empirical studies such as Akçin and Alper (1999) found out that disposable income was the main determinant of private consumption demand for a significant portion of total households, since severe liquidity constraints prevailed in the economy. This finding is also supported by this thesis study for the same sub-period of Turkish Economy.

However, the analysis of macroeconomic variables demonstrated that the influence of disposable income on the growth of private consumption demand disappeared in the long run for Turkish Economy. The dilemma stemmed from the fact that the development of financial markets, especially the rise of consumer credit and wealth accumulation through the increase of interest earnings, decreased the pressure of liquidity constraints on households in the economy.

The investigation of Turkish Economy as two subsequent periods revealed that financial deepening in the economy led to the increase of credit volume

available to households. Moreover, households were able to accumulate financial wealth to compensate for liquidity constraints in times of necessity. The rise of real interest rates changed economic relations extensively and contributed to the accumulation of financial wealth through interest earnings.

Therefore, the dependence of private consumption demand to disposable income declined due to increasing financial opportunities and wealth accumulation. Improving economic conditions enabled households to determine their consumption demand according to their future income prospects rather than simply depending on their disposable income.

Moreover, the analysis indicated that there is a consistent economic relationship between private consumption demand and permanent income in the long run. However, liquidity constraints, uncertainty perception of households and real interest rates can be significant determinants of private consumption demand in the short run.

Consequently, there are three main observations of this thesis study for consumption behavior of households in Turkish Economy using available macroeconomic variables:

i) First, it is observed that private consumption behavior is consistent with the premises of Permanent Income / Life-Cycle Consumption theory in the long run.

ii) Second, it is found out that the influence of liquidity constraints on private consumption demand has declined considerably throughout the period of analysis, which enabled households to smooth their consumption expenditures over periods.

iii) Third, it is shown that the high level of real interest rates led to the postponement of private consumption demand during the whole period, since the negative substitution effect was strong enough to dominate the positive income effect. However, the effect of the real interest rates on the growth of private consumption demand remained very small.

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APPENDIX A

TABLES AND FIGURES

Table A.1 – Unit Root Test Results (level)

$$\Delta y_t = a_0 + a_2 t + \gamma y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \varepsilon_t$$

	P	ADF Test Statistic	Critical Values*	Integration of Order
y_t	(1)	-3.288	-4.111	I(1)
c_t	(3)	-0.251	-2.601	I(1)
ni_t	(0)	-3.412	-3.536	I(1)
ri_t	(4)	-2.357	-2.604	I(1)

*Critical values are for 1% significance level.

Table A.2 – Unit Root Test Results (first difference)

$$\Delta^2 y_t = a_0 + a_2 t + \gamma \Delta y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta^2 y_{t-i} + \varepsilon_t$$

	p	ADF Test Statistic	Critical Values*	Integration of Order
Δy_t	(3)	-6.697	-2.602	I(0)
Δc_t	(3)	-5.310	-2.602	I(0)
Δni_t	(4)	-5.672	-2.602	I(0)
Δri_t	(4)	-6.253	-2.606	I(0)

*Critical values are for 1% significance level.

Derivation of Disposable Income[2] is presented at the equations below (i) and (ii):

(i) National Income = Gross National Product – Depreciation[3]

(ii) Disposable Income = National Income + Total Transfers + Interest payments – Total Taxes

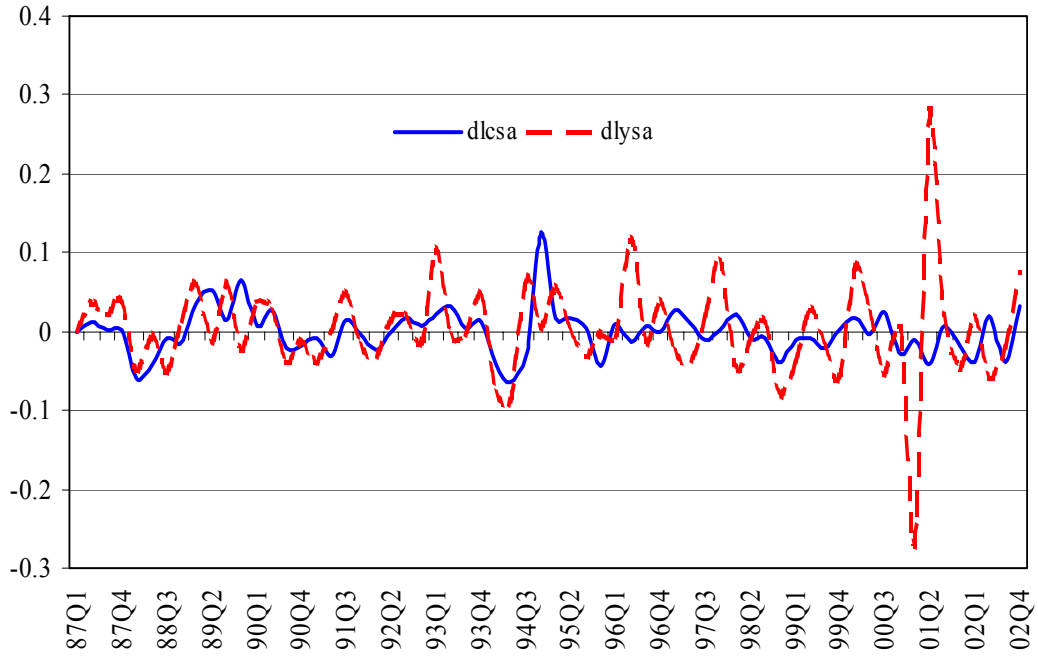
Table A.3 – Disposable Income (in current prices, billions of TL)

1987Q1	10947.0		1995Q1	1192403.3
1987Q2	13813.6		1995Q2	1541868.9
1987Q3	22627.9		1995Q3	2366720.1
1987Q4	20692.8		1995Q4	2251519.6
1988Q1	19322.7		1996Q1	2062827.1
1988Q2	25691.9		1996Q2	3057494.6
1988Q3	39112.8		1996Q3	4658694.7
1988Q4	34779.9		1996Q4	4625411.5
1989Q1	31955.5		1997Q1	4151095.9
1989Q2	41120.8		1997Q2	5346121.0
1989Q3	73620.4		1997Q3	8770007.2
1989Q4	62997.6		1997Q4	9531775.0
1990Q1	56342.1		1998Q1	8688461.6
1990Q2	76663.7		1998Q2	11023025.9
1990Q3	119137.3		1998Q3	16913331.6
1990Q4	104796.6		1998Q4	14392391.8
1991Q1	87002.7		1999Q1	13096927.9
1991Q2	115459.4		1999Q2	16770908.7
1991Q3	197822.3		1999Q3	25241717.2
1991Q4	176459.8		1999Q4	21781670.8
1992Q1	158959.9		2000Q1	23228985.1
1992Q2	200941.6		2000Q2	28466772.1
1992Q3	326540.4		2000Q3	38260893.0
1992Q4	298577.8		2000Q4	33382391.0
1993Q1	296189.8		2001Q1	23952642.6
1993Q2	368226.7		2001Q2	41701729.2
1993Q3	605666.2		2001Q3	62440208.1
1993Q4	590359.8		2001Q4	55668145.4
1994Q1	494640.0		2002Q1	56707526.8
1994Q2	699820.4		2002Q2	60378425.2
1994Q3	1199203.3		2002Q3	81689722.8
1994Q4	1190123.1		2002Q4	78928221.6

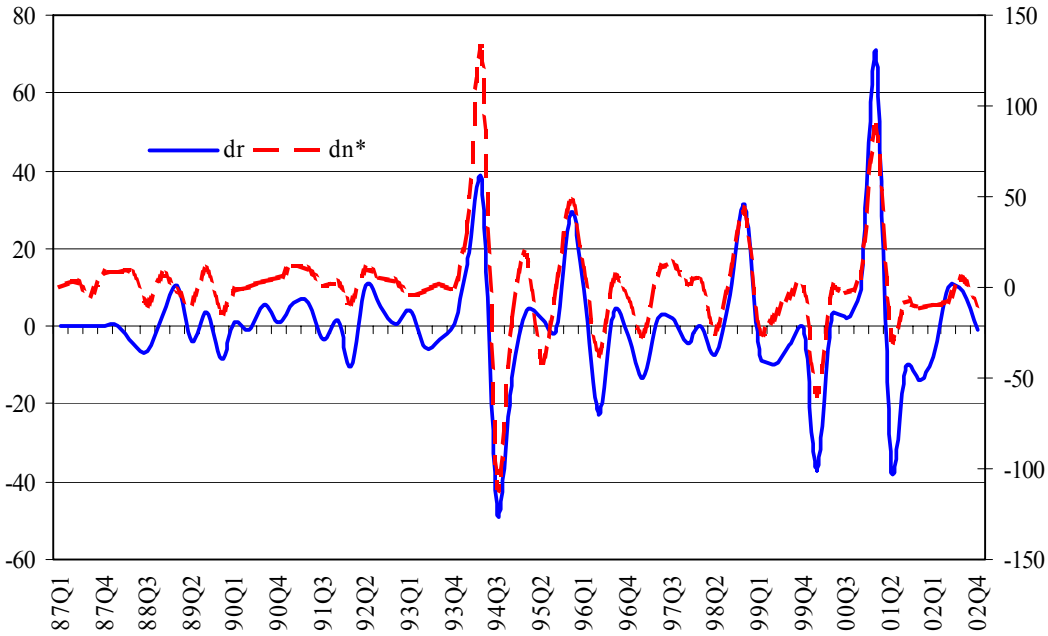
Source: SIS, SPO, Treasury

[2] DİE (1994), Gayri Safi Milli Hasıla; Kavram, Yöntem ve Kaynaklar.

[3] Depreciation ratio is assumed to be as 5% of Gross National Product.



Graph A.1 – Consumption and Disposable Income in Logarithmic and Stationary Forms



Graph A.1 – Real and Nominal Interest Rates in Stationary Forms

Table A.4* – Consumption and Income between 1987Q1-1995Q4 period

$$\Delta c_t = \mu + \lambda \Delta y_t + \varepsilon_t$$

Row	Instruments	First Stage Regressions Δc equation	First Stage Regressions Δy equation	λ estimate (s.e.)	Sargan Test
1	None (OLS)	---	---	0.330*** (0.137)	---
2	$\Delta y_{t-2},.....,\Delta y_{t-4}$	0.173 (0.062)	0.321 (0.006)	0.513*** (0.239)	4.139 (0.247)
3	$\Delta y_{t-2},.....,\Delta y_{t-6}$	0.239 (0.056)	0.312 (0.020)	0.359 (0.226)	9.719 (0.084)
4	$\Delta c_{t-2},.....,\Delta c_{t-4}$	0.133 (0.103)	0.169 (0.065)	0.716*** (0.317)	1.324 (0.723)
5	$\Delta c_{t-2},.....,\Delta c_{t-6}$	0.087 (0.242)	0.130 (0.168)	0.696*** (0.307)	1.758 (0.882)
6	$\Delta i_{t-2},.....,\Delta i_{t-4}$	0.273 (0.014)	0.118 (0.124)	0.639** (0.332)	6.661 (0.084)
7	$\Delta i_{t-2},.....,\Delta i_{t-6}$	0.349 (0.014)	0.068 (0.281)	0.647** (0.326)	8.548 (0.128)
8	$\Delta y_{t-2},.....,\Delta y_{t-4}$ $\Delta c_{t-2},.....,\Delta c_{t-4}$ $c_{t-2} - y_{t-2}$	0.339 (0.022)	0.318 (0.029)	0.508*** (0.217)	10.454 (0.164)
9	$\Delta y_{t-2},.....,\Delta y_{t-4}$ $\Delta c_{t-2},.....,\Delta c_{t-4}$ $\Delta i_{t-2},.....,\Delta i_{t-4}$ $c_{t-2} - y_{t-2}$	0.613 (0.000)	0.259 (0.096)	0.597*** (0.217)	14.334 (0.158)

* Impulse dummy variables are included in the instrument list for 1994:01.
** Significant at 10% level.
*** Significant at 5% level.

Table A.5* – Consumption and Real Interest Rates between 1987Q1-1995Q4 period

$$\Delta c_t = \mu + \sigma \Delta r_t + \varepsilon_t$$

Row	Instruments	First Stage Regressions Δc equation	First Stage Regressions Δr equation	σ estimate (s.e.)	Sargan Test
1	None (OLS)	---	---	-0.0009** (0.0005)	---
2	$\Delta r_{t-2}, \ldots\ldots, \Delta r_{t-4}$	0.144 (0.116)	0.215 (0.052)	-0.0022*** (0.0009)	0.718 (0.869)
3	$\Delta r_{t-2}, \ldots\ldots, \Delta r_{t-6}$	0.256 (0.072)	0.288 (0.053)	-0.0023*** (0.0008)	1.044 (0.959)
4	$\Delta c_{t-2}, \ldots\ldots, \Delta c_{t-4}$	0.133 (0.103)	0.204 (0.040)	-0.0020*** (0.0009)	2.161 (0.540)
5	$\Delta c_{t-2}, \ldots\ldots, \Delta c_{t-6}$	0.087 (0.242)	0.146 (0.146)	-0.0018*** (0.0009)	3.649 (0.601)
6	$\Delta i_{t-2}, \ldots\ldots, \Delta i_{t-4}$	0.349 (0.014)	0.290 (0.011)	-0.0024*** (0.0008)	1.211 (0.750)
7	$\Delta i_{t-2}, \ldots\ldots, \Delta i_{t-6}$	0.349 (0.014)	0.330 (0.018)	-0.0022*** (0.0008)	3.628 (0.604)
8	$\Delta r_{t-2}, \ldots\ldots, \Delta r_{t-4}$ $\Delta c_{t-2}, \ldots\ldots, \Delta c_{t-4}$	0.340 (0.030)	0.246 (0.080)	-0.0024*** (0.0008)	2.886 (0.823)
9	$\Delta r_{t-2}, \ldots\ldots, \Delta r_{t-4}$ $\Delta c_{t-2}, \ldots\ldots, \Delta c_{t-4}$ $\Delta i_{t-2}, \ldots\ldots, \Delta i_{t-4}$	0.506 (0.010)	0.160 (0.228)	-0.0025*** (0.0008)	5.007 (0.834)

* Impulse dummy variables are included in the instrument list for 1994:01.
** Significant at 10% level.
*** Significant at 5% level.

Table A.6* – Consumption, Income and Real Interest Rates between 1987Q1-1995Q4 period

$$\Delta c_t = \mu + \lambda \Delta y_t + \theta \Delta r_t + \varepsilon_t$$

Row	Instruments	First Stage Regressions Δc	Δy	Δr	λ (s.e.)	θ (s.e.)	Sargan Test
1	None (OLS)	---	---	---	0.232 (0.155)	-0.0006 (0.0005)	---
2	$\Delta y_{t-2},\ldots\ldots,\Delta y_{t-4}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-4}$	0.083 (0.287)	0.331 (0.033)	0.176 (0.148)	-0.035 (0.372)	-0.0023** (0.0013)	1.219 (0.943)
3	$\Delta c_{t-2},\ldots\ldots,\Delta c_{t-4}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-4}$	0.340 (0.030)	0.160 (0.166)	0.246 (0.080)	0.423 (0.397)	-0.0016 (0.0011)	1.797 (0.876)
4	$\Delta i_{t-2},\ldots\ldots,\Delta i_{t-4}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-4}$	0.350 (0.027)	0.128 (0.211)	0.189 (0.132)	-0.055 (0.419)	-0.0028*** (0.0012)	1.702 (0.889)
5	$\Delta c_{t-2},\ldots\ldots,\Delta c_{t-6}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-6}$	0.256 (0.047)	0.251 (0.050)	0.173 (0.116)	0.344 (0.421)	-0.0016 (0.0010)	4.687 (0.861)
6	$\Delta y_{t-2},\ldots\ldots,\Delta y_{t-6}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-6}$	0.259 (0.046)	0.314 (0.023)	0.266 (0.042)	-0.038 (0.359)	-0.0019** (0.0009)	6.389 (0.700)
7	$\Delta c_{t-2},\ldots\ldots,\Delta c_{t-6}$ $\Delta i_{t-2},\ldots\ldots,\Delta i_{t-6}$	0.535 (0.000)	0.178 (0.111)	0.267 (0.042)	0.401 (0.309)	-0.0016** (0.0008)	8.417 (0.493)

* Impulse dummy variables are included in the instrument list for 1994:01.
** Significant at 10% level.
*** Significant at 5% level.

Table A.7* – Consumption and Income between 1987Q1-2002Q4 period

$$\Delta c_t = \mu + \lambda \Delta y_t + \varepsilon_t$$

Row	Instruments	First Stage Regressions Δc equation	Δy equation	λ estimate (s.e.)	Sargan Test
1	None (OLS)	---	---	0.051 (0.058)	---
2	$\Delta y_{t-2},.....,\Delta y_{t-4}$	0.049 (0.176)	0.314 (0.000)	0.132 (0.098)	5.417 (0.247)
3	$\Delta y_{t-2},.....,\Delta y_{t-6}$	0.112 (0.072)	0.312 (0.000)	0.105 (0.095)	10.858 (0.093)
4	$\Delta c_{t-2},.....,\Delta c_{t-4}$	0.097 (0.064)	0.255 (0.001)	0.136 (0.106)	7.953 (0.093)
5	$\Delta c_{t-2},.....,\Delta c_{t-6}$	0.074 (0.148)	0.247 (0.003)	0.112 (0.103)	9.072 (0.173)
6	$\Delta i_{t-2},.....,\Delta i_{t-4}$	0.096 (0.064)	0.256 (0.001)	0.153 (0.107)	7.337 (0.119)
7	$\Delta i_{t-2},.....,\Delta i_{t-6}$	0.155 (0.030)	0.295 (0.001)	0.094 (0.096)	13.208 (0.040)
8	$\Delta y_{t-2},.....,\Delta y_{t-4}$ $\Delta c_{t-2},.....,\Delta c_{t-4}$ $c_{t-2} - y_{t-2}$	0.121 (0.076)	0.278 (0.002)	0.123 (0.096)	12.627 (0.125)
9	$\Delta y_{t-2},.....,\Delta y_{t-4}$ $\Delta c_{t-2},.....,\Delta c_{t-4}$ $\Delta i_{t-2},.....,\Delta i_{t-4}$ $c_{t-2} - y_{t-2}$	0.266 (0.007)	0.240 (0.012)	0.147 (0.096)	20.314 (0.041)

* Impulse dummy variables are included in the instrument list for 1994:01 and 2001:01.
** Significant at 10% level.
*** Significant at 5% level.

Table A.8* – Consumption and Real Interest Rates between 1987Q1-2002Q4 period *

$$\Delta c_t = \mu + \sigma \Delta r_t + \varepsilon_t$$

Row	Instruments	First Stage Regressions Δc equation	First Stage Regressions Δr equation	σ estimate (s.e.)	Sargan Test
1	None (OLS)	---	---	-0.0003 (0.0002)	---
2	$\Delta r_{t-2},.....,\Delta r_{t-4}$	0.030 (0.264)	0.425 (0.000)	-0.0005 (0.0003)	4.291 (0.368)
3	$\Delta r_{t-2},.....,\Delta r_{t-6}$	0.120 (0.075)	0.419 (0.000)	-0.0006** (0.0003)	9.072 (0.170)
4	$\Delta c_{t-2},.....,\Delta c_{t-4}$	0.097 (0.064)	0.405 (0.000)	-0.0005 (0.0004)	8.385 (0.078)
5	$\Delta c_{t-2},.....,\Delta c_{t-6}$	0.074 (0.148)	0.399 (0.000)	-0.0004 (0.0003)	9.364 (0.154)
6	$\Delta i_{t-2},.....,\Delta i_{t-4}$	0.096 (0.064)	0.433 (0.000)	-0.0007*** (0.0003)	5.276 (0.260)
7	$\Delta i_{t-2},.....,\Delta i_{t-6}$	0.155 (0.030)	0.427 (0.000)	-0.0008*** (0.0003)	8.135 (0.228)
8	$\Delta r_{t-2},.....,\Delta r_{t-4}$ $\Delta c_{t-2},.....,\Delta c_{t-4}$	0.162 (0.036)	0.460 (0.000)	-0.0006** (0.0003)	12.868 (0.075)
9	$\Delta r_{t-2},.....,\Delta r_{t-4}$ $\Delta c_{t-2},.....,\Delta c_{t-4}$ $\Delta i_{t-2},.....,\Delta i_{t-4}$	0.350 (0.001)	0.484 (0.000)	-0.0006** (0.0003)	22.568 (0.012)

* Impulse dummy variables are included in the instrument list for 1994:01 and 2001:01.
** Significant at 10% level.
*** Significant at 5% level.

Table A.9* – Consumption, Income and Real Interest Rates between 1987Q1-2002Q4 period

$$\Delta c_t = \mu + \lambda \Delta y_t + \theta \Delta r_t + \varepsilon_t$$

Row	Instruments	First Stage Regressions Δc	Δy	Δr	λ (s.e.)	θ (s.e.)	Sargan Test
1	None (OLS)	---	---	---	-0.030 (0.078)	-0.0004 (0.0003)	---
2	$\Delta y_{t-2},\ldots\ldots,\Delta y_{t-4}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-4}$	-0.011 (0.503)	0.285 (0.002)	0.418 (0.000)	-0.107 (0.383)	-0.0008 (0.0014)	5.536 (0.477)
3	$\Delta c_{t-2},\ldots\ldots,\Delta c_{t-4}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-4}$	0.162 (0.036)	0.264 (0.004)	0.460 (0.000)	-0.179 (0.367)	-0.0011 (0.0012)	11.991 (0.062)
4	$\Delta i_{t-2},\ldots\ldots,\Delta i_{t-4}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-4}$	0.222 (0.010)	0.290 (0.002)	0.453 (0.000)	-0.408** (0.211)	-0.0018*** (0.0007)	7.592 (0.270)
5	$\Delta c_{t-2},\ldots\ldots,\Delta c_{t-6}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-6}$	0.137 (0.047)	0.289 (0.001)	0.442 (0.000)	-0.211 (0.175)	-0.0012** (0.0006)	13.055 (0.221)
6	$\Delta y_{t-2},\ldots\ldots,\Delta y_{t-6}$ $\Delta r_{t-2},\ldots\ldots,\Delta r_{t-6}$	0.050 (0.226)	0.286 (0.001)	0.461 (0.000)	-0.164 (0.168)	-0.0011** (0.0006)	9.614 (0.475)
7	$\Delta c_{t-2},\ldots\ldots,\Delta c_{t-6}$ $\Delta i_{t-2},\ldots\ldots,\Delta i_{t-6}$	0.305 (0.001)	0.223 (0.007)	0.441 (0.000)	-0.243 (0.189)	-0.0015*** (0.0007)	16.519 (0.086)

* Impulse dummy variables are included in the instrument list for 1994:01 and 2001:01.
** Significant at 10% level.
*** Significant at 5% level.