International Journal of Social Science and Economic Research

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

ADAPTIVE EXPECTATIONS AND PARTIAL ADJUSTMENT MODELS FOR INCOME AND HOUSEHOLD CONSUMPTION IN ALBANIA

[1]Dr. Myslym OSMANI, [2]Dr. Mira ANDONI, [3]Dr. Arben KAMBO, [4]Msc. Aida MOSKO

[1]Agricultural University of Tirana, Tirana, Albania.

[2]Professional Academy of Business, Tirana, Albania.

[3]Agricultural University of Tirana, Tirana, Albania.

[4]University F.S. Noli, Korça, Albania.

ABSTRACT

This is a study on income and consumption expectations in Albania. Based on time series data for both variables for the time horizon 1996-2015, we make use of econometric modeling to identify how expectations of Albanian consumers about income and consumption are formed. We use the classical model as well as adaptive expectations (AE) and partial adjustment (PA) hypothesis. These hypothesis seem to have lost ground over years against the competitive hypothesis of rational expectations (RE), but still useful as many authors argue. In our research we try to discuss why AE is useful and bring evidence in its favor. Empirically the classical model shows that in aggregate Albanians tend to consume about 70 percent of their income. The models show that consumers each year adjust their income expectations by about 53 percent of the gap between current and last year's income expectation. The short run effect of income on consumption or short run marginal propensity to consume is about 0.41 ALL for each increase of one unit in expected income. The long run effect of income is about 0.782 ALL for one unit increase in income.

Keywords: Adaptive expectations, partial adjustment, income, consumption, coefficient of adjustment, short and long run effect, marginal propensity to consume.

I. INTRODUCTION

It was Keynes who mentioned first the importance of expectations in economics. In his famous book "The General Theory of Employment, Interest and Money", first published in 1936, when analyzing factors affecting the propensity to consume, he argues that for a particular individual the propensity to consume is dependent also on "changes of expectations of the relation between

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

the present and the future level of income". Expectations play a crucial role when people, or economic agents, take economic decisions for the future. Expectations about future income are among the most important, because they are related to future level and pattern of investment and consumption. They could be developed for any variable, such as income, consumption, investment, prices, inflation, interest rates, etc. They also could be developed by individuals (income, consumption prices, etc.) or companies and organizations, included governments.

Broadly speaking, there exit four models of expectations formation: the **Cobweb expectations** formation model, the **extrapolative expectations** model, the **adaptive expectations** (AE) model and **rational expectations** (RE) model. Here we focus on the two last models.

Historically and theoretically the adaptive expectations were first to be formulated and applied, starting roughly from the 70' to the end of the previous century. Then they were superseded by rational expectations, from the beginning of this century to our days. However, as we shall see below, there are many examples, and arguments, for the AE theory to co-exist and be applied parallel with the RE theory.

To present theoretical foundations of expectations formation concerning income we used Dornbusch et al. (1994), Gordon (1987), Snowdon et al. (2005), and Mankiw (2010).

As we pointed out above, expectations about income are among the most important and the first to be discussed by economists.

One way of how actual expectations could be formed is to learn from errors made in the past when they formed their expectations, thus to integrate their past experience (errors) in their next period's expectations. So the hypothesis used in this case is the error learning hypothesis. Exactly this type of hypothesis is known in the economic literature as the **adaptive expectations (AE) hypothesis**. The AE hypothesis about income is first dealt by Milton Friedman (1957) and Philip Cagan (1956); Cagan used AE hypothesis for the generation of expectations on inflation, and Friedman used it to generate expectations for income variable. Friedman argues that people consume only a fraction of their permanent (average or expected) income. However, in Friedman's work there is no a standard statement about what is permanent income, thus different economists have given their own formulations.

According to Dornbusch and Fischer (1994), permanent income is the "steady rate of unchanged rate of consumption a person could maintain for the rest of his or her life given the present level of wealth and income earned now and in the future". According to permanent income theory, consumption is not dependent on current income but on a long-term expected income, called by Friedman *permanent income*. Based on permanent income YP the simplest form of the consumption function is:

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

$$C_t=cYP_t$$

Based on Friedman concept of permanent income, mathematically one form of the AE hypothesis for permanent income YP would be:

$$YP_t=Y_{t-1}+\alpha(Y_t-Y_{t-1})$$

This in fact is an extrapolative expectations model of income. Here Y_{t-1} is income in previous period, Y_t is income in the actual period, α is a coefficient of adjustment or correction taking values between one and zero. Thus, permanent income for next year is income for last year plus a fraction of difference of income between actual period and last period of time. The above equation could be formulated differently:

$$YP_t=\alpha Y_t+(1-\alpha)Y_{t-1}$$

This last formulation shows that permanent income is a weighted average of actual and past years average. Expectations for the future could also take into consideration past values of the variable for some previous years, not just one. In this case, Snowdon (2005), the formula would be:

$$YP= \alpha\ Y_t+ \alpha(1- \alpha)Y_{t-1}+...+ \alpha(1- \alpha)^nY_{t-n}$$

This formula also shows that permanent income is a weighted average of actual and **n**-period past values of the variable income, with weights decreasing geometrically.

Based on YP formula we rewrite the consumption function in a different form:

$$C_t=cYP_t=c\alpha Y+c(1-\alpha)Y_{t-1}$$

Here ***c*** is the long term marginal propensity to consume, and ***cα*** is the short term marginal propensity to consume; the latter is smaller than the first.

The modern theory of consumption combines the life-cycle theory with the permanent income hypothesis. In doing so, it suggests including disposable income YD but also Real Wealth (WR) in the consumption function:

$$C_t=aWR_t+b\alpha YD_t+b(1-\alpha)YD_{t-1}$$

Gordon (1987) has written an equation of expectations for prices; based on his equation for prices, we can write another form of the equation of expected (permanent) income:

$$YP_t=YP_{t-1}+\alpha(Y_{t-1}-YP_{t-1})$$

Or:

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

$$YP_t=\alpha Y_{t-1}+(1-\alpha)YP_{t-1}$$

So, permanent income is a weighted average of the last year income and the expected income of the last year.

Mankiw (2010), argues that permanent income is the average income. Total income is the sum of the permanent income YP and the transitory, random, income YT:

$$Y=YP+YT$$

The adaptive expectation hypothesis has been extremely popular in empirical research and it has the merit of being simple, realistic to a reasonable extent and a good preliminary proxy for studying how expectations are formed. The adaptive expectations hypothesis was largely used in empirical research worldwide in the last decades of last century. As for example, AE hypothesis was for price formation hypothesis in agricultural markets by Nerlove (1958) and for the determination of monetary equilibrium by Cagan (1973). Relevant literature witnesses a worldwide use of AE hypothesis in empirical research.

Another hypothesis linked to that of adaptive expectations is that of **partial adjustment (PA)**, or **stock adjustment hypothesis**. This hypothesis is linked to the **flexible acceleration model** in economics. According to this model, there is a need for capital to produce certain level or amount of output, under given or unchanging economic environment and technology. This discussion could be possible also for the relationship between national income and household consumption; in this context, there is a need for income in order to have a certain amount of consumption under other unchanging factors.

Another hypothesis the economic agents use when forming their expectations for the future instead of the former adaptive hypothesis is the **rational expectation (RE) hypothesis**. By this hypothesis economic agents can use all past relevant information about the factors influencing the permanent income that they access to; in different words, in doing so, they become rational when forming their expectations. RE hypothesis was introduced by Muth (1961), and advanced by Robert Lucas (**"Econometric Policy Evaluation: A Critique**", 1976), Sargent and Wallace (1975).

Mathematically RE hypothesis could be formulated:

$$YP=E(Y_t/\varphi_{t-1})$$

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

Thus, permanent income YP is the expected income given information φ_{t-1} on past data on variables that might have an influence on it. So RE seems more completed, or rational than AE hypothesis.

After RE was presented, the use of adaptive expectation hypothesis suffered a decline in empirical research. There have been debates on potential causes of such a decline in the use of AE hypothesis. One problem or cause formulated by literature is that AE hypothesis is not based on relevant information; it's not rational if the economic agents take decisions based solely on their past experience. So, many economists have formulated critiques for the AE model. Just to present a few examples, according to Gertchev (2007) the AE model has two problems: first, expectations are formed *ad hoc*, because the coefficient of adjustment is set by the individual; and, by AE model it is possible that expectations errors are serially correlated and also they could lag behind observed values of the variable, in the case of changes in the trend. Therefore by AE, individuals or agents making forecasts do not learn enough from the past, or they don't have full information, when they form their expectations about the future.

But many economists also justify the use of AE method and consider it still valid in many occasions and under specific suppositions. As Muth points out, (Ewans, 2001a) AE also could be rational if the first difference of the variable of interest is a first order moving average (MA) process. Ewans and Honkapohja (2001b) and Sargent (1999) have argued that AE might be reasonable, if not fully rational, when the data generating process is unknown. Mlambo (2012) argues that AE hypothesis can be seen as an *ad hoc* approach and it could be used for short-term analysis, and in cases when data or information are missing. Another economist, of unquestionable merit, such as Gregory Chow, has consistently tried to bring theoretical and econometric evidence why the adaptive expectations hypothesis is still valid and could be used. We don't want to go into much depth but just to present some of Chow arguments (Chow, 2011) in support of adaptive expectation hypothesis. He showed that adaptive expectation hypothesis means that future observations (expectations) of a variable are a geometric mean of past observations with declining geometric weights. In his words, "The adaptive expectations hypothesis simply states that economic agents behave like good statisticians" (because they use the mean, by giving more weight to more recent past observations). He also used AE hypothesis with Taiwan data (Chow, 2014) and found this hypothesis valid. On the other side, the rational hypothesis supporters say that the rationality means taking into account changes in economic environment such as government policy and therefore parameters of econometric models built upon such an hypothesis are assumed constant over time. But, as Chow argues, (Chow, 2011), "by how much the parameters will change and to what extent government policies can be assumed to be decision rules rather than exogenous changes of a policy variable"? This means that in many instances changes in government policy do not have significant effects on economic

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

environment and in such cases the adaptive expectation hypothesis could be a good choice in forming expectations for specific variables. Again, Chow (1997) argues that econometric modeling based on RE hypothesis is not always valid; he used stock price data for Hong Kong and showed that RE hypothesis was not working, while AE hypothesis was successful. Shepherd also (2011) argues that AE hypothesis could be applicable when the data generating model is random walk with noise, and any model could be AE if certain conditions are met. Jan-OK (2003) argues that if the cost of gathering information is large (as required by RE hypothesis), then AE could be a good alternative to apply. Manitsaris (2006) used the AE hypothesis in a study to estimate the European Union Consumption function. I personally would also add an extra argument in favor of AE hypothesis; in cases when expectations are formed by individuals (single consumers or families), AE mechanism of expectations formations is more appropriate first because individuals have limited access to information. And if they do, they are not all able to use a complicated mechanism, sometimes using econometrics, such as RE hypothesis. On the other side, RE hypothesis could be used more effectively by institutions and organizations, which dispose much more technical capacities to use than single individuals.

Objective of the research:

In our research we aim at **assessing the relationship between two economic aggregates, income and household consumption**, **using AE hypothesis** and give an insight of how Albanian consumers form their expectations on. Further, we want to estimate short run and long run effects of income changes on household consumption in Albania.

II. METHOD AND DATA

We use the rationalization of the Koyck model, namely the **adaptive expectations model**, and the **partial adjustment model** for the variable **Household Consumption**.

Adaptive expectations consumption model

The adaptive expectation model in the context of Income-Consumption relationship might be short-run or longer run model is as follows: The long run consumption model:

$$\mathbf{Cons_t = a_0 + a_1 GNI_t^* + u}$$

Where GNI* is equilibrium, optimal, expected or long run income, so the long run income is unobserved. In this model, $\mathbf{a_1}$ is the mean change in Consumption when permanent (expected) income GNI* is increased by one. The adaptive expectation hypothesis could be written as follows:

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

$$GNI_t^* - GNI_{t-1}^* = \gamma(GNI_t - GNI_{t-1}^*)$$

Here, GNI_t^* is expected income at time **t**, GNI_{t-1}^* is expected income at time **(t-1)**, GNI_t is actual income at time **t**.

The above formula says that consumers adapt their expectations on income based on their past years experience; they suppose that increase in expected income over years is a fraction of the difference between the current value of income and the expected previous year income. After some algebraic manipulation, the adaptive expectation would result:

$$Cons_t = b_0 + b_1 GNI_t + b_2 Cons_{t-1} + e$$

Where b_0=a, b_1=be b_2=(1-γ)

Here γ is the coefficient of expectation, **0<γ<=1**. In this model the parameter in front of GNI_t is the mean change in Consumption when current income is increased by one unit.

Partial adjustment consumption model

If we assume that Consumption is unobserved, but GNI is known, the model describing relationship between Consumption and GNI would be:

$$Cons_t^* = c_0 + c_1 GNI_t + u_t$$

This is the *long run consumption function*. Here **Cons*** is the expected, or desired Consumption, so it is unobserved or unknown. The partial adjustment hypothesis is:

$$Cons_t - Cons_{t-1} = \delta(Cons_t^* - Cons_{t-1})$$

Where δ is the coefficient of adjustment, 0<δ<=1. The above equation says that Consumption is a fraction of desired change for a given period of time. If δ=1 then desired change is equal to actual change. Based on this hypothesis and after some algebra, we obtain the partial adjustment model:

$$Cons_t = d_0 + d_1 GNI_t + d_2 Cons_{t-1} + u_t$$

This is the short run consumption function, where d_0= δc_0, d_1= δc_1, d_2=1- δ. Interpretation of **δ** is similar to that of **γ** in the adaptive expectation model.

For more technical details about the AE and PA models see Gujarati (2004), Greene (2003), Wooldridge (2009), Osmani (2013), Stepien et al. (2006).

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

Data we used are secondary data on Gross National Income (GNI), and Household Final Consumption for Albania for the period 1996-2015. Data are presented in Table 1.

Table 1:Household final consumption expenditure Cons and National Income GNI in million ALL[1]

Year	GNI	*Cons*	Year	GNI	*Cons*
1996	334359	314054	2006	872735	673236
1997	331324	323507	2007	965528	784867
1998	384848	363085	2008	1080676	892776
1999	443594	382620	2009	1143937	918651
2000	501199	413162	2010	1239645	961912
2001	563449	438523	2011	1300624	1011826
2002	610494	486152	2012	1332811	1032478
2003	677738	541625	2013	1350053	1073609
2004	737656	566336	2014	1394419	1129915
2005	804163	615108	2015	1434740	1161195

Source: INSTAT, 2017

III. RESULTS

First, based on time series data as in table 1, we used EViews 9 to estimate the classical model of relationship between Income and Consumption (See table 2).

Table 2: Results of model estimation for the relationship between consumption and income

Dependent Variable: D(CONS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4538.077	11163.72	0.406502	0.6894
D(GNI)	0.691504	0.175768	3.934183	0.0011
R-squared	0.476565	Mean dependent variable		44586.37
Log likelihood	-214.0480	F-statistic		15.47780
Durbin-Watson stat	1.389092	Prob (F-statistic)		0.001069

D(CONS) = 4538.08 + 0.69*D(GNI)+e

There is a significant and positive relationship between the two variables. Marginal propensity to consume is 0.69 ALL.

[1] ALL=Albanian Lek (LEK is Albanian currency)

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

Then we estimated adaptive expectations and partial adjustment models. Basic results are as in table 3.

Table 3: Basic estimation results of the consumption model.

Dependent Variable: CONS				
Method: Least Squares				
Sample (adjusted): 2 20				
Included observations: 19 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	30538.71	12487.02	2.445636	0.0264
GNI	0.417846	0.110329	3.787270	0.0016
CONS(-1)	0.465517	0.146393	3.179902	0.0058
R-squared	0.995568	Mean dependent variable		724767.5
Adjusted R-squared	0.995014	S.D. dependent variable		288409.6
S.E. of regression	20364.91	Akaike info criterion		22.82495
Sum squared residuals	6.64E+09	Schwarz criterion		22.97408
Log likelihood	-213.8371	Hannan-Quinn criterion		22.85019
F-statistic	1797.083	Durbin-Watson stat		1.238284
Prob (F-statistic)	0.000000			

The **adaptive expectation model** looks:

$$\mathbf{CONS_t = 30538.7 + 0.4178*GNI_t + 0.466*CONS_{t-1}+e}$$

In short run, for an increase in income by one unit, consumption is expected to increase by 0.42 unit.

The coefficient of adjustment is:

$$\gamma=1-0.466=0.534$$

This coefficient tells us that the consumers adjust every year about 53% of the difference between actual and desired consumption.

$$a_0=30538.7/0.534=57188.7,\ \ a_1=0.4178/0.534=0.782$$

$$\mathbf{Cons_t=57188.7+0.782GNI_t*+e}$$

Consumers expect that in their future consumption for one unit extra of expected income to be much larger than it is actually.

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

To test usefulness of AE hypothesis we used the Chow's method. We estimate:

Table 4: Estimation results of the log autoregressive GNI model

Dependent Variable: D(LOG(GNI))				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.049153	0.018545	2.650403	0.0175
D(LOG(GNI(-1)))	0.406782	0.205436	1.980095	0.0652
R-squared	0.196818	Mean dependent variable		0.081425
Durbin-Watson stat	0.803423	Prob (F-statistic)		0.065158

$$\mathbf{D(LOG(GNI)) = 0.0491 + 0.407*D(LOG(GNI(-1)))}$$

We can easily find that current income is statistically dependent on past income level, which supports AE hypothesis.

The **partial short run adjustment model** formally looks the same:

$$\mathbf{CONS_t = 30538.7 + 0.4178*GNI_t + 0.466*CONS_{t-1}+e}$$

Where $d_0= \delta c_0=30538.7$, $d_1= \delta c_1=0.4178$, $d_2=1- \delta=0.466$. From these conditions we can calculate easily the parameters of the long run consumption:

$$\delta=1-0.466=0.534,\ c_0=57188.6,\ c_1=0.782$$

Finally the long run model would be:

$$\mathbf{Cons^*_t=57188.7+0.782GNI_t+e}$$

Coefficient of adjustment 0.534 tells that every year the increase in consumption is adjusted by 53% of the desired change. The coefficient 0.782 tells that in long run for one unit extra income the desired consumption will increase by 0.782 units.

IV. DISCUSSION

In literature, there is a debate about which model is more adequate in forming expectations, the AE including the PA model or the competitive RE model. It is true that the RE model is better as far as it takes into account more sources of information when economic agents form their expectations, not just past values of variables of interest. However, as economists argue, the AE and PA models perform well, as far as they have in their base the mean of the past values of variables. And the mean in itself is rational enough, because it tends to eliminate randomness and take into account key factors that have influenced values of variables in the past. It could be

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

more efficient if used for short to medium term expectations, because in such a case the chances of key environment factors to change are less probable. In any case, AE could be used at least to form proxy expectations, and in combination with RE model. In the Albanian context we believe that economic policy changes after election year 2013 have not affected key macroeconomic indicators; inflation, budget deficit and interest rates remain low and stabilized. Employment rates have changed not substantially and aggregate income growth is moderate. Under these conditions of not essential change in economic environment of the country it seems quite justified to use the AE or PA models for forming consumption, or income expectations.

As one could identify easily theoretically and by our results, for both AE and PA models we have the same parameters. But the underpinning hypothesis is different. The AE model analyses the actual change of consumption depending on expected income. Taking into account the adjustment coefficient, we can say that consumers adjust their income expectations by 53% of the difference between the current value of income and its previous expected value. The PA model analyses the expected change in consumption depending on current income. Every year, the increase of consumption in one year compared to the previous year, is adjusted by 53% of the desired consumption (consumption in one year compared to the expected of the previous year). So, if the question of which model to be used in a given case, it depends on the hypothesis that has been of interest in this case.

V. CONCLUSIONS

As it is expected on economic grounds, between household consumption and income in Albania there is a significant relationship. The classical model shows that for one unit increase in income (ALL) the consumption is expected to increase by 0.69 units (ALL), so in aggregate Albanians tend to consume about 70 percent of their income.

The AE model shows that there is a significant expectation forming process about income in Albania. The model shows that consumers each year adjust their income expectations by about 53 percent of the gap between current and last year's income expectation. The short run effect of expected income on consumption or short run marginal propensity to consume is about 0.41 ALL for each increase of one unit in expected income. The long run effect of expected income is about 0.782 ALL for one unit increase in income.

The PA model shows that there is also a significant expectation forming process about consumption in Albania. The model shows that actual change (between current and previous year) in consumption is as much as about 53 percent of the desired or expected consumption. This means that Albanian consumers might be very desperate as far as their hopes for more consumption are as much as half of what they have expected. The short run effect of actual

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

income on expected consumption or short run marginal propensity to expected consumption is about 0.41 ALL for each increase of one unit in actual income. The long run effect of income on expected consumption is about 0.782 ALL for one unit increase in income.

As for which model to choose, we believe that each model has its own merit. If our focus is more on income expectations we use the AE model; if the focus is on consumption expectations, we rely on PA model. Both models in our case provide useful information about how are Albanian consumers form their income or consumption expectations and how much is the amount of adjustment. These results could serve also as a proxy for the quality of policy in Albania as far as consumers' expectations are so far from being accomplished.

VI. REFERENCES

1) Cagan, P., (1956). The monetary Dynamics of Hyperinflations, in Studies in the Quantity Theory of Money, University of Chicago Press.
2) Chow, C.G. (2011). Usefulness of Adaptive and Rational Expectations in Economics, CEPS WP No. 221, September 2011, https://www.princeton.edu/ceps/workingpapers/221chow.pdf
3) Chow, C. G. (2014). Formation of expectations in econometric models, http://www.slideserve.com/isi/formations-of-expectations-in-econometric-models
4) Chow, C. G. (1997). Rational expectations is not generally valid for econometric models: evidence for stock market data, Pacific Economic Review, 2:3 (1997)
5) Dornbusch, R., Fischer, S. (1994). Macroeconomics, 6th edition, pp 307-313
6) Ewans, G. Ramey, G. (2001a). Adaptive expectations, underparametrization and the Lucas Critique, Journal of Monetary Economics, Volume 53 Issue 2, 2006
7) Evans, G. W., S. Honkapohja (2001b). Learning and Expectations in Macroeconomics Princeton University Press.
8) EViews 9 User's Guide
9) Friedman, M., A. (1957). Theory of the Consumption Function, National Bureau of Economic Research, Princeton University Press, 1957
10) Gertchev, N. (2007). A critique of Adaptive and Rational Expectations, in Quarterly Journal of Austrian Economics, Volume 10, 2007, Doi 10.1007/s 12113-007-9023-1
11) Gordon, R.J., (1987). Macroeconomics, fourth edition, pp 482-486
12) Greene, W.H. (2003). Econometric Analysis, 5th edition, Pearson Education LTD, 2003 pp 558, 567, 865, 904
13) Gujarati, D.N. (2004). Basic Econometrics, Third edition, 1995, McGraw-Hill, Inc., USA
14) Jang-Ok Cho (2003).The Role of Expectation Formation In a Real Business Cycle Model, http://www.bm.ust.hk/~ced/adaptive.pdf

ISSN: 2455-8834

Volume:02, Issue:10 "October 2017"

15) Keynes, J. M. (1936). The General Theory of Employment, Interest and Money, Basingstoke, Hampshire: Palgrave Macmillan
16) Manitsaris, A. (2006). Estimating the European Union Consumption Function under the Permanent Income Hypothesis, International Research Journal of Finance and Economics, 2006
17) Mankiw, G.N., (2010) Macroeconomics, 7th edition, Worth Publisher, USA, pp 514-516
18) Mlambo, L. (2012). Adaptive and Rational Expectations Hypotheses: reviewing the critiques, Journal of Economic behavior, No 2, 2012
19) Osmani, M. (2013). Econometric Methods, with EViews, Maluka Publishing House, Tirana
20) Shepherd, B. (2011). When are adaptive expectations rational? A generalization, Economics Letters 115 (2012) 4–6, journal homepage: www.elsevier.com/locate/ecolet
21) Snowdon, B., Vane, H.R. (2005). Modern Macroeconomics, Edward Elgar Publishing, Inc., 180-181, 227, 225-230
22) Stępień, M., Tijus. C. (2006). Adaptive Expectations & Partial Adjustment Models, http://www.slideserve.com/lucita/adaptive-expectations-partial-adjustment-models-presented-prepared-by-marta-stepien-and-cinnie-tijus
23) Wooldridge, J.M.(2009). Introductory Econometrics, A modern Approach, South-Western Cengage Learning, 2009 pp 16-17, 387-388.

