

THE VALIDITY OF PPP IN THE DAIRY SECTOR AND THE ROLE OF MACROECONOMIC VARIABLES: CASE OF GREECE

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Abstract

The present paper investigates the validity of PPP (Taylor and Taylor, 2004; Zafeiriou et al, 2006) and the role of the macroeconomic variables in the formation of prices in dairy products in the Greek market. The macroeconomic variables used in the present paper are the differences between the inflation rates of Greece and U.S.A., as well as the differences in the short – term interest rates between the two countries. In addition we employed another variable representing the openness of the dairy market in Greece, while the role of CAP was examined with the use of a dummy variable. In the first step we surveyed the validity of PPP for the case of Greece and then we examined the role of the macroeconomic variables in the validity or to the non validity of PPP for the commodity price index studied. The method applied for the study of the long – run relationship is the Johansen cointegration technique (1988, 1991). According to the results of our survey, one and sole relationship was validated, between the real exchange rates and the macroeconomic variables used. This result implies that in the long run there is a relationship among these variables, while only the real exchange rates and the interest rates difference affect the inflation rates differential in the long run as confirmed with the estimation of VECM

Keywords: PPP, Cointegration, Macroeconomic Variables, VECM.

1. Introduction

In European Union, the market of dairy products has been strongly affected by CAP. The CAP is characterized by complexity, while it is expressed by price support programs or subsidies. What must be mentioned is the realization of three major reforms leading to remarkable changes in the subsidy policy of dairy production. The first reform (the MacSharry reform), took place in 1992 that led to a movement from price support to direct farm payments which is based on the area farmed and livestock kept. As a result the intervention prices for dairy reduced products by 7.5% (Former et al, 1995). The second reform, Agenda 2000, expanded the shifts towards direct payments. Intervention prices for butter and milk powder were reduced by 15%, starting in 2005 (Benjamin et al, 1999). The cuts were compensated by the introduction of yearly direct payments in the form of a dairy premium and additional payments such as "top-up" premium and area payment. In 2003, the Fischler reform further weakened the link between subsidies and production. Relative to Agenda 2000, the intervention price cuts were brought forward one year, and the intervention price for butter was further reduced by 10%. In exchange, the compensation payments were increased. In short, the various CAP reforms have undergone a long process from price support, to the production-related subsidies, and eventually to the decoupled payments (Swinbank and Daugberg, 2006).

The market of dairy products in Greece has been thoroughly studied in the past. In particular, the formation of the prices in the dairy sector has been interpreted with the PPP theory and other models. According to the PPP theory the prices of similar products expressed in the domestic currency are the same. The prices of dairy products are formed within an economic environment affected by the Common Agricultural Policy. The present paper studies the validity of PPP in the long run and also surveys the relationship between the real exchange rate based on the prices of the dairy products in Greece, the difference of the interest rates between domestic and the foreign country, the difference of the inflation rates between the two countries and finally an index that expresses the openness of the market of the dairy products in the economy, under preview.

2. Data – Methodology

The time period used in the present study extends from 1.1996-12-2006 while it involves monthly data. The first step in the methodology employed is the application of stationarity test for every variable used. In particular, the KPSS test was applied, and the results of this test are given in Table 1. According to the

results all the variables employed in our study are integrated of order 1 (I(1)) with exception the nominal exchange rates that is integrated of order zero (I(0)).

Table 1 Results of KPSS stationarity test for all the variables used

Μεταβλητή	Έλεγχος KPSS
dp	1.096546
D(dp)	0.0243
dr	0.993264
D(dr)	0.424790
nxd	1.013846
D(nxd)	0.182812
pd	1.365434
D(pd)	0.090950
Pd*	0.486418
D(pd*)	0.35570
S	0.317513
D(S)	

Note: The critical values of the test are 0.739000, 0.463000, 0.347000 for 1, 5 και 10% significance levels in levels and 0.739000, 0.463000, 0.347000 for the first differences respectively.

*Dp = p-p**; denotes the inflation rates difference between the two countries used.

*Dr = r-r**; denotes the difference in the interest rates between the two countries used

nxd; denotes an index describing the openness of the dairy Greek market

pd; denotes the consumer domestic price index for the dairy products.

*Pd**; denotes the consumer foreign price index for the dairy products

S; denotes the nominal exchange rates

The next step in our study involves the estimation of the cointegration rank with the application of the Johansen technique (1988). The results of this application are given in the next Table 2.

Table 2.1 Results of Johansen cointegration technique (trace test)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.211038	38.34258	29.79707	0.0041
At most 1	0.093274	13.45364	15.49471	0.0992
At most 2	0.029763	3.172578	3.841466	0.0749

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Table 2.2 Results of Johansen cointegration technique (maximum likelihood test)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.211038	24.88894	21.13162	0.0141
At most 1	0.093274	10.28107	14.26460	0.1941
At most 2	0.029763	3.172578	3.841466	0.0749

Maximum likelihood indicates 1 cointegrating eqn(s) at the 0.05 level

According to the results both tests indicate the existence of a sole relationship and consequently indicating the validity of PPP in the long run. In this test we used as exogenous variables the macroeconomic variables mentioned above.

The next step in our study includes finding the rank of cointegration.

Table 3.1 Results of Johansen cointegration technique (trace test)

Hypothesized		Trace	5 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value
None **	0.416551	72.00247	29.68

At most 1 *	0.100306	15.96746	15.41
At most 2 *	0.046707	4.974643	3.76

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Table 3.2 Results of Johansen cointegration technique (maximum likelihood test)

Hypothesized		Max-Eigen	5 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value
None **	0.416551	56.03501	20.97
At most 1	0.100306	10.99282	14.07
At most 2 *	0.046707	4.974643	3.76

Maximum likelihood indicates 1 cointegrating eqn(s) at the 0.05 level

According to the results given above one relationship is confirmed for all the variables used, and consequently a sole relationship is valid in the long run. The macroeconomic variables affect the real exchange rate that is based on the consumer prices of the dairy products.

The relationship is given by the following cointegrating vector after normalizing the coefficient of the real exchange rate;

$$\text{QGREED} - 1.332222 \text{ DP} + 0.062465 \text{ DR} \\ (0.16032) \quad (0.03684)$$

According to the estimated vector the sign of the inflation rate differential is reverse related to the real exchange rate and consequently an increase in the domestic inflation rate implies a decrease in the real exchange rate. A positive sign is confirmed for the coefficient of the interest rates. An increase in the interest rates differential is positively related to the real exchange rates.

The next steps involve the estimation of the Vector Error Correction Models, and are given in the next Table 4;

Table 4 The estimated vector error correction model

Error Correction:	D(QGREED)	D(DP)	D(DR)
CointEq1	0.000624	-0.223439	0.004519
	(0.00082)	(0.02838)	(0.01293)
	[0.75934]	[-7.87231]	[0.34953]
D(QGREED(-1))	0.377070	1.676366	-3.645689
	(0.09943)	(3.43380)	(1.56401)
	[3.79225]	[0.48819]	[-2.33099]
D(QGREED(-2))	-0.177883	3.382378	0.042601
	(0.10217)	(3.52825)	(1.60703)
	[-1.74111]	[0.95866]	[0.02651]
D(DP(-1))	0.001387	0.507656	0.037366
	(0.00370)	(0.12786)	(0.05823)
	[0.37456]	[3.97054]	[0.64165]
D(QGREED(-1))	0.377070	1.676366	-3.645689
	(0.09943)	(3.43380)	(1.56401)
	[3.79225]	[0.48819]	[-2.33099]
D(QGREED(-2))	-0.177883	3.382378	0.042601
	(0.10217)	(3.52825)	(1.60703)
	[-1.74111]	[0.95866]	[0.02651]
D(DP(-1))	0.001387	0.507656	0.037366
	(0.00370)	(0.12786)	(0.05823)
	[0.37456]	[3.97054]	[0.64165]
D(DP(-2))	0.001824	0.091936	-0.011448
	(0.00290)	(0.10008)	(0.04558)
	[0.62946]	[0.91865]	[-0.25114]
D(DR(-1))	-0.004977	-0.221960	0.333244
	(0.00656)	(0.22662)	(0.10322)
	[-0.75845]	[-0.97943]	[3.22848]

D(DR(-2))	-0.013525	0.167959	-0.039613
	(0.00630)	(0.21748)	(0.09906)
	[-2.14764]	[0.77228]	[-0.39990]
C	-0.001705	0.002663	-0.058132
	(0.00270)	(0.09314)	(0.04242)
	[-0.63202]	[0.02859]	[-1.37029]
R-squared	0.208586	0.596649	0.172648
Adj. R-squared	0.150879	0.567238	0.112321
Sum sq. resids	0.068494	81.68692	16.94649
S.E. equation	0.026711	0.922445	0.420150
F-statistic	3.614562	20.28656	2.861843
Log likelihood	233.3515	-135.0118	-53.22444
Akaike AIC	-4.333682	2.750226	1.177393
Schwarz SC	-4.130268	2.953641	1.380808
Mean dependent	-0.000140	-0.002115	-0.083077
S.D. dependent	0.028987	1.402219	0.445940

According to the results given above, the error correction term is significant and negative only in the case the first differences of the inflation rate difference is the dependent variable, implying that the other two variables affect only the inflation rate difference while the opposite is not confirmed. Consequently, the real exchange rate based on the consumer price index of the dairy products is not Granger caused by the other two variables. This result means that the deviation from PPP as expressed by the real exchange rate cannot be attributed to the differences in the macroeconomic variables of the two countries studied.

3. Impulse – Response analysis

The next step in our study involves an impulse response analysis for the three endogenous variables used. The time reference used for this analysis is ten periods time (ten months, given that our data are monthly). According to the results presented in figure 1, we can conclude the following;

An innovation in the real exchange rate based on dairy products does not affect the inflation rate differential between the two countries. On the other hand, in the long term such a change does affect significantly after six period's time the interest rates differential. Furthermore, a one s.d. innovation in the inflation rates differential also affects slightly both the other variables. To be more specific, the real exchange rates are increasing within ten periods' time, while the interest rates differentials appear an sharp decrease within a two periods' time and then balancing change are observed. Finally, a change in the interest rate differential implies a similar decreasing trend for both the other variables that is the real exchange rates, and the inflation rates differential.

4. Conclusion

The particular study presents an effort to examine the role of macroeconomic variables to the deviation from PPP as expressed by the real exchange rates. The macroeconomic variables are the inflation rates differential, as well as the interest rate differential. We tried by choosing those two variables to embody the uncovered interest parity as well as the quantity theory of money to the deviation from PPP. According to the results of the particular analysis and with the application of the Johansen cointegration technique we confirmed the existence of a sole relationship in the long run between the real exchange rates and the macroeconomic variables employed. Furthermore, according to the estimated VECM, the error correction term is statistically significant and with negative sign in the case where the first difference of the inflation rates differential is the dependent variable implying a one way relationship from the other two variables to the one under preview. Finally, the impulse response analysis has shown that a one standard deviation innovation of DP leads to opposite reactions of the other two variables within a ten periods' time, while a similar response was observed to a one s.d. innovation of DR to the other two variables.

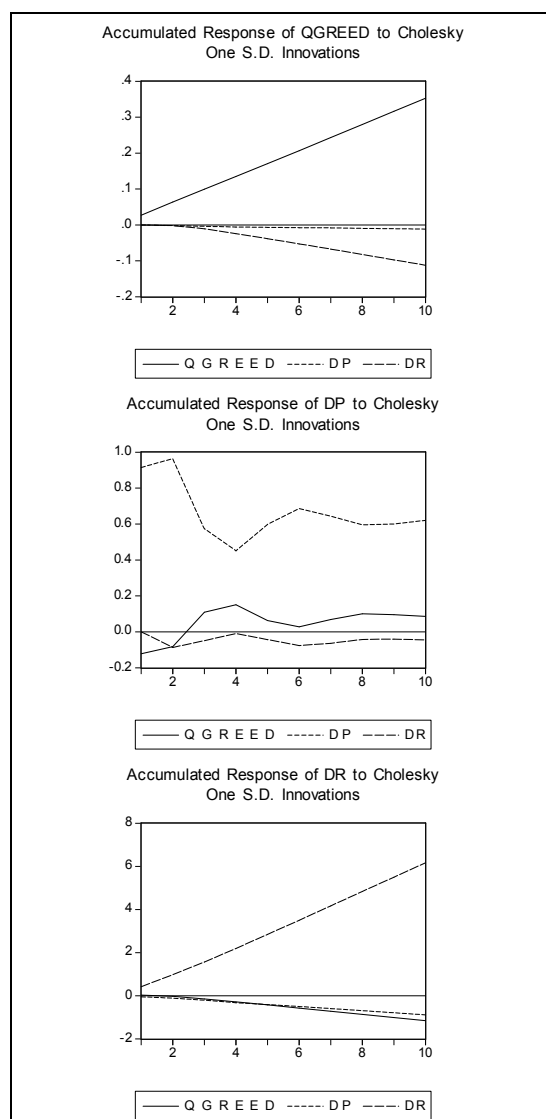


Figure 1: Impulse – Responses for a medium – run period of the three endogenous variables used (q, dp, dr).

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