Linking consumer prices to wholesale prices: Error correction models for the case of Greece

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Abstract

The purpose of this paper is to investigate and measure the proportion of changes in wholesale prices transferred to consumer prices in the economy of Greece. The data used in the investigation are monthly, covering the period from 1973:1 to 2000:11, and refer to consumer price indexes and finished products wholesale price indexes. Cointegration methods are used in order to investigate the cost transfer from wholesale prices to consumer prices, or in other words to test the existence or not of a long-term equilibrium relationship between the two prices. The paper concludes that long-term relationships exist between the two prices and thus, error correction models (ECM) are developed and estimated using the Seemingly Unrelated Regression Estimation (SURE) method. Multipliers, estimated using dynamic simulation of the ECM group of equations, indicate the sensitivity of consumer prices to changes in wholesale prices.

Keywords: *Consumer prices, wholesale prices, stationarity, cointegration, error correction models, dynamic simulation, multipliers, Greece.*

Introduction

The main factors in the process of product price determination have been well understood since the 50s. These may be categorized into two groups; domestic factors and external factors. The major domestic factor is the pressure of demand on supplies of labour and the other factors of production. When demand is high relative to supply there will be upward pressure on wages and income margins of the other factors of production. However, higher wages and/or income margins mean higher costs of production, which lead to higher product prices. Consequently, higher product prices affect wages and at the whole process the pressure of a wage-price spiral is added (Kennedy, 1996).

The major external factor is the influence of import prices on product prices. With import prices accounting in an open economy for a large part of total final expenditure and an even larger part of total variable costs of production, any rise in import prices will find its way into final product prices both directly, and through its effect on production costs. However, with imports that are in competition with domestic production, the effects may not be so drastic, since demand will switch to domestic products (Kennedy, 1996).

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The two major factors stated emphasise the side of the cost of production in the process of product price determination. However, the price of a product follows a chain of cost increments before it reaches the market. We could say that the first increment is the margin between producer's price and wholesaler's price, and the second increment is the margin from wholesaler's price to consumer's price. The purpose of this paper is to investigate the second increment. Specifically, the purpose of the paper is to investigate and measure the proportion of changes in wholesale prices that are transferred to consumer prices in the economy of Greece. Thus the major hypothesis to be tested is the following:

H_0: Changes in wholesale prices are all transferred to consumer prices. In other words, there exists a long-term equilibrium relationship between wholesale prices and consumer prices.

Section 2, employing the Augmented Dickey-Fuller (ADF) tests, investigates the non-stationarity of the data used. Two-variable cointegration analysis, employing the Engle-Granger approach, between the various consumer price indexes and the wholesale price index, is presented in section 3. The statistical estimates of the Error Correction Models (ECM) and discussion of the meaning of these estimates is presented in section 4. Section 5 presents the results of the sensitivity analysis of the estimates and finally, section 6 presents the conclusions and policy implications of the study. All estimates have been carried out using EViews 3.1.

Data stationarity tests

The data used in the analysis are monthly, cover the period from 1973:01 to 2000:11 and are taken from various issues of the Monthly Statistical Bulletin of Greece (NSSG, 2001). Employing 1990 as base year, the identification of the 11 variables used is the following:

CPI1 = Consumer price index, food
CPI2 = Consumer price index, alcoholic drinks and tobacco
CPI3 = Consumer price index, clothing and footwear
CPI4 = Consumer price index, housing
CPI5 = Consumer price index, durable and consumption goods
CPI6 = Consumer price index, health and personal care
CPI7 = Consumer price index, education and recreation
CPI8 = Consumer price index, transport and communication
CPI9 = Consumer price index, other goods and services
CPI = Consumer price index, general
WPI = Wholesale price index, overall final demand of finished goods

Specifically, the wholesale price index (WPI) covers the following product elements:

Finished products of local primary production for home consumption.
Finished products of local industrial production for home consumption.
Exported products of local primary and industrial production.
Finished products of foreign origin.

In examining the stationarity of these variables we used the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests as shown in Table 1 (Dickey and Fuller, 1979 and 1981; Dickey and Pantula, 1987; Dickey *et al,* 1984). The exact methodology followed is as follows (Seddighi *et al,* 2000): In order to find the proper structure of the ADF equations, in terms of the inclusion in the equations of an intercept and a trend, and in terms of how many extra augmented lagged terms to include in the ADF equations, for eliminating possible autocorrelation in the disturbances, the usual Akaikes's (1973) information criterion (AIC) and Schwartz's (1978) criterion (SC) were employed. The minimum values of AIC and SC indicated the 'best' structure of the ADF equations. With respect to testing autocorrelation in the disturbances, the usual Breusch (1978) and Godfrey (1978), or Lagrange multiplier LM (1), test was used.

Table 1. ADF unit root tests for price indexes

Variables	*in levels*			*in 1st differences*		
	Lag	*DF/ADF**	*LM(1)***	*Lag*	*DF/ADF*	*LM(1)*
CPI1	1	-2.0655	1.16 [0.28]	1	-12.9570	1.74 [0.19]
CPI2	1	-1.1105	0.22 [0.64]	1	-12.0883	1.11 [0.29]
CPI3	0	-2.8460	0.04 [0.84]	1	-20.5831	4.99 [0.03]
CPI4	1	-1.4519	2.53 [0.11]	1	-11.7033	2.03 [0.15]
CPI5	1	-2.2402	2.15 [0.14]	1	-20.0666	1.96 [0.16]
CPI6	1	-2.1660	0.30 [0.58]	1	-13.1780	0.00 [0.97]
CPI7	1	-2.2054	0.08 [0.78]	1	-18.3806	0.01 [0.92]
CPI8	1	-1.9707	0.00 [0.99]	0	-14.7151	0.01 [0.94]
CPI9	2	-2.3122	1.73 [0.19]	1	-19.7745	1.24 [0.27]
CPI	2	-2.4320	0.01 [0.91]	1	-18.0487	0.13 [0.72]
WPI	2	-2.2448	0.01 [0.98]	1	-12.4500	0.09 [0.76]

* Critical values: -3.99 (1%); -3.42 (5%); -3.13 (10%).
* Numbers in brackets indicate significant levels.

The minimum values of the AIC and SC statistics indicated that the 'best' ADF equations were those including an intercept and trend and the corresponding numbers of lagged terms used are shown in Table 1 under the heading 'Lag'. For all variables, apart CPI3 in 1st differences, the LM(1) test shows that there is no serial correlation in the disturbances. The DF/ADF statistics in Table 1 show that all the variables are non-stationary. However, these statistics show that all the first differenced variables are stationary. In other words all variables in Table 1 are integrated of order one, i.e. they are I(1).

Cointegration tests

We said in section 1 that the main hypothesis to be tested is that changes in the wholesale prices are all transferred to the consumer prices. In statistical terms this means that the wholesale price index and the consumer price indexes drift together, although individually these time series are non-stationary in the sense that they tend upwards or downwards overtime. This common drifting of variables makes linear relationships between these variables exist over long periods of time, thereby giving thus insight into long-term equilibrium relationships of these variables. In other words, if these linear relationships do hold over long periods of time wholesale prices and consumer prices are cointegrated; if these linear relationships do not hold over long periods of time wholesale prices and consumer prices are not cointegrated.

Similarly, Loizou *et al* (1997) following the cointegration approach examined the existence of cointegration between the index of prices paid and the index of prices received by Greek farmers. The existence of cointegration between the two time series means that a cost-price squeeze does not exist because the two variables follow an equilibrium path in the long run. The case of non-cointegration of prices paid and prices received by Greek farmers indicates that a cost-prise squeeze it does exist.

In order to test if the integrated of order one wholesale price index is cointegrated with each one of the integrated of order one consumer price indexes individually, the Engle-Granger (EG) test, and/or the Augmented Engle-Granger (AEG) test (1987), will be used. In the two variable cointegration case, as it is in this paper, the EG/AEG approach is preferable due to its simplicity. The steps we employed are the following:

Initially, because the two variables are I(1), we estimated with OLS the long-run equilibrium equation, or cointegrating regression,

$$CPIJ_t = \beta_0 + \beta_1 WPI_t + \varepsilon_t \qquad (1)$$

where $J = 1, 2, \ldots, 9$. Table 2 presents the results of the consistent estimates of the true cointegrating vectors, although this is not true for the estimated standard errors of these vectors. From these estimates, we obtained the corresponding disturbances, or the equilibrium errors, e_{jt}.

Table 2. Cointegrating regressions

Dependent Variable	*Constant*	*WPI*	R^2
CPI1	-6.541	1.102	0.995
CPI2	-21.870	1.502	0.968
CPI3	-10.329	1.077	0.988
CPI4	-9.817	1.206	0.989
CPI5	-2.188	0.977	0.997
CPI6	-9.922	1.220	0.992
CPI7	-12.903	1.265	0.987
CPI8	-4.557	1.135	0.992
CPI9	-10.989	1.214	0.991
CPI	-8.792	1.156	0.994

For the two variables to be cointegrated the equilibrium errors must be stationary. To test this stationarity we applied the DF/ADF unit root methodology to the estimated equilibrium errors. However, the DF/ADF equations did not include a constant term, because by construction the OLS residuals e_{jt} are centred around zero. The critical values reported in Table 1 are not appropriate for this case. MacKinnon (1991) presented critical values for these tests, stated in Table 3, which are even more negative than the usual Dickey-Fuller critical values. This is because the estimates in the DF/ADF equations are downward biased, due to the fact that by construction the OLS methodology seeks to produce stationary residuals e_t. The results in Table 3 have been constructed similarly to the results presented in Table 1.

Table 3. ADF unit root tests for equilibrium errors

Variables	*in levels*			*in 1st differences*		
	Lag	*DF/ADF**	*LM(1)***	*Lag*	*DF/ADF*	*LM(1)*
e1	0	-2.6354	0.00 [0.99]	0	-19.0395	0.64 [0.42]
e2	0	-1.2500	0.57 [0.45]	1	-13.8559	2.24 [0.13]
e3	0	-2.3705	4.14 [0.04]	1	-20.7450	1.29 [0.26]
e4	1	-2.6370	1.97 [0.16]	1	-11.0636	1.32 [0.25]
e5	1	-0.9117	1.94 [0.16]	1	-20.7578	0.00 [0.99]
e6	1	-1.6636	0.16 [0.69]	0	-20.8590	0.31 [0.58]
e7	0	-1.9759	1.72 [0.19]	0	-19.8028	6.83 [0.01]
e8	1	-1.5536	0.67 [0.41]	0	-15.9477	1.05 [0.30]
e9	1	-1.6035	1.55 [0.46]	1	-17.5895	1.23 [0.54]

* Critical values: -4.30 (1%); -3.74 (5%); -3.45 (10%).
* Numbers in brackets indicate significant levels.

For all variables, apart e3 in levels and e7 in 1st differences, the LM(1) test shows that there is no serial correlation in the disturbances. The DF/ADF statistics in Table 3 show that all the residuals are non-stationary. However, these statistics show that all the first differenced residuals are stationary. In other words all residuals in Table 3 are integrated of order one, i.e. they are I(1). This means that the initial variables included in the cointegrating regressions, i.e. the consumer price indexes and the wholesale price index, are cointegrated. In other words the hypothesis stated in this paper in true.

Error correction models

According to the Granger (1986) representation theorem if two variables are cointegrated then there is a long-run relationship between them. Of course, in the short run these variables may be in disequilibrium, with the disturbances being the equilibrating error. The dynamics of this short-run disequilibrium relationship between these two variables can always be described by an error correction model (ECM). For our case, this error correction model which connects the short-run and the long-run behaviour of the two variables is given by

$$\Delta CPIJ_t = lagged(\Delta CPIJ_t, \Delta WPI_t) + \lambda e_{t-1} + v_t \quad , \; -1 < \lambda < 0 \qquad (2)$$

where λ = short-term adjustment coefficient. Because all the variables (in differences) included in equation (2) are stationary we could use the OLS methodology in estimating this equation. However, because we have nine such similar equations, this group of equations represents a typical Seemingly Unrelated Regression Estimation (SURE) model. To support our thesis the Breusch and Pagan (1980) Lagrange multiplier statistic, LM, was calculated in order to test for the null hypothesis that all covariances of the disturbance terms are zero. It was found that LM = 913.6 which is much greater than the critical value of $\chi^2(36) = 51.0$, meaning thus, that it is worth employing the SURE methodology.

After experimentation, the corresponding to equation (2) error correction equations are the following,

Δ(CPI1) = C(10) + C(11)*Δ(CPI1(-2)) + C(12)*Δ(WPI) + C(13)*E1(-1) (3)

Δ(CPI2) = C(20) + C(21)*Δ(CPI2(-1)) + C(22)*Δ(WPI) + C(23)*E2(-1) (4)

Δ(CPI3) = C(30) + C(31)*Δ(CPI3(-1)) + C(32)*Δ(WPI) + C(33)*E3(-1) (5)

Δ(CPI4) = C(40) + C(41)*Δ(CPI4(-1)) + C(42)*Δ(WPI) + C(43)*E4(-1) (6)

Δ(CPI5) = C(50) + C(51)*Δ(CPI5(-5)) + C(52)*Δ(WPI) + C(53)*E5(-1) (7)

Δ(CPI6) = C(60) + C(61)*Δ(CPI6(-4)) + C(62)*Δ(WPI) + C(63)*E6(-1) (8)

Δ(CPI7) = C(70) + C(71)*Δ(CPI7(-4)) + C(72)*Δ(WPI) + C(73)*E7(-1) (9)

Δ(CPI8) = C(80) + C(81)*Δ(CPI8(-1)) + C(82)*Δ(WPI) + C(83)*E8(-1) (10)

Δ(CPI9) = C(90) + C(91)*Δ(CPI9(-4)) + C(92)*Δ(WPI) + C(93)*E9(-1) (11)

where C(ji), for j=1, 2, …, 9 and i=0, 1, 2, 3, are the coefficients to be estimated. Table 4 presents the results of estimation of this group of error correction equations using the SURE methodology.

In Table 4 the statistics RC and DC refer to the regression coefficient and the determination coefficient, corresponding to the regression of the predicted variables – derived from the dynamic simulation of the group of the ECM equations - on the actual variables.

Combining the specification of the ECM equations (3)-(11) and the corresponding results presented in Table 4, we conclude as follows:

1) In all equations ΔWPI enters with no lag. This is acceptable because ΔWPI is stationary (Seddighi *et al,* 2000) and means that any change in WPI is simultaneously transferred to ΔCPIs.
2) The estimated coefficients of ΔWPI have the positive expected sign in all equations and they are all very significant, indicating the importance of wholesale prices in determining consumer prices.
3) In the various equations ΔCPI enters with various lags indicating thus the different dynamic history of each of the consumer prices. Lags range from one month to five months and thus producing a dynamic spiral.

4) The estimated coefficients of lagged ΔCPI have the positive expected sign in all equations but they are not all significant. Specifically, in three equations (CPI1, CPI3 and CPI5) the estimated coefficients are not significant.

Table 4. Error correction models: SURE results

	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*	R^2	*DW*	*RC*	*DC*
C(10)	0.014399	0.117981	0.122042	0.9029				
C(11)	0.050365	0.045670	1.102813	0.2702				
C(12)	0.942564	0.114608	8.224281	0.0000				
C(13)	-0.054190	0.018255	-2.968491	0.0030	0.21	2.01	1.013	0.996
C(20)	0.530971	0.153674	3.455181	0.0006				
C(21)	0.188214	0.050869	3.699971	0.0002				
C(22)	0.338797	0.152345	2.223882	0.0262				
C(23)	-0.017361	0.006741	-2.575451	0.0101	0.08	2.11	1.171	0.984
C(30)	0.074576	0.364090	0.204829	0.8377				
C(31)	0.014194	0.033549	0.423092	0.6723				
C(32)	0.959302	0.366007	2.620995	0.0088				
C(33)	-0.178888	0.029495	-6.065051	0.0000	0.16	2.03	1.006	0.989
C(40)	0.263871	0.106356	2.481018	0.0132				
C(41)	0.226499	0.047025	4.816524	0.0000				
C(42)	0.487309	0.100311	4.857969	0.0000				
C(43)	-0.038943	0.009781	-3.981527	0.0001	0.19	1.83	1.045	0.993
C(50)	0.050621	0.161632	0.313185	0.7542				
C(51)	0.010992	0.029581	0.371589	0.7102				
C(52)	0.851492	0.160204	5.315032	0.0000				
C(53)	-0.153080	0.023681	-6.464335	0.0000	0.19	2.07	1.005	0.997
C(60)	0.422559	0.086485	4.885899	0.0000				
C(61)	0.124330	0.046239	2.688845	0.0072				
C(62)	0.342631	0.081848	4.186195	0.0000				
C(63)	-0.037479	0.008275	-4.529322	0.0000	0.13	2.16	1.072	0.997
C(70)	0.343256	0.123601	2.777123	0.0055				
C(71)	0.081327	0.044411	1.831230	0.0672				
C(72)	0.556582	0.122804	4.532286	0.0000				
C(73)	-0.032221	0.009198	-3.503113	0.0005	0.10	2.23	1.073	0.995
C(80)	0.143962	0.084938	1.694894	0.0902				
C(81)	0.161304	0.046942	3.436250	0.0006				
C(82)	0.642208	0.082711	7.764520	0.0000				
C(83)	-0.021898	0.009654	-2.268233	0.0234	0.23	2.03	1.057	0.992
C(90)	0.359549	0.117477	3.060578	0.0022				
C(91)	0.201658	0.048193	4.184396	0.0000				
C(92)	0.365738	0.115166	3.175755	0.0015				
C(93)	-0.035418	0.011250	-3.148386	0.0017	0.11	2.35	1.064	0.997

5) In all equations the estimated short-term adjustment coefficients, λ, have the negative expected signs and they are all very significant. These coefficients range from -0.02, for CPI2, to -0.18, for CPI3, showing the part of the deviation of the actual variable from its long-run equilibrium level that is corrected each month.
6) In general terms, the various statistics, together with the statistics of adequacy of predictions RC and DC, indicate that the estimated equations can be used for predictions and/or sensitivity analysis.

Sensitivity analysis

In order to examine how sensitive are the various consumer price indexes to changes in the wholesale price index, the dynamic multipliers for a 1% increase in the WPI have been estimated. Although the behaviour of all the multipliers is rather similar, the strength of the phenomenon is different in most of them. Specifically, all the multipliers reach their maximum value in the first month of the 1% shock in the WPI variable and then smoothly decrease towards their equilibrium value. This is because there is no any lag in the WPI in the main body of the ECM equations and furthermore WPI enters the equilibrium error with one lag. Due to the appearance of the consumer price indexes as lagged dependent variables in all equations the price spiral which is created contributes to the smooth decrease of the multipliers towards their equilibrium values.

Table 5 presents relevant with the estimated multipliers information. It is seen, for example, that with respect to the max value, the multipliers of CPI3, CPI1 and CPI5 are the most sensitive and the multipliers of CPI9, CPI6 and CPI2 are the least sensitive. Similarly, with respect to the 12 month mean value, the multipliers of CPI3, CPI5 and CPI1 are the most sensitive and the multipliers of CPI9, CPI6 and CPI2 are the least sensitive. In the last column of Table 5 we have calculated the shock which is necessary on WPI to ensure a 1% cumulative increase in the level of CPIs for one year. The main advantage of this method is to allow a comparison of alternative shocks having equivalent effects on the CPIs. The drawback is that it provides no assessment concerning the feasibility of these shocks in terms of economic policy (Catinat *et al.,* 1987). It is seen, for

Table 5. Results from dynamic multipliers

Variables	*Max value*	*12 months mean*	*Shocks*
CPI1	0.887	0.082	1.016
CPI2	0.250	0.039	2.136
CPI3	0.938	0.087	0.958
CPI4	0.424	0.063	1.323
CPI5	0.884	0.083	1.004
CPI6	0.296	0.050	1.667
CPI7	0.470	0.057	1.462
CPI8	0.588	0.065	1.282
CPI9	0.319	0.054	1.543

example in the last column of Table 5, that in order for CPI3 to cumulatively increase by 1% in one year, WPI must increase by 2.136% in the first month. This means that CPI3 is the least sensitive of all the variables with respect to changes in WPI.

Conclusions

The purpose of this paper was to investigate the role of wholesale prices in determining consumer prices in the Greek economy and to measure its influence in a 12 month period.

For this purpose cointegration analysis was used in order to investigate the cost transfer from wholesale prices to consumer prices and in this respect the paper concluded that a long-term equilibrium relationship exists between the two prices supporting thus the hypothesis of the study. Consequently, error correction models were developed and estimated employing the SURE methodology. The econometric results were relatively very good for all equations. In all cases the variables were generally significant and the signs were the expected ones. In terms of the estimated short-term adjustment coefficients, which show the part of the deviation of the actual variable from its long-run equilibrium level that is corrected each month, the indexes of "clothing and footwear", "durable and consumption goods" and "food", indicated the largest monthly adjustment, the indexes of "housing", "health and personal care", and "other goods and services", indicated a moderate monthly adjustment, and finally, the indexes of "education and recreation", "transport and communication" and "alcoholic drinks and tobacco", indicated the smallest monthly adjustment.

The sensitivity of the dynamically simulated ECM equations has also been investigated, in order to measure the relative influence of the wholesale prices on the various consumer prices. From the estimated dynamic multipliers it is seen that a large proportion of a 1% increase in the wholesale price index in any month is automatically transferred in the same month in all consumer price indexes. Specifically, the indexes of "clothing and footwear", "food" and "durable and consumption goods" seem to absorb the biggest transfer of the increase in the first month, the indexes of "transport and communication", "education and recreation" and "housing" seem to absorb a moderate transfer of the increase in the first month, and the indexes of "other goods and services", "health and personal care" and "alcoholic drinks and tobacco" seem to absorb the smallest transfer of the increase in the first month. In terms of the shocks needed in the wholesale price index in order for the consumer price indexes to cumulatively increase by 1% in one year, the sensitivity of the CPIs in an increasing order is the following:

"alcoholic drinks and tobacco" < "health and personal care" < "other goods and services" < "education and recreation" < "housing" < "transport and communication" < "food" < "durable and consumption goods" < "clothing and footwear"

The conclusions, with respect to the sensitivity analysis presented, are very important in terms of the economic policies aiming at moderating any changes in the wholesale price indexes. This is because, although the cointegration analysis showed that a long-term equilibrium relationship exists between consumer prices and wholesale prices, and thus there is no a "cost-price squeeze", this long-term equilibrium relationship proved to have different strength in terms of its effects. In other words, the transfer of increases in wholesale prices is greater for "food" prices, for example, than it is for "alcoholic drinks and tobacco" prices.

Finally, and in the same context of economic policy, we said in section two that the wholesale price index is determined by four other indexes referring to home production of primary and industrial products and to products of foreign origin. Therefore, it could be very important for the whole exercise to be repeated in order to investigate the individual influence of the various wholesale price indexes in determining consumer price indexes.

References

Akaike, H. (1973) Information theory and an extension of the maximum likelihood principle. In: Petrov, B. and Csake, F. (eds.) 2nd International Symposium on Information Theory. Budapest: Akademiai Kiado.

Breusch, T. (1978) Testing for autocorrelation in dynamic linear models. Australian Economic papers. 17. pp. 334-355.

Breusch, T. and Pagan, A. (1980) The LM test and its applications to model specification in econometrics. Review of Economic Studies. 47. pp. 239-254.

Catinat, M., Cawely, R., Ilzovitz, F., Italianer, A. and Mors, M. (1987) The determinants of investment. European Economy. 31. pp. 5-60.

Dickey, D. A. and Fuller, W. A. (1979) Distributions of the estimators for autoregressive time series with unit root. Journal of American Statistical Association. 74. pp. 427-431.

Dickey, D. A. and Fuller, W. A. (1981) Likelihood ratio statistics for autoregressive time series with a unit root. Econometrics. 49. pp. 1057-1072.

Dickey, D. A. and Pantula, S. (1987) Determining the order of differencing in autoregressive processes. Journal of Business and Economic Statistics. 15. pp. 455-461.

Dickey, D. A., Hasza, D. P. and Fuller, W. A. (1984) Testing unit for roots in seasonal time series. Journal of the American Statistical Association. 79. pp. 355-367.

Granger, C. W. J. (1986) Developments in the study of coitntegrated economic variables. Oxford Bulletin of Economics and Statistics. 48. pp. 213-228.

Engle, R. F. and Granger, C. W. J. (1987) Cointegration and error correction: Representation, estimation and testing. Econometrica. 55. pp. 251-276.

Godfrey, L. (1978) Testing against general autoregressive and moving average error models when the regressors include lagged dependent variables. Econometrica. 46. pp. 1293-1302.

Kennedy, M. C. (1996) Economic Activity and Inflation. In: Artis, M. J. (ed.) The UK Economy. 14th ed. Oxford: Oxford University Press.

Loizou, E., Mattas, K. and Pagoulatos, A. (1997) Macro-monetary effects on agricultural prices: the case of Greek agriculture. Applied Economic Letters. 4. pp. 397-401.

MacKinnon, J. G. (1991) Critical values of cointegration test. In: Engle, R. F. and Granger, C. W. J. (eds.) Long-run Econometric Relationships: Readings in Cointegration. New York: Oxford University Press.

NSSG (2001) Monthly Statistical Bulletin of Greece. Athens (various issues).

Seddighi, H. R., Lawler, K. A. and Katos, A. V. (2000) Econometrics: A Practical Approach. London: Routledge.

Schwarz, R. (1978) Estimating the dimension of a model. Annuals of Statistics. 6. pp. 461-464.