A New Look at the Relationship of Real Balances to Income, Interest Rates, and Inflation in Greece – A Note

By Hercules Voridis*, Athen

I. Introduction

A series of papers on the demand for money in Greece, i.e., *Brissimis* and *Leventakis* (1981, 1983), *Himarios* (1983, 1987), *Panayotopoulos* (1984), *Prodromidis* (1984), *Smith* (1985), *Tavlas* (1987), have recently appeared in this Journal. These sustained a debate, mainly about the substitutability of narrow money with other, domestic, financial and physical assets, and about the stability of the demand for $M1$. The purpose of this note is to put forward an alternative interpretation of the role of monetary aggregates in the Greek economy, thus suggesting a somewhat different emphasis in studies of the demand for monetary assets.

The pervasiveness of financial regulation, (implemented by means of administrative interest rate ceilings, reserve ratios, selective credit controls, etc.), is, commonly, identified as the principal feature of the Greek banking system, see, e.g., *Courakis* (1981), *Halikias* (1978), *OECD* (1986), etc. Such an institutional setting calls for a specific analytical framework. Elsewhere, the issue of the interest elasticity of money demand, and of investment, arose, at some stage in the exchanges between "Keynesians" and "Monetarists", see *Goodhart* (1975, Chapter 3, passim), because of concern with crowding-out and with the relative potency of monetary policy. However, the conventional transmission mechanism, whereby an excess demand for cash spills over to an excess supply of bonds, thus bidding market determined interest rates up, and hence influencing aggregate demand, is irrelevant in Greece.[1]

* I wish to thank Professor *Charles Goodhart* for his thorough comments. Any remaining errors and any opinions expressed are mine. Financial support, in the form of a partial scholarship, from the *Alexander S. Onassis Public Benefit Foundation,* is gratefully acknowledged.

[1] *Buffie* (1984) and *van Wijnbergen* (1983) reinstate the conventional linkages, and introduce further interest sensitivities on the (aggregate) supply side, for economies with financial systems similar to that of Greece, on the assumption of an, all-important, parallel, equilibrating, unofficial funds market.

This is because, interest rates are, prima facie, set exogenously. Rather, an analysis of the Greek macroeconomy should acknowledge that, as stated by *Alan Blinder* (1987, p. 336), "credit restrictions, which reduce the supply of credit for either working capital or investment, are a major channel through which financial policies have real effects". Indeed, this recommended approach conforms also with recent theoretical advances, surveyed by *Gertler* (1988), and by *Stiglitz* (1989), on the implications of rationing, (which is caused, however, by imperfect information, rather than pervasive regulation, in credit and equities markets), for the propagation of economic disturbances.[2]

A characteristic mechanism, operative under conditions of pervasive regulation in the financial system, is as follows: Because of administratively fixed interest rates, set below market clearing levels,[3] there prevails excess demand for bank loans, and (non-price) rationing takes place. There do not exist alternative, well developed, capital markets. Hence, at least some components of aggregate expenditure, and notably of investment, become constrained by the availability of finance. Under rationing, the short side of the market (for loanable funds) determines the volume of transactions. Consequently, a general rise in (domestic) real interest rates might stimulate capital formation, (contrary to the predictions of neoclassical theory), provided it ensures an increase in the resources available to banks for onlending. According to this interpretation, the pertinent task of econometric research should be to establish that comprehensive monetary aggregates, and thus, in turn, credit and investment expenditures, expand, in real terms, in response to an upward change of nominal bank interest rates or to a deceleration in price inflation. A number of such empirical projects, carried out in pooled multi-country samples, are surveyed by *Fry* (1988), *Kitchen* (1986), etc.

II. Estimation

Table 1 presents estimates of the "reduced-form", compare *Gordon* (1984), semilogarithmic relationship between each of three broad deposit money aggregates, in real terms, real income and the real interest rate, in Greece, over the period 1961 - 1985. The reported regressions were selected

[2] *Bernanke* and *Blinder* (1988) have adapted the IS/LM apparatus, (which was, traditionally, used to illustrate the consequences of alternative assumptions about interest elasticities), so as to represent this novel approach in a non-trivial way.

[3] An assumption which is seldom challenged, see *Beckerman* (1988). At any rate, *Blinder* and *Stiglitz* (1983) argue that, even in the absence of rigidities in capital markets, small firms are bound to face financial rationing constraints, especially when the monetary stance of the authorities is contractionary.

Table 1

The relationship of deposits to income and the deposit rate (Greece: 1961 - 1985)

OLS

$$(lq-p)_t = \underset{(-2.057)}{-1.260} + \underset{(2.233)}{0.372\,y_t} + \underset{(4.129)}{0.009\,(r-\dot{p})_t} + \underset{(8.758)}{0.802\,(lq-p)_{t-1}}$$

$$\bar{R}^2 = 0.997 \quad S = 0.037 \quad Z_1(1,19) = 0.941 \quad Z_2(5,15) = 0.808 \quad Z_3(5,13) = 1.790$$

$$(td-p)_t = \underset{(-2.685)}{-3.400} + \underset{(2.866)}{0.873\,y_{t-2}} + \underset{(2.738)}{0.011\,(r-\dot{p})_{t-1}} + \underset{(3.570)}{0.549\,(td-p)_{t-1}}$$

$$\bar{R}^2 = 0.991 \quad S = 0.064 \quad Z_1(1,18) = 0.848 \quad Z_2(5,14) = 0.325 \quad Z_3(5,13) = 2.566$$

$$(sd-p)_t = \underset{(-2.035)}{-1.907} + \underset{(2.049)}{0.454\,y_{t-2}} + \underset{(4.490)}{0.014\,(r-\dot{p})_t} + \underset{(7.007)}{0.797\,(sd-p)_{t-1}}$$

$$\bar{R}^2 = 0.994 \quad S = 0.055 \quad Z_1(1,18) = 0.321 \quad Z_2(5,14) = 0.471 \quad Z_3(5,13) = 1.015$$

2SLS

$$(lq-p)_t = \underset{(-3.301)}{-2.549} + \underset{(3.319)}{0.653\,y_t} + \underset{(3.447)}{0.012\,(r-\dot{p})_t} + \underset{(6.734)}{0.691\,(lq-p)_{t-1}}$$

$$S = 0.036 \quad Z_4(1) = 0.246$$

$$(sd-p)_t = \underset{(-2.060)}{-2.026} + \underset{(1.892)}{0.439\,y_{t-2}} + \underset{(3.043)}{0.020\,(r-\dot{p})_t} + \underset{(6.783)}{0.838\,(sd-p)_{t-1}}$$

$$S = 0.057 \quad Z_4(1) = 0.000$$

lq: log of 'liquid liabilities' i.e., liabilities of commercial banks and other financial institutions.
sd: log of time, savings and 'other' deposits with commercial banks.
td: log of total deposits with commercial banks (i.e., demand, time, savings and 'other' deposits).
y: log of real GDP.
p: log of GDP deflator; $\dot{p} = dp/dt$.
r: deposit rate.

Data Source: IMF, *International Financial Statistics Yearbook (IFS)*, 1986.

Statistics: S: standard error of estimate. Z_1: modified LM test for first order serial correlation approximately distributed as F with degrees of freedom shown. Z_2: The *Chow* prediction test approximately distributed as F with the indicated degrees of freedom. Z_3: F test of the reported equation versus a corresponding overfitting equation (specified in the text). Z_4: LM test for first order serial correlation under IV estimation, distributed as χ^2 (1).

by means of a sequential specialization procedure, inspired by the 'general to simple' econometric methodology, see *Gilbert* (1989). The primary concern, in this exercise, is to avoid serial correlation, viewed as a general diagnostic of equation mispecification. Moreover, a similar interpretation can be given to parameter stability statistics, and, in particular, to the Chow prediction test, as argued by *Pesaran, Smith* and *Yeo* (1985). For each deposit aggregate, we began a specification search by estimating an overfitting equation, which included the current value and two lags of each explanatory variable, as well as two lags of the dependent variable. Having verified that the residual, from that regression, was not autocorrelated, we simplified by sequential, data based, imposition of omission restrictions, until an equation was derived with all regressors significant at least at 10%, and free from serial correlation. (We confirmed, by an F test, that the omission restrictions are jointly acceptable; homogeneity with respect to prices had to be assumed.) As an indicator of residual autocorrelation, we employed the modified LM(1) test, first discussed by *Durbin* (1970). Stability was assessed by the Chow prediction test (of parameter-cum-variance equality), with 1980 as the intermediate breakpoint, in view of the severity of the second oil shock for middle income countries, such as Greece, see *Bruno* and *Sachs* (1985, p. 11). These statistics were deployed here, because of their superior performance in small samples, as demonstrated by the Monte Carlo experiments of *Spencer* (1975) and *Kiviet* (1986), respectively. All three OLS regressions pass, comfortably, all the tests at 5%. Subsequently, we ran the equations which contained current valued explanatory variables by two stage least squares. (The predetermined variables comprised a constant, two lags of income, two lags of the monetary aggregate, in real terms and in logarithms, and two lags of the real deposit rate.) The 2SLS estimates are free from residual autocorrelation at 5%, as indicated by the LM(1) test, adapted for instrumental variables, see *Breusch* and *Godfrey* (1981). Comparison of these estimates with the OLS results shows that such specifications are prone to simultaneity problems. (The correlation coefficient between current valued variables and corresponding instruments was never below 0.75.)

All three monetary aggregates are significantly, (at least at 10%), related to (a single lag of) real income, (a single lag of) the real interest rate, and their own (once) lagged value. In experimental runs, we also entered the nominal deposit rate, r, separately from the rate of inflation, $\dot{p}$. The following equation for (the log of) total commercial banks deposits, td, is the best such regression (y denotes the log of real income; see Table 1 for definitions of the reported statistics):

$$(td-p)_t = \underset{(-2.450)}{-3.261} + \underset{(2.703)}{0.851}\, y_{t-2} + \underset{(1.795)}{0.014}\, r_{t-1} - \underset{(-2.670)}{0.011}\, \dot{p}_{t-1} + \underset{(3.477)}{0.547}\, (td-p)_{t-1}$$

$$S = 0.065 \quad \bar{R}^2 = 0.991 \quad Z_1(1,17) = 0.889 \quad Z_2(5,13) = 0.288.$$

The restriction, that the coefficient on the nominal deposit rate equals in magnitude, but is opposite in sign to the coefficient on the inflation rate, is easily acceptable, i.e., $F(1,18) = 0.187$. The appearance of r_{t-1} might indicate that the (effective) own rate on this monetary aggregate follows the movements in our series for the deposit rate, with some delay. A wide variety of deposit instruments, each bearing a different interest rate, exists in Greece. Most of these rates are reset, almost in step, by administrative decision. Hence, we took the view that it would be sufficient, for the purposes of illustration, to use the series compiled in the IFS as the "representative" deposit rate. The absence of the contemporaneous value of income, from the regressions for two of the monetary aggregates, might be attributable to multicollinearity. Alternatively, the second lag of income, which is significant, (and similarly $\dot{p}_{t-1}$ in the equation above), might be proxying for the expected, or permanent, value to which behaviour might be, as usual, more closely associated, *Laidler* (1985, p. 119). The long-run income elasticity is higher for the aggregates dominated by deposits likely to serve more as assets, rather than media of exchange. This accords with the common belief (ibid., p. 145) that economies of scale are more pronounced with transactions balances. Finally, the invariable appearance of the lagged dependent variable, which serves to "soak-up" residual autocorrelation, is justified on the basis of short-run costs of adjustment (ibid., p. 108).

III. Conclusions

Our impromptu estimations have revealed the vigorous negative response of real bank liabilities to declines in real deposit rates, in Greece, over the period 1961 - 1985. The research programme, which was adumbrated in this note, promises a number of interesting, and useful, further findings. For example, our results indicate that a, potentially, drastic contraction in investment must be appended to the standard list of the costs of a, ceteris paribus, rise in price inflation, compare *Dornbusch* and *Reynoso* (1989). This can be confirmed by the following specimen flexible accelerator equation:

$$I_t = \underset{(-11.492)}{-84.989} + \underset{(6.992)}{0.544}\, Y_t + \underset{(2.186)}{0.199}\, Y_{t-1} + \underset{(4.099)}{148.855}\, l_t^{l} - \underset{(-2.686)}{40.579}\, gq_t$$

$$- \underset{(-4.475)}{54.990}\, gq_{t-1} - \underset{(-2.827)}{32.358}\, gq_{t-2} + \underset{(3.070)}{0.305}\, L_{t-2} - \underset{(-13.143)}{0.228}\, K_{t-1}$$

$\bar{R}^2 = 0.986 \quad Z_1(1,15) = 0.826 \quad \text{D.W.} = 2.410 \quad Z_2(5,11) = 0.366.$

I is real gross private investment, Y is real GDP, r^l is the nominal loan rate, $L = \Delta CR/q$ where Δ is the difference operator, CR is domestic credit claims on the private sector and q is the implicit investment deflator. gq is the rate of inflation of q. The estimation period is 1961 - 1985 (annual data). The series for I and Y were compiled from the *Monthly Statistical Bulletin* of the Bank of Greece, while r^l and CR are given in the IFS. K is the cumulative sum of past real net private investment.

The equation also corroborates the description of the characteristic tendencies in financial systems under pervasive regulation, given in the introduction to this note: credit conditions play a large part in the determination of investment while the latter's conventional negative dependence on the user cost of capital (real interest rate) is masked.[4]

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[4] Needless to mention, even within this scheme of things, there is always interest for empirical investigations of the factors (interest rate relativities etc.) which govern portfolio redistributions among alternative deposit instruments. For example, *Goodhart* (1984, p. 158) argues, with some scepticism, that: "In so far as shifts over the boundary from [bank liabilities] designated as 'monetary' into those designated as 'non-monetary' leaves the economic position and opportunities of deposit holders largely unchanged (and the above qualification should be emphasized), it could then be argued that 'control' established in this way, by encouraging possibly quite small shifts in the maturity holdings of bank deposits, is somewhat cosmetic in its overall economic effect. Admittedly, shifting the public's asset holdings outwards along the maturity spectrum must always be regarded as restrictive; nevertheless the extent of such real shift may not be measured well by concentrating on any one, or even a few, aggregates."

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Zusammenfassung

Eine neue Überprüfung der Beziehung von Realkasse zu Einkommen, Zinssätzen und Inflation in Griechenland Ein Kurzbeitrag

Der Aufsatz deckt eine positive Relation zwischen dem Volumen weit abgegrenzter monetärer Aggregate und dem realen Einlagenzins auf (Griechenland 1961 - 1985). Auf diese Weise kann ein wichtiger Zusammenhang in der griechischen Makroökonomie verfolgt werden: Deflation und/oder die Erhöhung staatlich festgesetzter Zinssätze vergrößern die Ressourcen der Banken und ermöglichen daher eine Expansion kreditbestimmter Investitionsausgaben.

Summary

A New Look at the Relationship of Real Balances to Income, Interest Rates, and Inflation in Greece – A Note

A positive relationship is detected, (Greece 1961 - 1985), between the volume of broad monetary aggregates and the real deposit rate. Thus, an important link can be traced in the Greek macroeconomy: Deflation and/or increases in administered interest rates augment the resources of banks, hence enable an expansion of credit constrained investment expenditures.

Résumé

Une nouvelle vue de la relation entre les balances réelles et le revenu, les taux d'intérêt et l'inflation en Grèce Une remarque

On a découvert pour la Grèce de 1961 à 1985 une relation positive entre le volume d'aggrégats monétaires généraux et le taux réel d'intérêt des dépôts. C'est pourquoi, on peut tracer un lien important dans la macroéconomie grecque: la déflation et/ou les accroissements des taux d'intérêt officiels augmentent les ressources bancaires, donc permettent une expansion du crédit, forcant les dépenses d'investissements.