The "Vicious Circle" Hypothesis: The Greek Case

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I. Introduction

The double digit inflation all countries (industrial, developed and developing) have experienced during the last decade is attributed: a) to the sharp rise in the oil prises in the late 1973 and again 1979, b) to the considerable increase in the commodity prices, and c) to the adoption and implementation of the floating exchange rate regime by almost all the industrial and developed countries since early 1973.

By passing the two oil price shocks and the commodity price hike, due to their undisputed role in aggravating and feeding the inflation of last decade, the focus is on the role and the impact of the flexible exchange rate regime on world inflation. This system of exchange rates has been adopted by almost all countries, and specially by all industrial countries, and it is in effect up to this day, uninteraptedly, since its implementation in early 1973.

The inflationary impact associated with the working of the flexible exchange rate regime has been attributed, by some economists, even proponents of the adoption of this system of exchange rates, to the removal of the "discipline arguments" with which the system of flexible exchange rates is associated with.

John F. O. Bilson[1] in his paper "The Vicious Circle Hypothesis" says: "the move to a flexible exchange rate regime removes the balance of payments constraint on the money supply mechanism and hence eliminates the last barrier to an inflationary spiral. For the first time in history the central banks of the major industrial countries do not face any external constraint in their ability to increase the stock of the high-powered money".

A. D. Crockett and *M. Goldstein* in their paper "Inflation Under Fixed and Flexible Exchange Rates",[2] after making and overall evaluation of the discipline argument (pp. 531 - 537), do accept the relative inflationary

[1] *Bilson* (3), p. 5.
[2] *Crockett* and *Goldstein* (6).

impact of the flexible exchange rate system over that of fixed exchange rates regime.

However, their answer to the question they impose "Are flexible exchange rates more inflationary than a system of fixed exchange rates?" is: "It all depends".[3]

They do accept, though, that: "there does appear to us to be a case . . . for supposing that flexible exchange rates make it easier for inflationary pressures to arise and to be accomodated than do fixed rates".[4]

However their overall conclusion reads as follows: "the type of exchange rate system has relatively little influence on the average rate of world inflation".[5]

The inflationary impact of the flexible exchange rate regime is attributed to the greater monetary autonomy that a country enjoys operating under this system compared to that of the fixed exchange rates.

This greater monetary autonomy a country enjoys under the system of floating rates is not to be understood, though, on the basis of the limited or complete absence of its central bank's intervention in the foreign exchange market, as this system presupposes,[6] but rather it has to be understood as the central banks' ability and responsibility in choosing and implementing its own monetary policy independently from the policy choice made by other central banks, i.e. the removal of the "discipline argument".

The extent of the monetary autonomy a country enjoys operating under the system of flexible exchange rates and the way it affects its exchange rate has created ambiguities both on theoretical and empirical grounds. A passage from the Annual Report of the Bank for International Settlements is vivid on the complexity of the issue:

"According to one view, the greater monetary autonomy which countries enjoy under a floating regime implies that exchange rate movements will passively reflect the inflation rates which countries 'choose' to maintain relative to inflation in other countries.

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[3] Ibid, p. 537.

[4] Ibid, p. 537.

[5] Ibid, p. 537.

[6] Theoretically, under the system of flexible exchange rates the central banks do not intervene in the foreign exchange market fact which permits the monetary authorities to have greater room for conducting the monetary policy they choose for domestic purposes. The experience, though, since the implementation of the system of floating exchange rates in early 1973, is exactly the opposite, i.e. the central banks of all countries and mainly those which their currencies are heavily traded in the foreign exchange market have intervene in many times and to a great extent since the implementation of the system of floating exchange rates.

While there is considerable truth in this view, experience has shown that the interrelationships between inflation and floating rates are much more complex. The casual relations run in both directions and often tend to be self-reinforcing. This stems from the fact that movements in exchange rates may often be the result of changes in such factors as confidence, expectations and the monetary/fiscal policy mix. Hence they can, through their influence on import and export prices, exert an independent effect on the rate of domestic price and wage inflation. The influence is particular strong in open economies with large trading sectors and in economies where wage respond promptly to changes in the consumer price level".[7]

Which one of the above two views holds true, namely, if the causal relation runs from prices to exchange rates or if it runs from exchange rates to prices, it is an empirical issue.

The depreciation/price inflation spiral, the so-called "the vicious circle hypothesis", has been investigated in numerous studies.

These studies found statistical evidence of the working of the "vicious circle hypothesis" using the *Sims-Granger* causality test to exchange rate – price relationship.

Bilson in his paper has raised objection as to the correctness of this causality test. Specifically he questions the causality test on the ground that it "ignores the fact that the exchange rate is an endogenous variable. The causality test may indicate that exchange rates "cause" prices when the correct explanation is simply that exchange rates respond more rapidly than prices to changes in underlying economic conditions".[8]

Further, in the conclusion of his paper he emphasizes that the expansionary monetary policy is the cause for both the exchange rate depreciation and the domestic inflation. Specifically: "Although it appears that the exchange rate causes subsequent movements in prices and wages, the paper has demonstrated that the probable cause of both the depreciation of the exchange rate and the inflation of domestic prices is an expansionary money supply".[9]

The Bank of International Settlements is attributing as well to domestic developments and specifically to the monetary policy, the cause of why some countries "got into the vicious circle".[10]

The purpose of this paper is to investigate if Greece has got into a vicious circle by applying the *Granger* causality test. Despite the two theoretical

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[7] *Bank for International Settlements,* Annual Report, 1976, p. 31.
[8] *Bilson* (3), p. 3.
[9] Ibid, p. 33.
[10] *Bank for International Settlements,* Annual Report, 1977, p. 38.

objections[11] raised by *Bilson* concerning the applicability of the *Sims-Granger* causality tests for the statistical verification of the interrelationship existing between exchange rates and prices it seems that, for reason given immediately below, the first of his objections, i.e. the endogeneity of both the exchange rates and prices, is not valid in the case of Greece, at least.

As it has been argued elsewhere by the author[12] the money supply is not the decisive factor in determining the exchange rate of drachma. First, the interest rate is not subject and it is not determined by the free interplay of the market forces in the money market, but, on the contrary, the level of the interest rate is "administered" by the monetary authorities.

Second, the free capital movement, especially the outflow of funds, is totally prohibited in Greece. Thus, the absence of these two important factors can reasonably be considered responsible for the "exogeneity" of the exchange rate of drachma. Consequently, the *Sims-Granger* causality test can be validly applied to verify the interrelationship existing between exchange rates and prices, since one only of these parameters is endogenous (i.e. prices) while the other (i.e. exchange rates) can reasonably assumed, with the rationale given above, to be exogenous.

II. Testing the Hypothesis

Testing for causality between the exchange rate and prices in Greece under both exchange rate regimes, that is under the flexible exchange rate regime and under the fixed exchange rate regime, the *Granger* causality test is applied.[13] The *Granger* test is preferred over that of *Sims* test for the following reasons:

a) the *Granger* test requires only past values of the independent variable, so the length of the lag structure is determined by the user, and

b) since the paper aims at verifying the interrelationship between exchange rates and prices under both exchange rate regimes, the *Granger* test has the advantage of interpreting more easily the existing causality between the variables under different exchange rate systems.[14]

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[11] The first of these objections has been presented above, p. 3. The second objection associated with the vicious circle hypothesis is that it "neglects the expenditure – reducing role of the exchange rate in the adjustment process". *Bilson,* p. 4.

[12] *Panayotopoulos* (9), p. 373.

[13] *Granger, C. W. I.* (7).

[14] On the same line of reasoning are the arguments of *Mixon, Pratt* and *Wallace* (8) for preferring and making use of *Granger* test over that of *Sims* test.

The *Granger* causality test estimates equations in the form:

$$X_t = \alpha_0 + \sum_{j=1}^{n} \hat{b}_j X_{t-j} + \sum_{j=1}^{m} \hat{c}_j Y_{t-j} + e_t \tag{1}$$

and

$$Y_t = d_0 + \sum_{j=1}^{m} \hat{g}_j Y_{t-j} + \sum_{j=1}^{n} \hat{k}_j X_{t-j} + u_t \tag{2}$$

If the $\hat{c}j$'s $(j = 1, \ldots, m)$ are assured to be equal to zero, i.e. $c_1 = c_2 = \ldots = c_n = 0$, it is inferred that Y does not causes X and thus equation (1) is reduced to

$$X_t = \alpha_0 + \sum_{j=1}^{n} \hat{b}_j X_{t-j} \tag{1'}$$

The *Granger* causality test is conducted as follows.

Initially, equation (1′) is tested where the dependent variable X is regressed on its lagged values. This is referred to as restricted equation.

Then, equation (1) is tested, where the dependent variable X is regressed on its lagged values and on the lagged values of an added variable Y. This is referred to as unrestricted equation. The null-hypothesis, that is $c_1 = c_2 = \ldots = c_n = 0$, in equations (1) and (1′) is tested using the F-statistic. If it turns out the value of the F-statistic of the estimated equations to be significant, i.e. greater that the critical F' value, then it is inferred that Y causes X. If the opposite hold true then it is inferred that Y does not causes X.

The F-statistic is of the form:

$$F_{Q-K,n-Q} \sim \frac{(SSR_Q - SSR_K)/Q - K}{(SSR_Q)/n - Q}$$

where K is the number of restrictions placed on equation (1′) and Q is the number of restrictions placed on equation (1) and n the number of observations.

III. The Empirical Tests

In the context of the present paper the interrelationship between the exchange rate (Drachma) and the domestic prices is tested under both exchange rate regimes, i.e. under the system of flexible exchange rates applied after 1973 and under the systems of fixed exchange rates that prevailed before 1973.

The break down in the time series in 1973 might be objected since Greece held its currency fixed to the U.S. dollar up to February 1975 (the fixed parity between drachma and U.S. dollar was interrupted for a short period only, from October 1973 to January 1974).

This argument is not valid for the following reasons:

First, despite the fact, that Greece is conducting her international trade mainly in the U.S. dollar, the Greek drachma depreciated to a considerable extend vis-a-vis the currencies of all other countries (i.e. French Franc, Deutschmark, etc.) with which the volume of trade (goods and services) cannot be considered negligible.

Second, since all the industrial countries let their currencies float, in early 1973, the prices of the imported goods (and services) are assumed to have affected, since then, the domestic price level (the import prices affect almost instantly the domestic price level).

Third, domestic factors support as well the break down of the time series in 1973. Namely, since 1973 consumer prices started raising very fast as opposed to the period before 1973.

Despite the arguments given above to justify the break down of the time series, under consideration, in two subperiods taking as a cut off point the year 1973, the *Chow* test, which comprises a formal method to decide upon the possibility of pooling or not the data, was performed. The *Chow* test, using as cut-off point the year 1973, indicated that the data cannot be pooled. Thus, the time series were divided in two subperiods. One for the time period before 1973, during which the fixed exchange rate system was in operation, and the other for the time period after 1973, during which the flexible exchange rate system was adopted.

The data used in the empirical test are monthly observations of the variables, not seasonally adjusted. A log-linear relationship is assumed between the variables. Because the causality test requires covariance stationarity the data have been converted to first differences.

Various methods are employed to transform the non-stationary time series to covariance stationary series since the causality test requires the variables to be jointly covariance stationary. One widely used method is the one proposed by *Box* and *Jenkins*.[15] They suggest that the elimination of non-stationarity can be achieved making use of the filter $(I - B)^d$, with (d) equal to 1 or 2.

[15] *Box-Jenkins* (4).

Various researchers make use of the *Box-Jenkins* approach each one using different form of filter, depending on the nature of the variables used.

In this paper the *Box-Jenkins* approach is not utilized.

The estimated equations using the *Granger* causality test are the following:

$$(CPI)_t = a_0 + \sum_{j=1}^{12} \hat{b}_j (CPI)_{t-j} + \sum_{j=1}^{12} \hat{c}_j (EXR)_{t-j} \tag{3}$$

and

$$(EXR)_t = d_0 + \sum_{j=1}^{12} \hat{b}_j (EXR)_{t-j} + \sum_{j=1}^{12} \hat{c}_j (CPI)_{t-j} \tag{4}$$

with 12 month lagged structure, where:

CPI: the ratio of the Greek and the German consumer price indices

EXP: the Drachma/Deutsch mark exchange rate.

These equations are used to investigate the interrelationship between exchange rate and prices.

To investigate the relationship between money supply and exchange rate the following equations are estimated:

$$(M)_t = a_0 + \sum_{j=1}^{12} \hat{b}_j (M)_{t-j} + \sum_{j=1}^{12} \hat{c}_j (EXR)_{t-j} \tag{5}$$

and

$$(EXR)_t = d_0 + \sum_{j=1}^{12} \hat{b}_j (EXR)_{t-j} + \sum_{j=1}^{12} \hat{c}_j (M)_{t-j} \tag{6}$$

with 12 month lagged structure where:

M: the ratio of the Greek and German money supply narrowly defined.

The rationale for using the Drachma/Deutsch Mark exchange rate is twofold. First it has to do with the substance of the test undertaken and, second it is associated with the statistical limitations imposed by the data.

As far as the first of the above arguments is concerned the answer reads as follows:

The Greek inflation rate constantly far exceeds that of Germany. The inflation rate differential working against Greece is an important variable in the decision making process of the Greek Central Bank in establishing the Drachma/Deutsch Mark exchange rate coping with the competitiveness of Greek exports and the cost of the imported goods.

On the other hand, Germany is the single most important trade partner of Greece. In terms of the merchandise trade, the value of Greek exports represents the 19% of its total exports and the imports from Germany the 14% of Greece's total imports. If the value of the invisible trade is also included (tourism, worker's remmitances, etc.) then the value of the international transactions between these two countries far exceeds the above figures.

As far as the second argument is concerned the statistical limitations in using the Drachma/U.S. dollar exchange rate is to be noted. The Drachma/U.S. dollar exchange rate remained fixed during the period before 1973. This fact makes impossible for a statistical test to be undertaken for the period before 1973 and thus the comparison between the two exchange rate regimes, which is the purpose of this paper, cannot be achieved.

VI. The Results

In the following Table 1 the results of the estimation of the above equations are given where the relative price level, the relative money supply, and the exchange rate of Greece and Germany are used for the period before the implementation of the flexible exchange rate in 1973, i.e. 1965 - 1972, and for the period after the implementation of this exchange rate system, i.e. 1973 - 1980.

Table 1

No. of Equat.	Functional Relationship	Time Period	*F*-Statistic
(3)	Relative price level regressed on exchange rate (Drch/DM)	1973 - 1980	3.6897*
		1965 - 1972	.3372
(4)	Exchange rate (Drch/DM) regressed on relative price level	1973 - 1980	.6088
		1965 - 1972	.2804
(5)	Relative money supply regressed on exchange rate (Drch/DM)	1973 - 1980	.7299
		1965 - 1972	.4081
(6)	Exchange rate (Drch/DM) regressed on relative money supply	1973 - 1980	2.2892**
		1965 - 1972	.6413

Data Sources: OECD; Main Economic Indicators; Bank of Greece; Monthly Bulletin.
The degrees of freedom (12,59) are the same for all equations in both time periods.
* Significant at 1% level; ** Significant at 5% level.

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Zusammenfassung

Die Teufelskreishypothese: Der Fall Griechenland

Aus den Ergebnissen einer empirischen Schätzung geht hervor, daß die Wechselkurse nach 1973 nicht passiv die Veränderungen des inländischen Preisniveaus widerspiegeln. Im Gegenteil: Der Wechselkurs ist ein unabhängiger Faktor bei der Ankurbelung der inländischen Inflation, und zwar durch den Einfluß, den sie auf die relativen Preise von Ein- und Ausfuhrgütern sowie Dienstleistungen ausübt.

Die statistische Untersuchung hat gleichfalls gezeigt, daß Veränderungen im Geldangebot den Wechselkurs nicht berühren. Diese Tatsache stärkt die oben abgeleiteten Ergebnisse, d. h. Wechselkursänderungen führen zu inländischer Inflation.

Nach 1973 ist Griechenland in einen Teufelskreis geraten. Die Abwertungs-/Inflationsspirale, die seitdem in Gang ist, muß unterbrochen werden.

Es ist allerdings zuzugestehen, daß eine solche Aufgabe nicht einfach zu bewältigen ist. Harte wirtschaftspolitische Maßnahmen müssen in Kraft gesetzt werden, die neben Aktionen, die sich auf die Wiederherstellung eines wirtschaftlichen Gleichgewichts richten, versuchen das Vertrauen wieder herzustellen und die Erwartungen zu revidieren.

Der Anpassungsprozeß, den das Land unternehmen muß – an sich schon überfällig und problematisch – wird weiterhin dadurch erschwert, daß das Land unter einem System flexibler Wechselkurse agiert.

Summary

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It is evident from the results of the empirical estimation that the exchange rates after 1973 do not passively reflect changes of the domestic price level. On the contrary, the exchange rate is an independent factor in feeding domestic price inflation, through the influence it exerts on the relative prices of importable and exportable goods and services.

The statistical investigation has shown, as well, that changes in the money supply do affect the exchange rate. This fact reinforces the above findings, i.e. the exchange rate changes lead to domestic price inflation.

After 1973 Greece has "got" to a vicious circle. The depreciation/price inflation spiral, which is in operation since then, has to be broken down. However, it has to be admitted that such a task is not an easy operation. Strong policies have to be implemented that, besides actions which are focusing on the adjustment of the economy itself, will attempt to establish confidence and to reverse the expectations of the public.

The adjustment procees the country has to undertake, prolonged and problematic itself, is further complicated since the country is operating under the system of flexible exchange rates.

Résumé

L'hypothèse du cercle vicieux: le cas de la Grèce

Les résultats d'une évaluation empirique démontrent que les taux de change après 1973 ne reflètent guère passivement les changements du niveau national des prix. Au contraire: au cours du processus inflationniste national, le taux de change est un facteur indépendant, à savoir par l'influence que l'inflation exerce sur les prix relatifs des biens d'importation et d'exportation ainsi que des services.

L'analyse statistique a également montré que des changements de l'offre monétaire ne touchent pas le taux de change. Cette constatation renforce les résultats déduits ci-dessus, c'est-à-dire que les fluctuations de taux de change entraînent une inflation nationale. La Grèce est entrée dans un cercle vicieux depuis 1973. La spirale inflationniste et la spirale de dévaluation règnant depuis cette époque, doit être arrêtée.

Il faut cependant admettre que cette tâche n'est pas simple. Il faut mettre en vigueur de sévères mesures de politique économique. Celles-ci doivent viser à rétablir un équilibre économique. En plus, ces mesures de politique économique doivent essayer de rétablir la confiance et de réviser les attentes. Le système de taux de change flexibles existant en Grèce complique encore le processus d'adaptation indispensable pour le pays, processus problématique et qui est déjà en retard.