INTEREST RATES DETERMINANTS AND CONSEQUENCES FOR MACROECONOMIC PERFORMANCE IN SPAIN

Ignacio Mauleón
José Pérez

Banco de España. Servicio de Estudios
Documento de Trabajo n.º 8420

El Banco de España al publicar esta serie pretende facilitar la difusión de estudios de interés que contribuyan al mejor conocimiento de la economía española.

Los análisis, opiniones y conclusiones de estas investigaciones representan las ideas de los autores, con las que no necesariamente coincide el Banco de España.

ISBN: 84-505-0648-7

Depósito legal: M. 43459 - 1984

Talleres Gráficos del Banco de España

This paper has been presented at the autumn meeting of central bank economists at BIS, held in Basle on 7th and 8th November 1984. We are grateful to J. Viñals and A. Ojeda for his comments and suggestions. The help of L. Domingo with the computational task is also acknowledged.

Resumen

Este trabajo analiza las causas de la evolución de los tipos de interés españoles y sus consecuencias sobre la actividad real. El análisis se lleva a cabo mediante el planteamiento y estimación de un modelo simultáneo de ecuaciones que explica la evolución de los tipos de interés, precios y renta. La conclusión principal es que el déficit público debe ser reducido para mejorar el crecimiento potencial de la economía española.

Palabras clave

Déficit público, tipos de interés, nivel de renta, precios, estimación simultánea, simulación a largo plazo.

Abstract

In this paper we try to disclose the basic forces at work behind the general upward trend in the nominal rates of interest. The problem is tackled by setting up a small and compact macro model. This model is then estimated by maximum likelihood and after extensive testing we come to the conclusion that the reduction of the public deficit is a basic condition to improve the country's growth potencial.

Key words

Public defict, rates of interest, output, prices, simultaneous estimation, long-run simulation

Contents

Introduction

High interest rate levels appear as one of the most disturbing features of the Spanish economy, which has exhibited a poor performance during the last decade: slow growth, a very high and increasing unemployment rate, growing public sector deficit, decreasing investment and saving ratios and double digit inflation. The purpose of this paper is to examine the level of interest rates, their determinants --with particular emphasis on domestic factors-- and their implications for macroeconomic problems and policy in Spain.

In Section I we describe some of the most noticeable facts related to interest rate determination and macroeconomic performance. We emphasize the significance of domestic factors --specifically the growing volume of general government debt outstanding and the anti-inflationary monetary policy --to explain high interest rates. As regards the macroeconomic performance, the monetary and fiscal policy mix appears to crowd out private sector investment, contributing to a deceleration of the rate of increase of GDP and weakening the potential growth of the Spanish economy. While high interest rates seem to have a negative effect on private expenditure, they do not apparently have a positive effect on total domestic savings. In Section II we develop a very simple and aggregative model of the Spanish economy to determine interest rates, exchange rate, output and the price level. The model is appropriate to test the relative importance of domestic and international determinants of interest rates and their implications for economic activity. In Section III we estimate a preliminary small version of the model that allows us to test the significance of domestic

factors --particularly of the public sector deficit-- in determining interest rates and their implications for economic activity. The main conclusion is that growing general government outstanding debt has contributed significantly to increase interest rates and to reduce the rate of growth of the Spanish GDP. International factors --interest rates and foreign public deficits-- seem to play a minor role as determinants of domestic interest rates. Higher interest rates in the United States, by appreciating the dollar and stimulating exports, have had a positive effect on Spanish output that has not been compensated by a negative impact on domestic demand. Finally, a crucial empirical result is that a change in the stance of monetary policy would not improve the macroeconomic performance, because a more expansionary policy would contribute mainly to increase the inflation rate. Therefore, the reduction of the structural public sector deficit appears as a basic condition to improve the country's growth potential.

Finally, we would like to stress that the work reported in this paper belongs to a more ambitious project, and therefore it is unfinished. For example, the exchange rate has not been modelled yet. More importantly, public expenditure has not been explicitly included in the output equation due to the current unavailability of reliable data. This is likely to overstate the negative impact of the fiscal deficit estimated in the model, but we believe that the basic conclusions of the model carry through anyhow.

I.- Interest rates, determinants and implications: some facts

In the last decade, domestic interest rates showed an upward trend in Spain which intensified after 1977. This evolution is illustrated in Chart 1.A, that shows some representative short-term and long-term nominal interest rates.

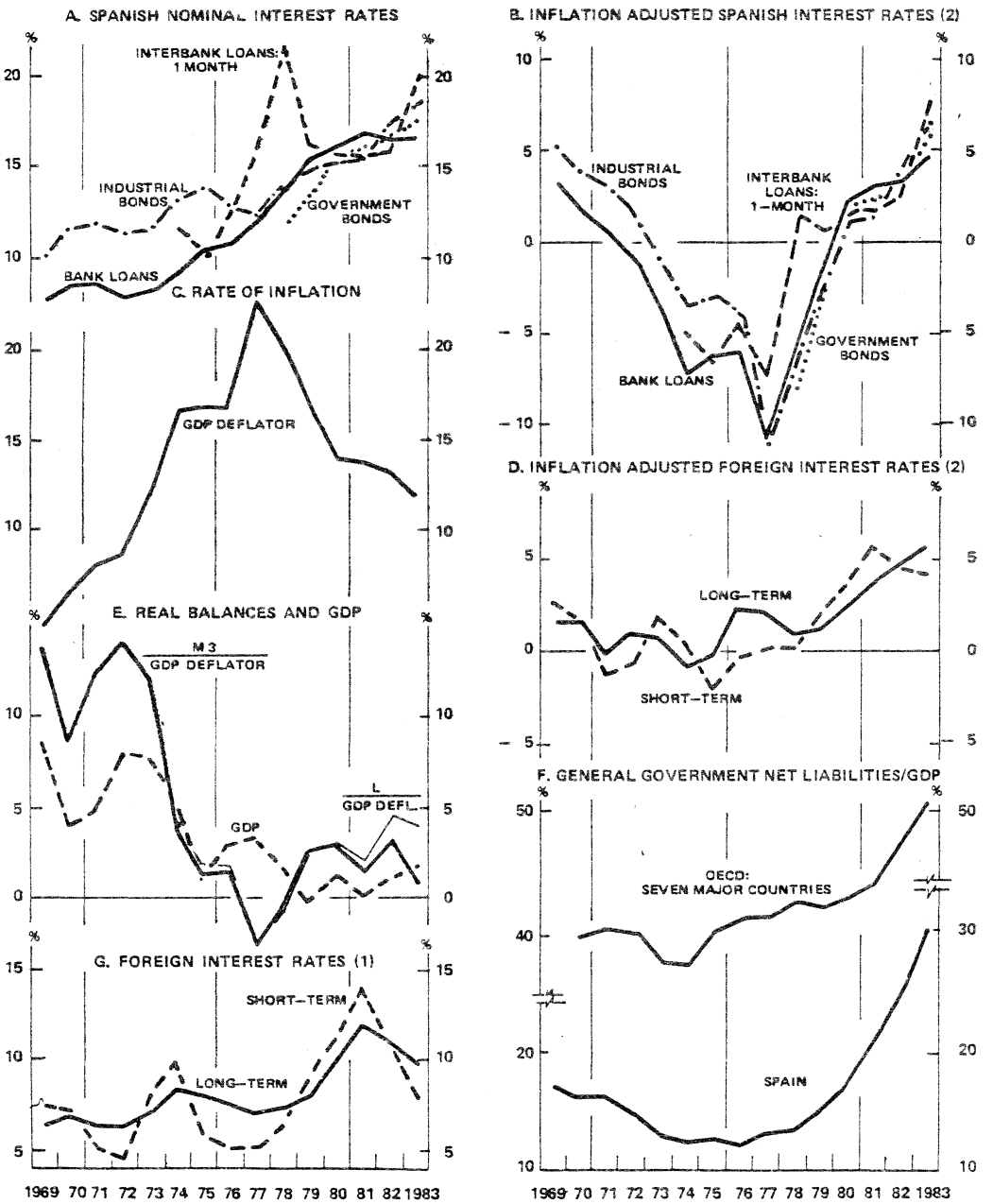
a) Expected rate of inflation

Industrial bonds yield to maturity and bank loans interest rates raised nine percentage points between 1969 and 1983 (six and seven and half points since 1974), and the overnight interbank loans rate increase was close to ten points in the 1974-1983 period. On the other hand the rate of inflation (measured by the GDP deflator) was in 1983 seven and a half points higher than in 1969; but this increase hides a process of strong acceleration till 1977 (22.8% this year against 4.4% in 1969) and a later deceleration that has been continuous from then on (see Chart 1.C). Thus, although the increasing rate of inflation seems to explain the evolution of nominal interest rate levels in the long-run, a closer analysis of the relationship between them (Chart 1.A and 1.C) casts some doubts about it.

To this effect it is necessary to emphasize that the evolution of inflation adjusted interest rates (Chart 1.B) is determined basically by the inflation process itself. Accordingly, inflation adjusted interest rates fell with the acceleration of inflation until 1977 and from then on they have risen to levels

CHART 1

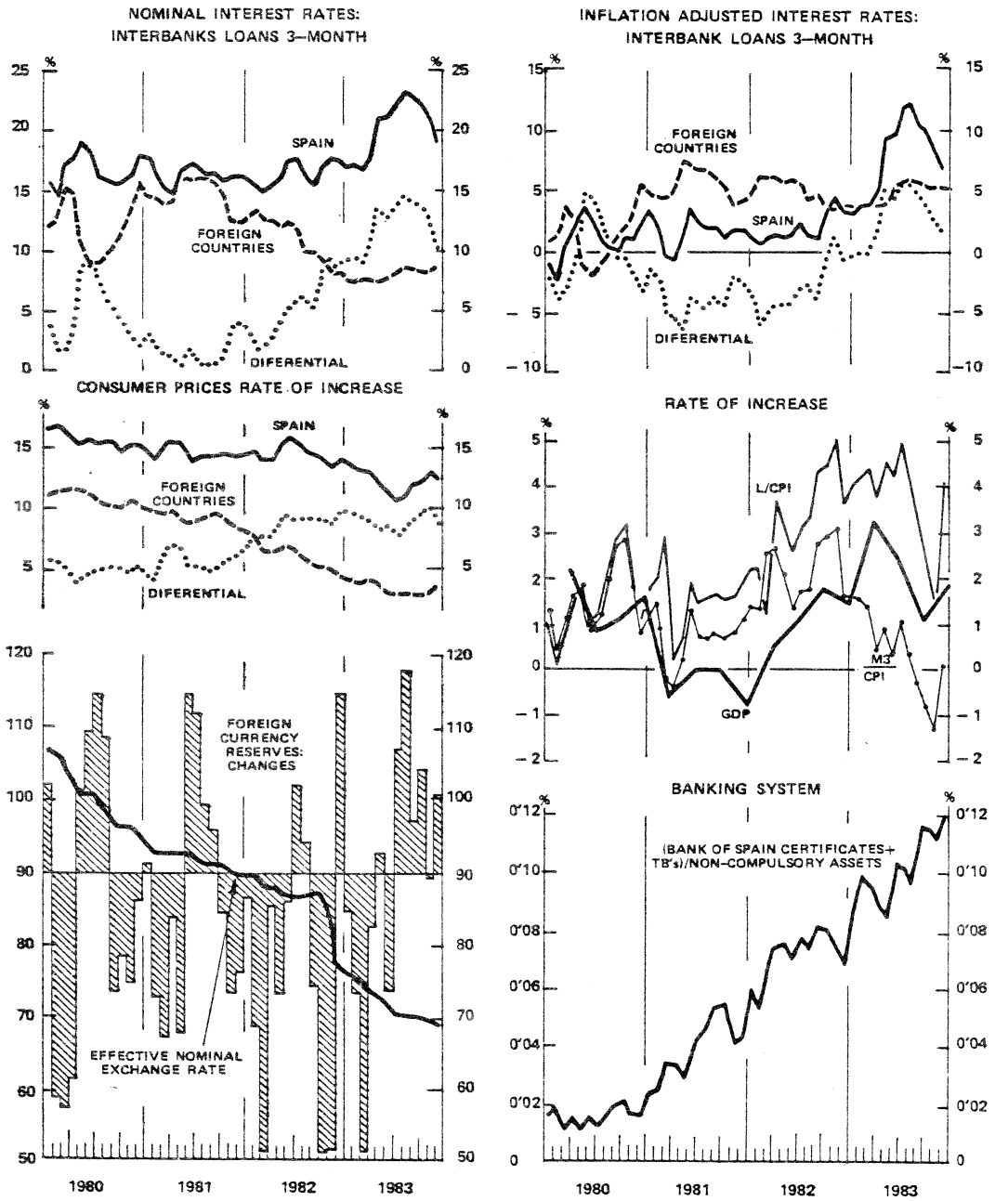
INTEREST RATES AND RELATED VARIABLES



Sources of Data: FMI, OCDE, INE, BE.
(1). U.S., Swiz., W.Germ., Fr., UK and Japan interest rates weighted by spanish liabilities composition.
(2). Adjusted by GDP deflator rate of increase.

CHART 2

INTEREST RATES AND RELATED VARIABLES



Sources: of data: OCDE, INE y BE.
Inflation rate is increasured by CPI rate of increase over previous year. Foreign interest rates and consumer prices are weighted average (see char 1 footnote (1)). Effective exchange rate is related to industrial countries.

above the maximum reached in the sixties in spite of a significant drop of the rate of return on capital (although this assertion should be taken cautiously, since the pretax rate may not be appropriate). As a consequence, when we try to approximate inflation expectations by an adaptive process, "real interest rates" are unstable and correlated with the rate of growth of prices; and results do not improve when we consider "restricted rationality" assuming that price expectations depend on preannounced monetary targets.

In fact, recent empirical studies do not find a significant relationship between nominal interest rates and inflation in Spain, and in other econometric works before 1976, estimated coefficients were lower than .25.

Two factors could contribute to explain such a loose relationship between nominal interest rates and inflation expectations: administrative regulations and credibility in antiinflationary policies.

b) Financial regulations

Until 1977, most banks interest rates were regulated with ceilings that were below market rates in spite of upwards revisions in the Bank of Spain basic rate, as far as inflation was accelerating. This can explain the lack of a stable relationship between bank interest rates and inflation during that period, but this does not necessarily have to be the case with other non-regulated interest rates. In fact, the market rates --industrial bonds and interbank rates-- are above bank loans rate till 1977 (Chart 1.A), reflecting

the existence of permanent credit rationing. And, although it is probable that the behaviour of market --bonds and interbank-- rates was "contaminated" by regulations, we may observe that after a first package of liberalization measures in 1977, these rates didn't show any significant increase, apart from the rise explained by the restrictive monetary policy which was simultaneously implemented (see Chart 1.E). However, the liberalized bank loans rate showed a strong increase after the 1977 deregulation reaching levels above market rates; and credit rationing indicators showed a clear reduction from then on.

At the beginning of 1981, loans interest rates were fully deregulated, just as deposit rates over six months. These measures had no significant influence on loans rate levels; and banks, which perhaps were worried about the "adverse effects" of high interest levels on borrowers behaviour, continued to use credit rationing. Thus, new pressures on market interest rates in 1982-1983 were not reflected in loan rates. Therefore, the current state of high nominal (and inflation adjusted) effective interest rates had nothing to do with deregulation.

Empirical studies (see section III) show that the evolution of market interest rates --specifically, industrial bonds yield and interbank rates-- can be reasonably explained by other factors, corroborating initial impressions on the impact of deregulation. In other words, liberalization of financial regulations has permitted competitive markets to emerge and it has reduced the role of "credit rationing" and "non-interest payments", but it doesn't seem to have

had a very significant impact on interest rates effective levels. Nevertheless, we have to emphasize that liberalization will permit a closer relationship between nominal interest rates and expected inflation.

c) Policy mix and the credibility problem

Spanish authorities have been pursuing a policy mix of easy budget and tight money, which can contribute to explain recent upwards trends in nominal and inflation adjusted interest rates.

Chart 3.B shows that the general government budget was usually in surplus until 1976. Afterwards, the budget run into a deficit and it rose rapidly to reach 5.9% of GDP in 1983. In order to finance the increasing deficit, general government net debt oustanding had to rise at an annual rate of 50% since 1978. It has produced a strong increase of the ratio of public debt outstanding to domestic non-financial sectors debt (see a proxy in Chart 5), and an impressive growth of its ratio to GDP (Chart 1.F). The subsequent pressure on credit markets has contributed undoubtedly to drive up nominal interest rates, and the rapidly growing debt outstanding can also explain the upwards trend in inflation adjusted rates, since it may have undermined the credibility of the anti-inflationary policy (1).

---

(1) To this effect it is important to emphasize that a sustained general government deficit around 5.5% would imply a rate of increase of 25%-30% of debt oustanding in 1983-86, while anti-inflationary policy pursues a deceleration of prices to a target level of a 6% annual rate in 1986.

Meanwhile, monetary authorities have implemented a gradual deceleration of monetary aggregates: the rate of growth of M3 has declined from 20.1% in 1977 to 12.7% in 1983. This policy has contributed successfully to reduce inflation (measured by the GDP deflator rate of growth) from 22.8% in 1977 to 12.0% in 1984, without any acceleration in the meantime.

In spite of this evidence, financial markets seem to distrust the capability or the engagement of the government in this process. Two factors contribute to found that distrust: a) the high and increasing rate of unemployment, and b) the growing debt outstanding. In fact, the monetary deceleration has not followed a steady path; every time the authorities have reached a significant reduction in the rate of inflation, they have implemented a more accommodating policy tending to maintain the rate of growth of monetary aggregates. It has produced some plateaus in the deceleration process which had to be followed by a new episode of a tighter monetary policy. It has produced fluctuations of interest rates around the trend; so, we can identify (see Chart 1.A and 1.E) periods of restraint like 1977-8, 1983 and 1974-5, with upwards movements in nominal interest rates, followed by downwards movements around the trend. The uncertainties generated by this process have contributed to increase the risk premium and the adjusted interest rates.

d) External factors

International influences appear to be secondary determinants of the evolution of Spanish interest rates. Chart 1.F illustrates that growing public sector deficits in foreign countries exert less pressure on the Spanish financial markets and interest rates than the domestic public deficit, which plays a dominant role.

As regards foreign interest rates, an examination of Chart 1 doesn't show a close relationship of domestic rates with them. This can be explained by obstacles to movements of capital that inhibit an effective integration of the domestic and international financial markets. Accordingly, international influences on domestic interest rates are loose as in the case of inflation.

Nevertheless, there exists a convergence of domestic rates with foreign real interest rates, specially since 1979, which restricts the capability of Spanish monetary authorities to manoeuvre. This is evident from Chart 2, which shows that Spanish authorities modulated the implementation of monetary policy in 1980 to take account of foreign interest rate evolution. Thus, they were successful in maintaining inflation differentials. Afterwards, they abandoned this discipline and implemented a less restrictive policy to estimulate economic activity. The consequence was an increasing inflation differential that supported expectations of exchange depreciation and it led to an increasing external disequilibrium. Finally, the authorities had to implement a tight policy with important costs to regain credibility.

In this sense, foreign factors have been useful to reinforce the necessary monetary discipline to reduce inflation.

e) Implications of interest rates for macroeconomic performance.

Charts 1.E and 3 show a worsening process in the achievements of the spanish economy during the period of the upward interest rates trend.

High interest rates have contributed to depress private expenditure sensitive to interest rates changes. Investment spending by non-financial firms and households dropped dramatically as a percentage of GDP since 1974 as a consequence of the declining return of capital (see Chart 3.E) and the increasing interest rates.

The high dependence of spanish firms on short-term external finance --increased during the economic crisis-- has reinforced the effects of growing interest rates as far as they have contributed to increase the debt burden and to reduce internal flows of funds.

Chart 3 shows the sectoral surplus or deficit as a percentage of GNP. Since 1976 the deficit of general government has been growing, while firms and households have run into increasing surpluses through fluctuations related with the evolution of the current account deficit. This is consistent with the view that public sector deficit has crowded out private sector

CHART 3

SECTORAL SURPLUS AND DEFICIT

Percentages of GNP

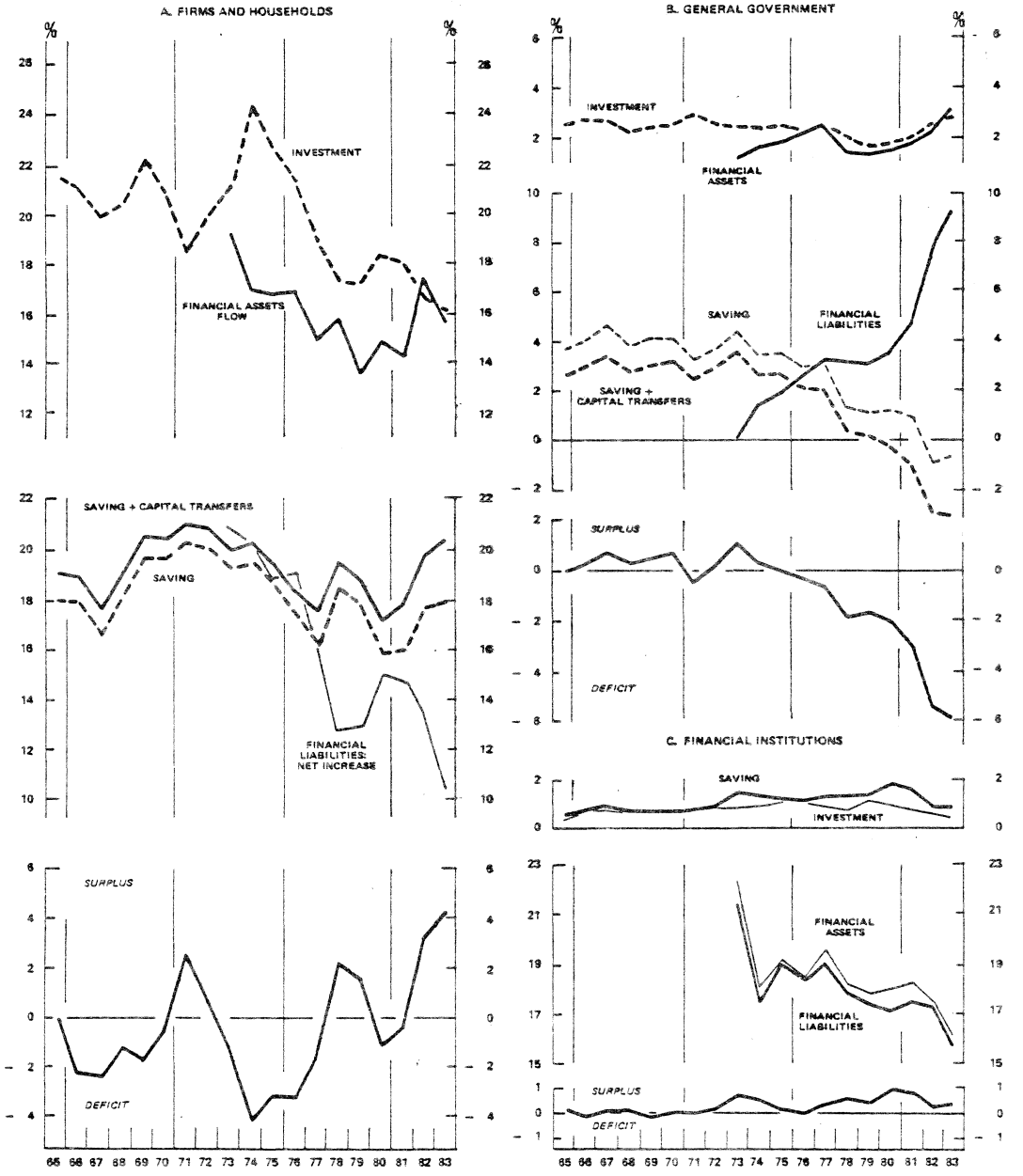


CHART 3–D

TOTAL DOMESTIC SECTORS

Percentages of GNP

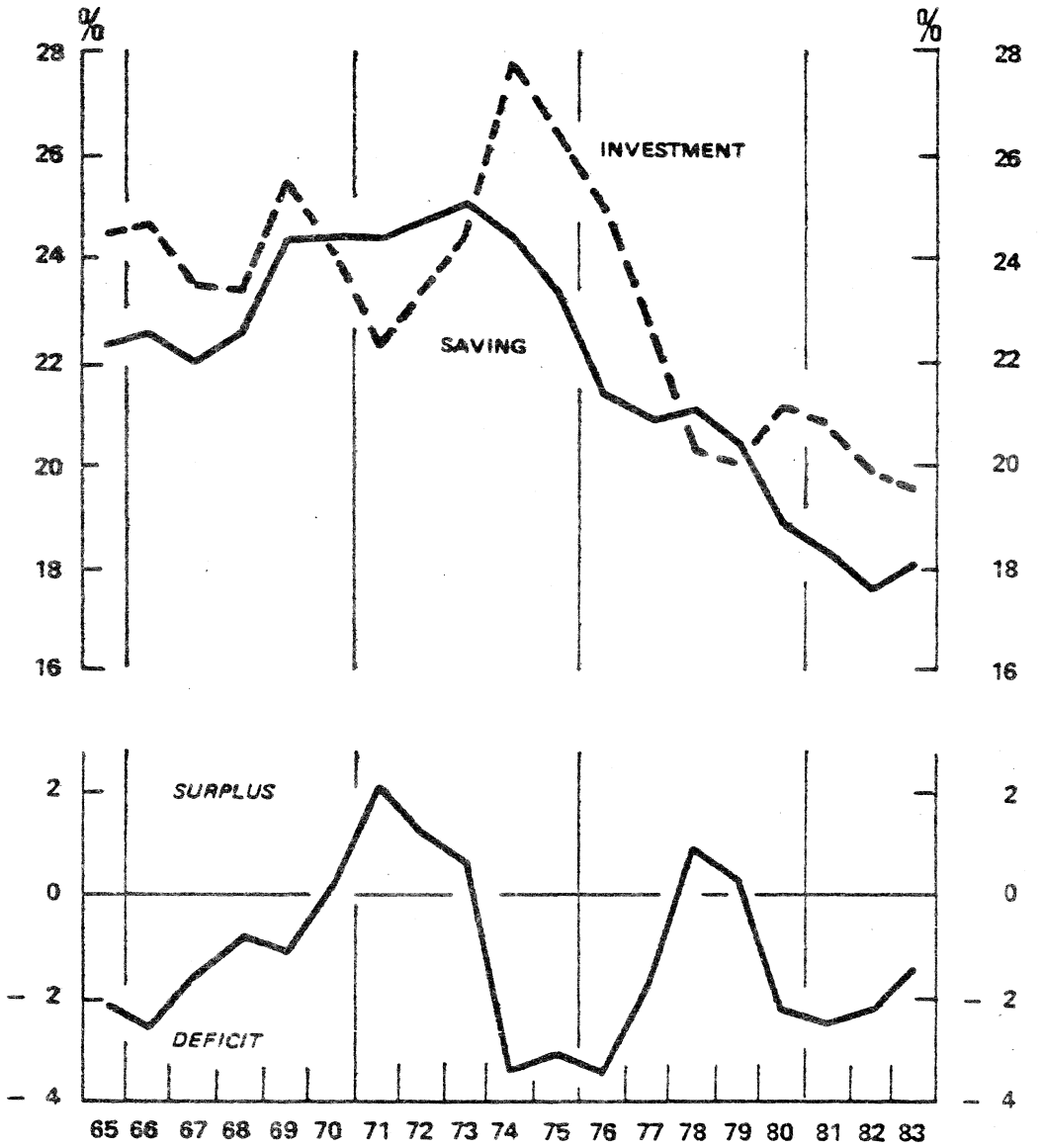
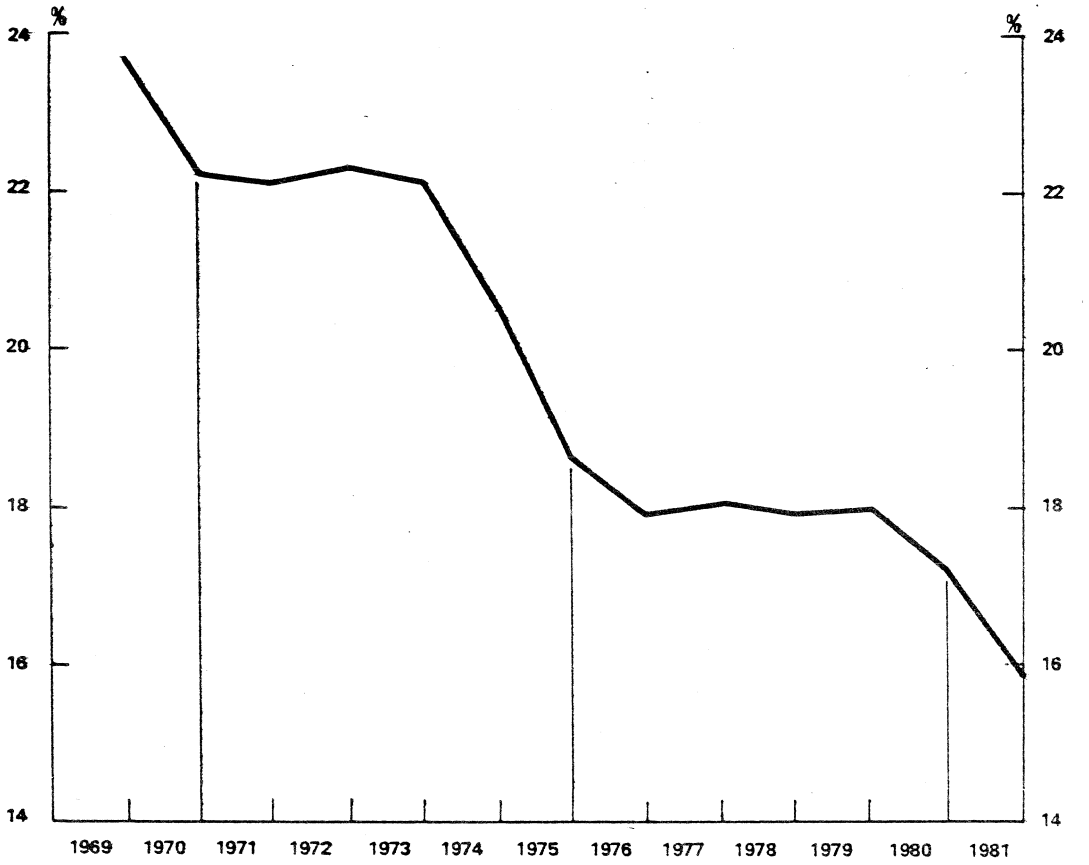


CHART 3–E

RATE OF RETURN OF CAPITAL



Source: Dirección General de Planificación. Ministerio de Economía y Hacienda.

investment by inducing high interest rates and diminishing credit availability.

High interest rates seem to have a positive effect on private savings, but they appear unable to outweight some other negative factors and the declining behavior of general government saving (see Charts 3.D).

The evidence examined suggests that the process of increasing interest rates has a domestic origin, an importante role being played by the growing ratio of public debt outstanding to total domestic nonfinancial sectors debt (and to GDP), which is inconsistent with a balanced and sustained recovery. Empirical results discussed later (Section III) support this view.

II.- The model

In this section, we develop a very simple and aggregative model of the spanish economy to determine simultaneously short- and long-term interest rates, the exchange rate, output and the price level. Because the model is quite compact it necessarily means that we have only incorporated the salient features in a "stylized" way to have a good approximation to reality. We have only represented those determinants of interest rates which are likely to be most important after taking into account institutional arrangements and previous empirical studies. Thus, a) we assume imperfect substitution among assets (and liabilities) and, particularly, between pesetas and foreign-currency assets (and liabilities)(1); b) we take account of empirical evidence against a simple formulation of the Fisher effect (2); c) we center the proximate determination of interest rates in the money and credit markets, and we recognize the sluggishness in credit market clearing.

---

(1) This assumption is supported by different empirical studies (i.e. Dolado-Durán (1983), Viñals (1983), Berges (1984)) and controls over international capital movements (see OCDE (1982)).

(2) Mauleón (1984), Pérez (1977)

In this model, the bank credit market plays a key role in the transmission of monetary impulses to exchange rate, output and prices (1).

The basic structure of the model can be represented by the following set of equations (2):

$$AC^s = h_o \underset{+}{(\hat{M})} \qquad [2.1]$$

$$AC^d = h_1 \underset{-}{(r_s}, \underset{+}{M}) \qquad [2.2]$$

$$M^d = h_2 \underset{-}{(r_s}, \underset{+}{P}, \underset{+}{Y}) \qquad [2.3]$$

$$AC^s = AC^d \qquad [2.4]$$

$$M^d = M \qquad [2.5]$$

$$CT_P^d = h_3 \underset{-}{(r}, \underset{+}{(r_w} + \underset{+}{\Delta e^e}), \underset{+}{P}, \underset{+}{Y}) + CPU_P \qquad [2.6]$$

$$e{+}CT_F = h_4 \underset{+}{(r}, \underset{-}{(r_w} + \underset{+}{\Delta e^e}), \underset{+}{P}, \underset{+}{Y}, \underset{+}{(CT_p^d} - CT_p)) + e{+}CPU_F \qquad [2.7]$$

---

(1) This is a consequence of the high level of intermediation in the Spanish financial markets. Bank credit (a broad definition including total bank earning assets: loans and securities) represents around 75% of non financial sectors liabilities, and foreign-currency liabilities are close to 17%. Furthermore, bank liabilities are around 90% of non bank firms and households assets.

(2) All variables (except interest rates, which are in levels) are expressed in natural logarithms; the exchange rate, e, is defined as the domestic currency price of one unit of foreign exchange.

$$\Delta r = \lambda(CT_p^d - CT_p) \qquad [2.8]$$

$$M = CT_p + R + OP \qquad [2.9]$$

$$R = CCA + CT_F + OPB \qquad [2.10]$$

$$CC = h_5((e + P_w - P), Y, IM_w) \qquad [2.11]$$
$$(+) \quad (-) \quad (+)$$

$$CCA = \Sigma CC \qquad [2.12]$$

$$\hat{R} = \Sigma R_{-h}\, \delta_h \qquad [2.13]$$

$$\Delta e = h_6((e - P + P_w)_{-1}, (\Delta P - \Delta P_w), (R - \hat{R})) \qquad [2.14]$$
$$(-) \quad (+) \quad (-)$$

$$Y = h_7(r, \Delta P^e, G, (e + P_w - P), IM_w) \qquad [2.15]$$
$$(-) \quad (+) \quad (+) \quad (+) \quad (+)$$

$$Y = h_8((W - P), (e + P_w - P)) \qquad [2.16]$$
$$(-) \quad (-)$$

$$W = h_9(P^e, Y) \qquad [2.17]$$
$$(+) \quad (+)$$

$$\Delta e^e = \theta_1((e - P + P_w), (\Delta P^e - \Delta P_w^e)) \qquad [2.18]$$
$$(-) \quad (+)$$

$$\Delta P^e = \theta_2(\Delta \hat{M}) \qquad [2.19]$$
$$(+)$$

$$\Delta P^e - \Delta P_w^e = \theta_4(\Delta P - \Delta P_w) \qquad [2.20]$$

The model has twenty equations in twenty unknowns (AC^s, AC^d, r_s, M, M^d, CT_p^d, CT_p, r, CT_f, e, R, R, P, Y, w, CC, CCA, e^e, P^e, P_w^e), where the monetary aggregate target, $\hat{M}$, bank credit to general government, CPU, real government expenditures, G, the foreign variables: r_w, IM_w, P_w, M_w, and some other items of the banks balance sheet and the balance of payments: OP, OPB, are taken as exogenous.

Equations [1] - [5] are a simplified monetary block, where the intermediate monetary target, $\hat{M}$, real output, Y, and the price level, P, enter as explanatory variables to determine a short-term interest rate, r_s, the adjusted bank reserves, AC (1), and money (or liquidity) balances, M. Monetary policy implementation rests upon control by the Bank of Spain of the evolution of adjusted bank reserves (2). Within the range of annual rates of growth announced by the authorities at the end of every year, the Bank of Spain fixes a concrete guideline, $\hat{M}$, which becomes a landmark for the implementation of monetary policy for a short period of time --a quarter, usually--, through adjusted bank reserves supply, AC^s, on a daily basis. Although the Bank of Spain pays attention, in the very short-run, to short-term interest rates to conduct money markets in an orderly way, interest rates feedback on bank reserves supply is small on a quarter. Additionally, we

---

(1) "Reserve adjustments" allow for the effects of changes in reserve requirements on bank liabilities.

(2) See Martínez Méndez (1980), Ariztegui-Pérez (1984).

assume fully sterilized intervention, which is supported by empirical evidence on the period considered (1). However, in modulating monetary targets within the annual ranges, the Bank of Spain is paying increasing attention (specially after 1979) to foreign interest rates and foreign price changes to avoid their impact on domestic prices and wages in an economy with a high degree of indexation. This introduces a channel of transmission of foreign interest rates movements on the domestic money market conditions, as far as AC^s is dependent on the preannounced annual targets and the actual evolution of foreign money markets.

Other channels could flow through the demand for bank reserves, [2], and the demand for money, [3]. The first is becoming increasingly important in the last few years as a consequence of reforms introduced in forward exchange market regulation (and the mechanism of intervention) that enable banks to maintain higher amounts of foreign liquid assets. The second is limited by exchange and capital movements controls as far as these are very restrictive for non-financial residents purchases of securities, and foreign currency money balances are forbidden (2). Thus, although domestic money markets are

---

(1) Dolado-Durán (1983) find that sterilization was significant and close to 100% in the period analized (1974-1982). This result is supported also by Viñals (1983), who finds a very substantial, although not 100% sterilization.

(2) Nevertheless, exchange rate expectations may affect the demand for money balances through "leads" and "lags" in foreign currency flows.

increasingly integrated in international money markets, it is through the credit market that foreign interest rates influence more directly domestic rates, and it is through the credit market that monetary policy affects in a very important way exchange rate dynamics (1).

Equations [6]-[9] are a schematic representation of credit markets, where monetary policy and money market conditions, M, bank credit to general government, CPU, real output, Y, the price level, P, foreign interest rates, r_w, and exchange rate expectations, Δe^e, determine domestic credit interest rate, r (2), total credit in pesetas, CT_p, and foreign currency credit, CT_F. We assume sluggishness in the pesetas credit market clearing [8]; as a consequence, the private sector demand of foreign currency credit depends on the excess demand in the pesetas credit market [7].

We have to emphasize the role of the policy mix in determining domestic interest rates. Controlling bank reserves the monetary authorities affect bank credit supply to non-bank domestic sectors, but credit available

---

(1) To this effect, we have to emphasize that exchange control to capital movements has traditionally been a rather liberal one in the case of long-term capital inflows and a very restrictive one in the case of long-term capital outflows.

(2) We are considering a broad definition of credit including total bank earning assets (loans and securities) in pesetas: CT_p. Foreign currency liabilities (loans and securities), CT_F, are net of foreign assets of non-bank residents, and they include foreign currency credit intermediated by resident banks.

to firms and households, CT_p-CPU_p, will also depend on bank credit demanded by the general government. The pressure of public sector on bank credit markets has adopted different forms in the last decade but its joint consequences on interest rates and private sector availability have been quite similar. General government finances a very high portion of its accumulated deficit in the monetary and banking system: --91% in 1974 and 76% in 1983 (81% if we include the recently developed treasury bills market)-- (1) so that CPU_p/CT_p has grown dramatically since 1978 (Chart 5), in a period in which general government net debt outstanding has increased to an annual rate of 50% and monetary authorities have implemented an anti-inflationary policy, decreasing the rate of growth of M3 from 20.1 (20.8% for L) in 1978 to 12.7 (15.5% for L) in 1983.

The allocation of the private sector demand for credit between pesetas and foreign currency liabilities [6]-[7] depends on interest rates differentials, domestic credit market rationing and exchange rate expectations. Thus, monetary policy and public sector deficits affect the short-run dynamics of the exchange market.

A third block of equations, [10]-[14], represents a managed floating exchange rate system, where the Bank of Spain's foreign currency reserves, R, affect the exchange rate through a reaction function [14]. There exists a desired level of foreign currency reserves, R,

---

(1) Additionally, foreign currency credit to general government has been around 6% of debt oustanding during the last decade.

that we assume, in a preliminary stage, a function of past levels [13]. Actual levels [10] are determined by the evolution of cumulated current account, CCA, net foreign currency liabilities, CT_F, and other balance of payments items, OPB. The current account equation [11] and the decisions on portfolio liabilities [7] play a key role influencing R and e. Sterilized intervention is used to offset, in a certain degree, undesired movements in real exchange rate, which enables the authorities to solve, in the short-run, potential conflicts between the objetives of monetary and exchange rates policies. The authorities try to drive the exchange rate around an equilibrium level based on a purchasing power parity (1) reacting with a lag to foreign reserves deviations.

As regards exchange rate expectations [18], we assume that the expected depreciation of the peseta, Δe^e, is dependent on the level of the current spot, e, compared to the current equilibrium based on purchasing power parity, and on inflation differentials.

A fourth set of equations [15]-[17], the "real block", and [19] allow us to endogenize output and the price level. Equation [15] represents real total domestic demand as depending on real interest rate, real general government spending, real exchange rate and real foreign countries imports.

---

(1) Previous empirical studies support (i.e. Dolado-Durán) a weak purchasing power parity hypothesis, where real exchange rate is not constant, depending on domestic and external variables.

Equation [16] represents aggregate output supply depending on real wage and real price of imported inputs. Equation [17] shows the nominal wage process, where nominal wages , W, adjust to changes in the expected price level and to economic conditions. We assume "restricted rationality" in the formation of price expectations [19], as far as the expected rate of inflation depends on preannounnced monetary targets. This is a plausible assumption after 1977; although collective bargaining in Spain has undergone considerable changes during the last few years, there exists an important degree of interaction between monetary policy programming and agreements on wage guidelines reached every year between workers and employers.

As described by equations [1]-[20], our model cannot be empirically estimated because of the presence of a number of unobservables. Therefore, the next logical step is to combine equations [1]-[20] in order to obtain an empirically estimable model without unobservables. Equation [1]-[5] are combined to produce an estimable short-term interest rate equation, and equations [6], [8] and [20'] are combined to produce an estimable bond interest rate. We combine [7], [8] and [20'] to get an estimable private sector demand for foreign currency credit, and [13]-[14] to obtain an exchange rate equation. Finally, equations [16], [17] and [19] are combined to produce an estimable price equation. After substituting and rearranging, we can write the model in terms of observables as:

$$r_s = g_o(P, Y, M) \qquad [2.21]$$

$$\Delta r = g_1(r_w, e-P-P_w, \Delta P-\Delta P_w, P, Y, CT, CPU_p) \qquad [2.22]$$

$$eCT_F - eCPU_F = g_2(r, r_w, e-P-P_w, \Delta P-\Delta P_w, P, Y, \Delta r) \qquad [2.23]$$

$$CC = g_3(e + P_w - P, Y, IM_w) \qquad [2.24]$$

$$\Delta e = g_4((e-P+P_w)_{-1}, \Delta P - \Delta P_w, R - \Sigma R_{-h}\ \delta_h) \qquad [2.25]$$

$$Y = g_5(r, \Delta P^e, G, e-P_w-P, IM_w) \qquad [2.26]$$

$$P = g_6(M, Y, e+P_w) \qquad [2.27]$$

$$CCA = \Sigma CC \qquad [2.28]$$

$$R = CCA + CT_F + OPB \qquad [2.29]$$

$$CT = M - R - OP \qquad [2.30]$$

In a preliminary phase, we have estimated simultaneously equations [21], [22], [26] and [27]. Additionally, we have currently some shortage of data that we expect to fill up in the next future: we don't have quarterly data for general government spending (1); we have assumed that $\hat{M}=M$ until we complete $\hat{M}$ quarterly data; and we have substituted total exports, X, for IM_w in this preliminary work.

---

(1) We have quarterly data for central government expenditures, but it is not a good proxy for the pressure put on demand by the public sector in a period of decentralization of spending to regional governments.

Nevertheless, this four equations system allows us to test the influence of monetary and fiscal policy on interest rates and their influence on economic activity and inflation. This is very important because domestic factors, and particularly the public sector deficit, appear as the most serious candidates to explain interest rates evolution and the poor performance of the economy; slow growth, low level of capital formation, external disequilibrium and inflation.

Some economic advisers and government officials take the view that tight monetary policy is the main factor explaining this poor performance. They demand a high public deficit (around the current levels: 6% of GDP) and an expansionary monetary policy.

Therefore, it is crucial to test jointly the existence of a crowding-out process and the consequences of an expansive monetary policy.

In estimating equations [21]-[22] we have removed the segmented or recursive determination of short-term and long-term interest rates that the model sets up. Thus, we have included in [21] a proxy of the pressure put on the credit market by the public sector to test its influence on the market for bank reserves and the short-term interest rates; and we have included short term interest rate as an explanatory variable in equation [22]. This would be supported by a more developed model including a market for short-term paper that has been omitted in the basic model.

III.- Empirical results

We have estimated a four equation model to address the questions raised in the preceding section. The model has been estimated by full information maximum likelihood methods in the period spanning from 1975 to 1983 with quarterly spanish data. The four equations seek to explain the behaviour of key macroeconomic variables in the monetary and real sector. They try to follow the channels through which exogenous shocks affect the behaviour of the economy. The variables explained are short and long term interest rates (r_s, r), real output (Y) and prices (P). The model takes as given or exogenous, real exports (X), nominal growth of a broad measure of money (M3), credit to the public sector (CPU), and import prices (PI). The estimation results are as follows (1):

$$r_s = \underset{(5.7)}{6.8}(CPU-CT) + \underset{(5.3)}{52}(P+Y-M)_{-1} + \underset{(3.2)}{75}\Delta P_{-1} + \underset{(3.1)}{93}(Y-Y_{-3})_{-2} - \underset{(3.3)}{94}(\Delta P+\Delta Y-\Delta M)_{-4}$$

$$\Delta r = \underset{(2.0)}{.33}\Delta r_{-1} + \underset{(3.4)}{23}\Delta(P+Y-CT)_{-1} + \underset{(2.5)}{6.3}\Delta(CPU-CT) + \underset{(2.5)}{.05}\Delta(r_{s,t-1}+r_{s,t-2}) +$$

$$+ \underset{(1.2)}{.2}\ M12 + \hat{u}$$

$$\hat{u} = \underset{(1.8)}{-.5}\ \hat{u}_{-3} + \hat{\varepsilon}$$

---

(1) All variables (except interest rates, which are in levels) are expressed in natural logarithms. The no significant variables have been excluded.

$$\underset{(5.4)}{\Delta_4 Y} = \underset{(5.4)}{.75\ \Delta_4 Y_{-1}} + \underset{(2.3)}{.063\ \Delta_4 X_{-2}} - \underset{(2.7)}{.01\ \Delta r} + \hat{v}$$

$$\hat{v} = \underset{(1.4)}{-\ .4\ \hat{v}_{-4}} + \hat{\varepsilon}$$

$$\Delta P = \underset{(4.4)}{.43\ \Delta P_{-1}} - \underset{(2.2)}{.24\ \Delta P_{-4}} + \underset{(7.)}{.6\ \Delta M} + \underset{(4.)}{.51\ \Delta Y_{-2}}$$

$$+ \underset{(2.2)}{.31\ \Delta Y_{-4}} + \underset{(2.7)}{.033\ \Delta PI} + \underset{(4.1)}{.052\ \Delta PI_{-4}} \qquad (3.1)$$

where $\Delta=1-L$, $\Delta_4=1-L^4$, and M12 is a quarterly dummy variable that takes the values (-1, -1, 0,1) (The appendix gives a more detailed account of the estimation results).

One possible way to quantify the impact of public deficit financing is to obtain the mathematical long run solution of the model. For that purpose we need some notation. Let us consider the usual linear and dynamic simultaneous equation system written in the following form:

$$\underset{(nxn)}{B\ (L)\ Y_t} + \underset{(nxk)}{C\ z_t} = u_t \qquad (3.2)$$

where B(L) is a polynomial matrix on the lag operator L, 'y' is a vector of 'n' endogenous variables, and the k exogenous variables are gathered in 'z' (current and lagged). For the purpose of obtaining the long run solution it does not matter whether 'u_t' is

autocorrelated or not. This is because we set it to its expectation, that is, zero. Given a set of values of the exogenous variables z, the long run solution for 'y' is simply given by

$$Y = B(1)^{-1} C Z \qquad (3.3)$$

Seasonal dummies would affect only the non-homogeneous part of the solution, leaving the 'systematic' or homogeneous part unaltered, as given in (3.3). Noting that

$$(1-L^4) = (1-L)(1+L+L^2+L^3) \qquad (3.4)$$

we find that the long run solution of the model for prices and real output as given in (3.3) are as follows:

$$\Delta Y = .12\Delta M - .058\Delta CPU - .024\Delta PI + .14\Delta X \qquad (3.5)$$

$$\Delta P = .86\Delta M - .060\Delta CPU + .13\Delta PI + .14\Delta X \qquad (3.6)$$

(M has been set equal to CT for convenience. This does not strain the estimation results).

Several comments are in order. First we note the (near) unit elasticity of prices w.r.t. money and the (almost) null response of output to nominal money. We find also a significant negative effect of credit financed public deficit (CPU) on GDP (Y), which works through its impact on interest rates. In order to get a more understandable measure of the public deficit weight, it may be useful to consider the level solution of the output equation which is given by,

$$y = m^{.12}\ cpu^{-.058}\ pi^{-.024}\ x^{.14} \qquad (3.7)$$

Now we can break down the GDP growth rate in the sample period according to the contribution made by each factor. Manipulation of (3.7) yields,

$$(1+g_y) = (1+g_m)^{.12}(1+g_{cpu})^{-.058}(1+g_{pi})^{-.24}(1+g_x)^{.14} \quad (3.8)$$

where $\Delta x/x = g_x$ and similarly for the remaining variables. Note that $\Delta Log(x) \neq \Delta x/x$ when this last quantity is far away from zero and this is why we cannot use (3.6) under these conditions. Solving (3.8) for 'g_y' and substituting the sample values of g_m, g_{PI}, g_x from 1975 to 1983 we get,

$$g_y = (1.27)(1+g_{cpu})^{-.058} - 1 \quad (3.9)$$

Since $g_{cpu} \simeq 7.2$, (720%), that gives an estimated value for 'g_y' of 13% which is not far from the actual value of 15%. Had 'g_{cpu}' been equal to zero, the GDP growth rate would have been 1.3% higher every year during the sample period, that is double than it actually has been. Undoubtedly, there is a feed-back from GDP to the deficit but this does not change this conclusion (this point is discussed below). Money financing of the public deficit would not have improved things. The long run solution (3.5,6) shows that most of that increase would have been absorbed by inflation with hardly any real effects. Formally, the model admitts this mathematical possibility. But the implied rate of inflation would be so high that the economy would be greatly perturbed rendering useless the simplification of the model (3.1).

It may be worthwhile analyzing the working of the system facing exogenous shocks, so as to understand the

final multipliers of (3.6). An increase in nominal money supply has an immediate negative impact on the interest rate, which pushes output up. But it drives up prices directly and indirectly through increased ouput. This offsets the initial fall in interest rates, leaving output almost unchanged. Exports have a positive effect on output, thereby increasing velocity and so interest rates and prices. Finally, import prices have an immediate effect on domestic prices that in turn, push up interest rates, and real GDP down.

These are the basic features of the model. We turn now to a discussion of the estimation problems and some remaining questions. First of all, we had to deal with choosing a long term interest rate. Spanish capital markets are narrow and firms are financed mainly by private banks. But it is well known that the credit market adjusts sluggishly. Some rationing is normal, and the rate of interest on loans is fairly sticky. Also, this market was deregulated in 1977. We decided finally to pick up the rate of interest on long term private industrial bonds (r). Its shape matches fairly closely that of the short term interbank rate, which is the only really free market rate in Spain (see Chart 4). The second important decision we faced was the selection of a sample period. Since only in the last years the public deficit has had a sizeable amount we thought 1974 was an adequate choice. This is because the impact of a variable cannot be captured if its variability is small.

A model must pass several tests if it is to be supported by data. The following four criteria are sufficiently general: a) stability, b) absence of serial correlation, c) no significant variables excluded, d)

normality of residuals. There is a deep motivation behind all of them: the first is a guaranty against the well known problem of data mining, unavoidable in empirical research. The second and third ensure the absence of biases, and the validity of standard errors. Finally, the fourth is devised to prevent the disturbing impact of outliers in all kinds of least squares fits.

The first equation explains the short term interest rate by variables determining the supply and demand for money, and by the pressure of general government demand for credit. This reflects the fact discussed previously, that the disequilibrium in this market translates into the market for bank reserves. The equation does not include as regressor any lagged dependent variable so that adjustments take place fast as postulated by the theory. The fit as measured by R^2 is fairly high. It is remarkable that foreign short terms interest rates were statistically insignificant (we tried the US federal funds rate). There was a slight problem with some outliers (see Chart 4) but since the equation is 'static', the solution is just to drop those observations from the analysis. This problem can be conveniently tackled in the framework of unobservable variables. Suppose that in period T_1 we observe a model $Y=xB+\varepsilon$, but that only the x's are available in other period, T_2. A reasonable procedure would be to estimate first the model by OLS on T_1, predict Y_2 using X_2, and reestimate it by OLS with dependent variable (Y_1, Y_2). Then, we would be minimizing,

$$(Y-X_1B)'(Y-X_1B) + (\hat{B}-B)X_2'X_2(\hat{B}-B) \qquad (3.10)$$

The first sum of squares is minimized at B, and the second is zero at this value. Therefore, we get the same estimate of B by simply discarding X_2.

Real output is explained by exports (real) and first differences of nominal long term interest rates. The R^2 is reasonably high although most of it comes from the contribution of the lagged dependent variable. The D-W test does not have any known distribution in this case but it is customary to present it. It is implicitly assumed that a very extreme value detects 'something'. Although the equation is non linear in parameters the R^2 can be defined as $(1-\hat{\sigma}^2_\varepsilon/\sigma^2_y)$ and gives an idea of the goodness of fit. The data for real quarterly output have been interpolated at the Research Department of the Bank of Spain using Denton's methodology.This is probably why the series has a strange seasonal pattern vhich can be softened by means of the filter $(1-L^4)$ since it can be written as a moving average of simple increments (see 3.4). The long run elasticity of exports is 25% which squares previous information. The interest rate appears with the correct sign and it is significantly different from zero. It must be stressed that single OLS estimation did not capture this effect, simply because simultaneity in this model is essential. Some omitted variables are government expenditures and taxes. The basic reason is that quarterly data on those variables are not available. But it is plausible that they are a function of real output, and so, the equation is not grossly misspecified. Nevertheless this omission is likely to have caused an overestimation of the crowding out effect (a straightforward calculation from national accounts shows a contribution of .5 annual percentage points to GDP, on average, by public consumption and investment).

Interest rate equations are frequently modelled in differences, and we have followed that tradition too. However the serial correlation tests showed a systematic negative correlation at all lags, although not very significant. This might be explained as the result of overdifferencing in the following way. Consider an error process of the form

$$u_t = \alpha u_{t-1} + \varepsilon_t = \varepsilon_t/(1-\alpha L),\ 0<\alpha<1 \qquad (3.11)$$

Denoting $\rho=\alpha(1-\alpha)$, it is not too difficult to show that

$$\Delta u_t \simeq - \sum_{s=0}^{m} \rho^s \Delta u_{t-s} + \varepsilon_t \qquad (3.12)$$

But estimation in levels showed persistently a D.W near zero, and a lagged dependent coefficient near unity. Since estimation in levels under these conditions is well known to give even worse problems it was decided finally to estimate the equation in differences. An U.S. long term rate of interest was tested and found totally insignificant. We conclude therefore, that there is not a negative impact of U.S. public deficit on real activity in Spain through domestic interest rates. To the contrary, the short run impact might very well be positive through dolar appreciation and increased exports.

The price equation gives a reasonable fit as measured by the R^2. More interestingly, it tracks very well the jumps of the dependent variable at the beginning of the sample period (see fig. 6). Long run unit elasticity from real income to prices was imposed and

easily accepted by the data. Prices are shown to react quickly to money and with a high coefficient. Import prices are clearly significant too, and the long run coefficient has a reasonable value according to previous information.

All equations passed the three type of tests devised to check the criteria laid down above for validating an equation. Maximum likelihood ratio tests against serial correlation of any order are easily carried out in non linear models with existing computer software packages (i.e. with TSP). Stability tests were conducted on the basis of post-sample predictive accuracy. This type of test is not generally implemented in econometric packages but some programming solves the difficulty. Detecting outliers is always a problem because the probability of finding an observation very far away from the mean in a large sample nears unity. Casual inspection of the graphs in the appendix shows a good visual tracking performance of the model. The actual values of the dependent variables are never missed by a very big amount.

The price equation was reestimated by instrumental variables (IV), including as regressors, the current values of the remaining endogenous variables in the model. No coefficient was detected as significantly different from zero. Joint estimation of the three equations for prices (P), income (Y), and interest ratee (r) led to a test of block recursiviness based on the usual likelihood ratio criterion. The test was passed very easily and therefore, the price equation was estimated independently. A similar argument led to the single estimation of the short term interest rate eauqtion. The motivation here, is to avoid the inadequate sample size

situation. Joint estimation implies a large number of exogenous variables with a limited set of observations. This makes estimates unstable and standard errors large.

Two remaining problems deserve some discussion. The first concerns the treatment of rational expectations. Consider a two equation model as follows

$$Y_t = \beta\, x_t^e + \varepsilon_t$$

$$X_t = \alpha\, Y_{t-1} + v_t \qquad (3.13)$$

The first equation describes the reaction of private agents to the expected value of a policy economic variable. The second equation is a policy rule: authorities set the policy variable according to past private actions. Assuming rational expectations, $x_t^e = Ex_t$, $x_t = x_t^e + u_t$ where x_t^e and u_t are orthogonal by definition. After some manipulation we can write

$$Y_t = \beta x_t + e_t$$

$$= \gamma\, x_t + w_t \qquad (3.14)$$

where x_t and w_t are orthogonal, but γ depends on α as well as on β. Then, if the policy rule changes, so does γ. This problem can be easily solved by a joint maximum likelihood estimation of the first equation in (3.14) and the second in (3.13). Barro and Miller among others suggest that it is the expected deficit what enters the model. In the framework just developed, this is just a problem of testing the endogeneity of the deficit by means of a Hausman test.

There is another important problem that merits attention. In order to validate the simulation exercises conditioned on the deficit we must ensure the absence of feedback. Consider then, the following two equation model in long run equilibrium,

$$y = - cx + h$$
$$x = a - by \qquad (3.15)$$

We cannot say much about 'y' given 'x' unless we ensure that a=b=0. This last situation carachterizes the absence of feedback. But suppose $a \neq 0 \neq b$, and x=0 so that y=b/a=h. The first equation must be fulfilled by the data any how. Then we can compare the actual situation to a hipothetical case in which x=0, and y=h. This is perfectly valid and we only need the first equation to do that. The simulation at the beginning of this section is based on this line of reasoning. Nevertheless, we intend to estimate the feed-back equation from real output and interest rates to public deficit in future research.

IV.- Conclusions

The research reported in this paper was aimed at disclosing the basic forces at work behind the general upwards trend in nominal interest rates. It is generally believed that high interest rates discourage private expenditure, thereby reducing output. We hoped that a close study of these two basic relationships could provide some clues for economic policy.

We set up an econometric model to address these questions. In spite of the obvious flaws of the estimated model, we feel that on the basis of the long run solution presented in (3.5, 3.6) we can draw some important recommendations for policy making. We can summarize them conveniently in the following set of remarks:

-- The behaviour of the Spanish economy in the last ten years reflects the answer of a rigid economic system to an adverse shock. The initial external adverse shock has been amplified by domestic mechanisms.

-- One big problem is the high level of nominal interest rates. Foreign interest rates (i.e. USA rates) do not seem to be the cause. To the contrary, domestic public deficit is identified as the main force behind this upwards trend.

-- Interest rates are found to have a significant negative impact on real activity.

-- Increases in the nominal quantity of money are almost totally absorbed by increased prices in two quarters, with hardly any real effects.

Therefore, we think that one of the big problems of the spanish economy is the public deficit, and this can only be reduced permanently by reversing the structural forces that cause it. This is specially so, since most of the deficit comes from transfers to public firms in bankruptcy and to social security.

APPENDIX: List of variables, graphs and tables

All variables (except the interest rates, which are in level form) are expressed in natural logarithms.

r_s: One month interbank rate.

CPU_p: Domestic credit to the public sector

r: Long term yield on private industrial bonds.

CPI: Consumer price index (also denoted by P).

Y: GDP interpolated by R. Sanz

PI: Imports price index.

M: M3

M12: Dummy variable.

X: Real exports.

V: P+Y-M (income velocity of circulation).

CT_p Domestic credit to non bank sectors.

CPR: $CPU_p - CT_p$.

DR: Δr

DIM: Δr_s

DCPR: ΔCPR

DP: ΔCPI

DY: ΔY (GDP)

DV: ΔV

DSY: $Y - Y_{-4}$

DSX $X - X_{-4}$

DDP: Δ^2CPI

DWY: $Y - Y_{-3}$

DM: ΔM

DPI: ΔPI

DIMM $\Delta(r_{s,t} + r_{s,\ t-1})$

Table 1

Dependent variable

	I M		D P
CPR	6.8	DP_{-1}	.43
	(5.7)		(4.4)
LV_{-1}	52.	DP_{-4}	-.24
	(5.3)		(2.2)
DP_{-1}	75.	DM	.6
	(3.2)		(7.)
		DY_{-2}	.51
			(4.)
DWY_{-2}	93.	DY_{-4}	.31
	(3.1)		(2.2)
DV_{-4}	-94.	DPI	.033
	(3.3)		(2.7)
		DPI_{-4}	.052
			(4.1)
T	35(75.2-83.4)		35(75.2-83.4)
SSR	93.		.0016
R^2	.74		.66
DW	1.8		2.3
Estimation method	Ordinary least squares		Ordinary least squares with linear restrictions
Log. LKH	-67		125.3

Table 2

Dependent variable

	D S Y		D R
b_1	.75	a_1	.33
	(5.4)		(2.0)
b_2	.063	a_2	22.4
	(2.3)		(3.4)
b_3	-.01	a_3	6.3
	(2.7)		(2.5)
ρ_4	-.4	a_4	.05
	(1.4)		(2.5)
		a_5	.2
			(1.2)
		ρ_3	-.5
			(1.8)
T	28(76.3-83.2)	T	28(76.3-83.2)
SSR	.002	SSR	3.7
R^2	.65	R^2	.51
DW	2.2	DW	1.9
Estimation method	System estimated jointly by maximum likelihood		

$$\Sigma = \begin{bmatrix} 7 * 10^{-4} & \\ 5 * 10^{-3} & .13 \end{bmatrix}$$

Log likelihood function: 83.1

Model

$$DSY = b_1 * DSY_{-1} + b_2 * DSX_{-2} + b_3 * DR + u_t$$

$$u_t = \rho_4 \, u_{t-4} + \varepsilon_{1t}$$

$$DR = a_1 * DR_{-1} + a_2 \, Dv_{-1} + a_3 * DCPR + a_4 * DIM_{-1}$$

$$+ a_5 * M12 + v_t$$

$$v_t = \rho_3 \, v_{t-3} + \varepsilon_{2t}$$

CHART 4

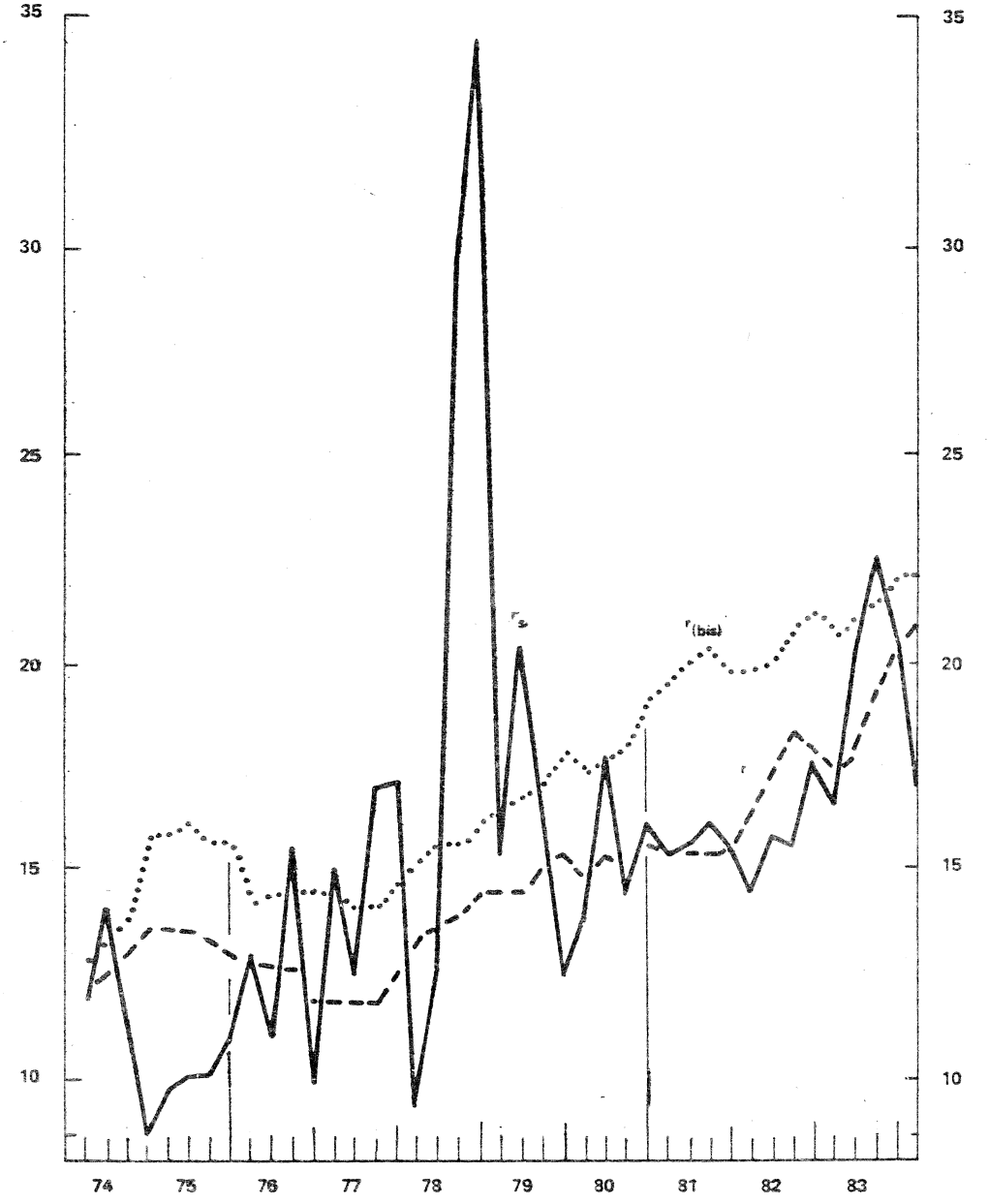


CHART 5

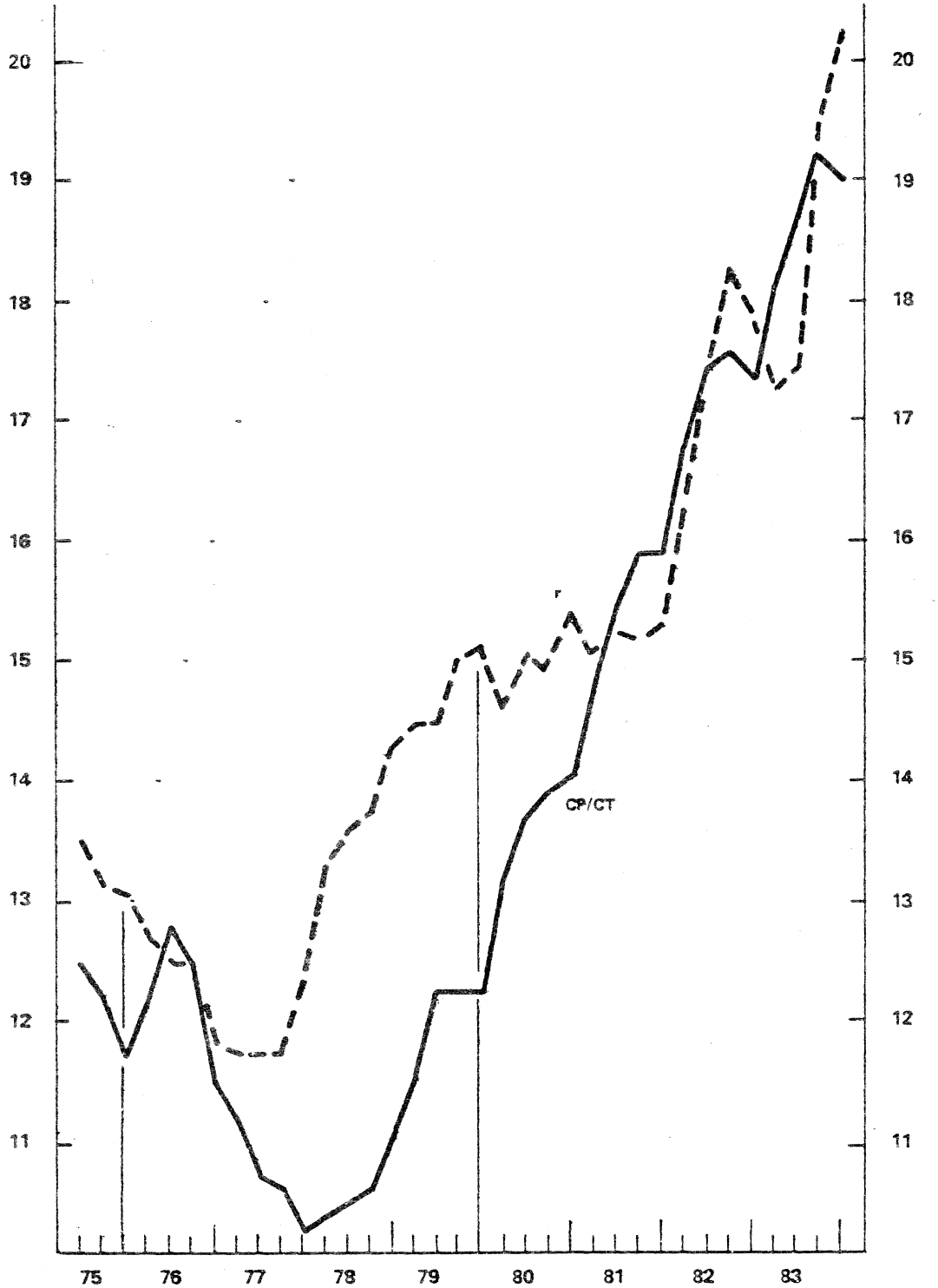


CHART 6

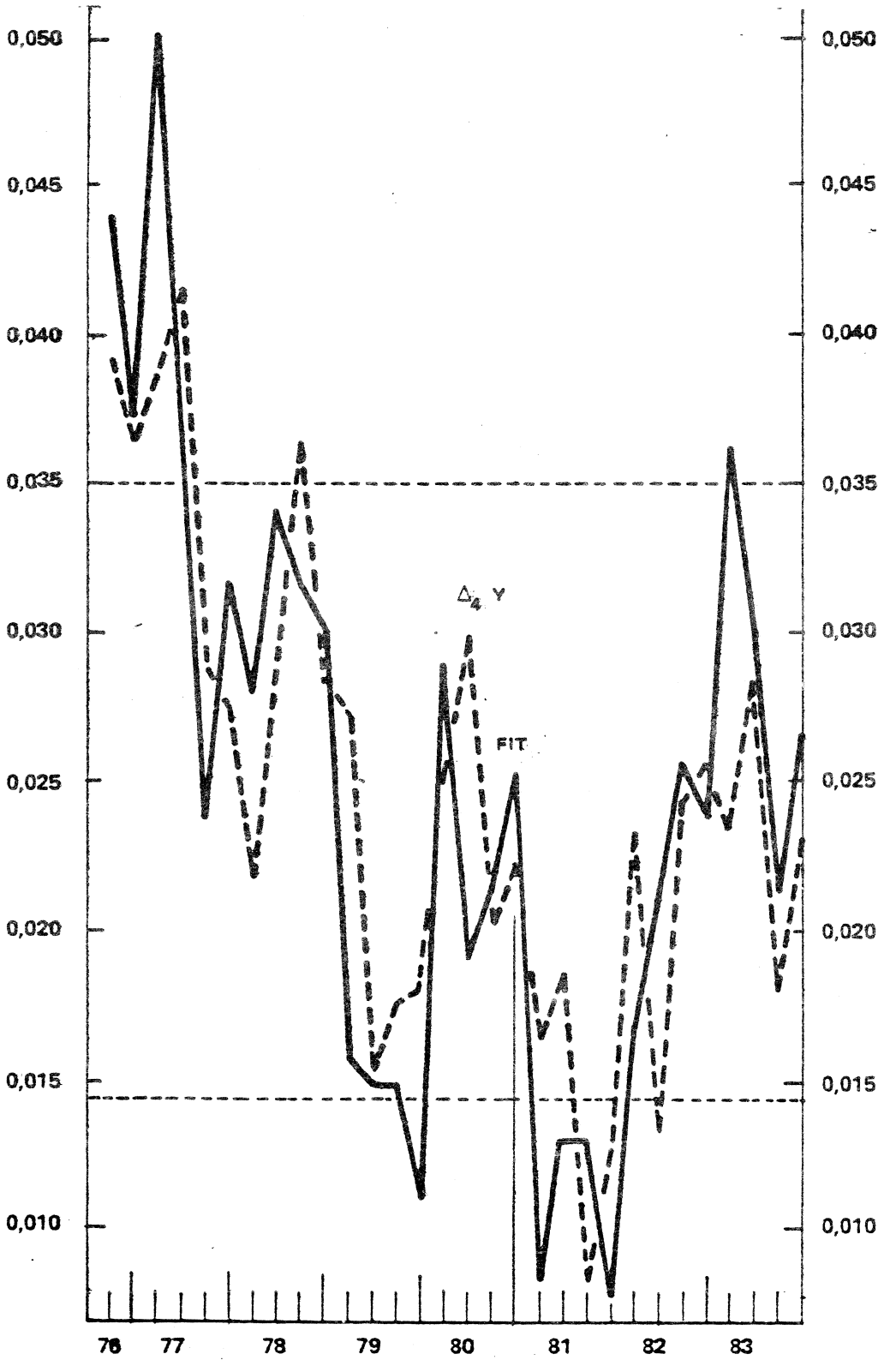

0,050
0,045
0,040
0,035
0,030
0,025
0,020
0,015
0,010
Δ_4 Y
FIT
76
77
78
79
80
81
82
83

CHART 7

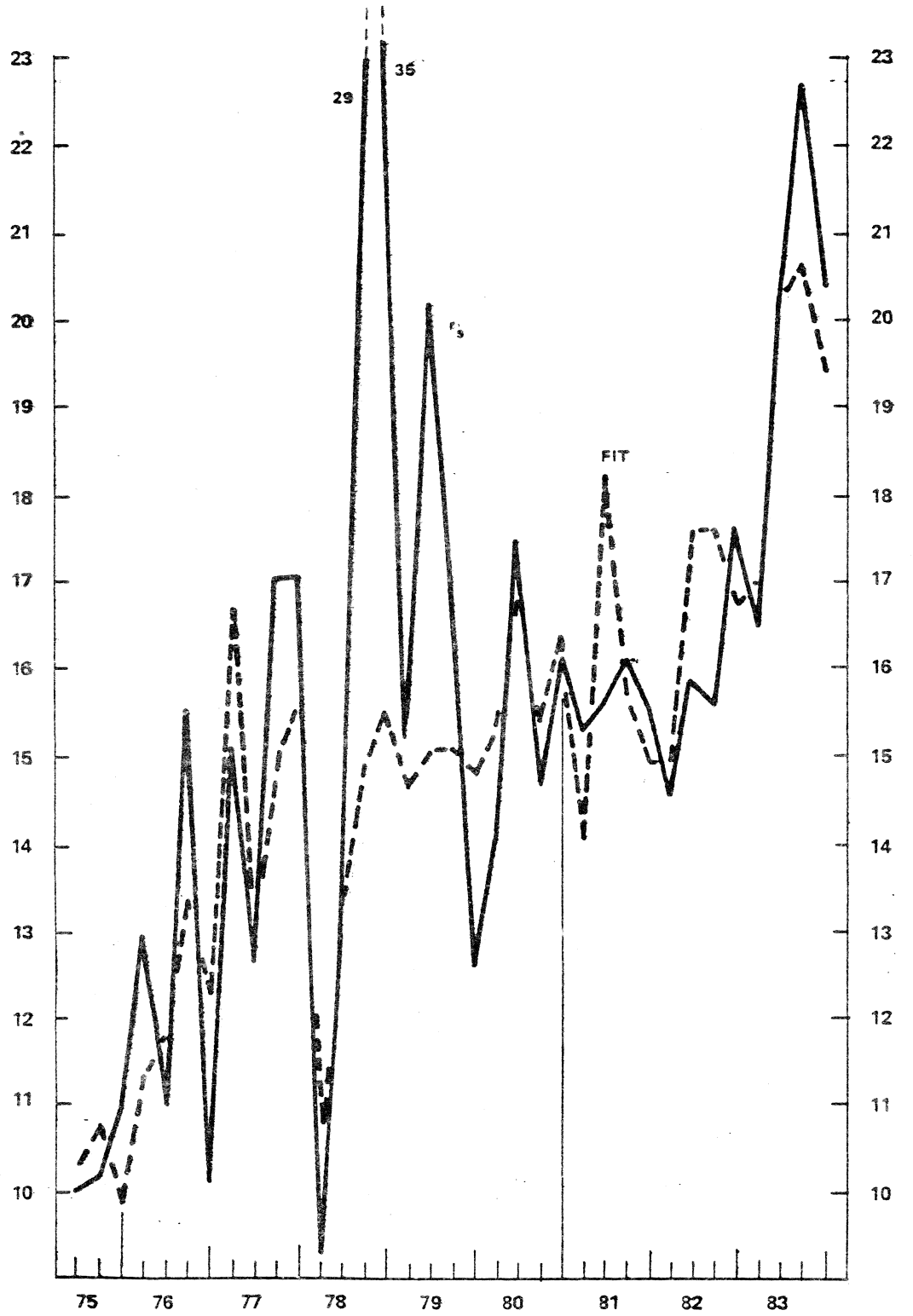

23
22
21
20
19
18
17
16
15
14
13
12
11
10
29
35
FIT
75
76
77
78
79
80
81
82
83

CHART 8

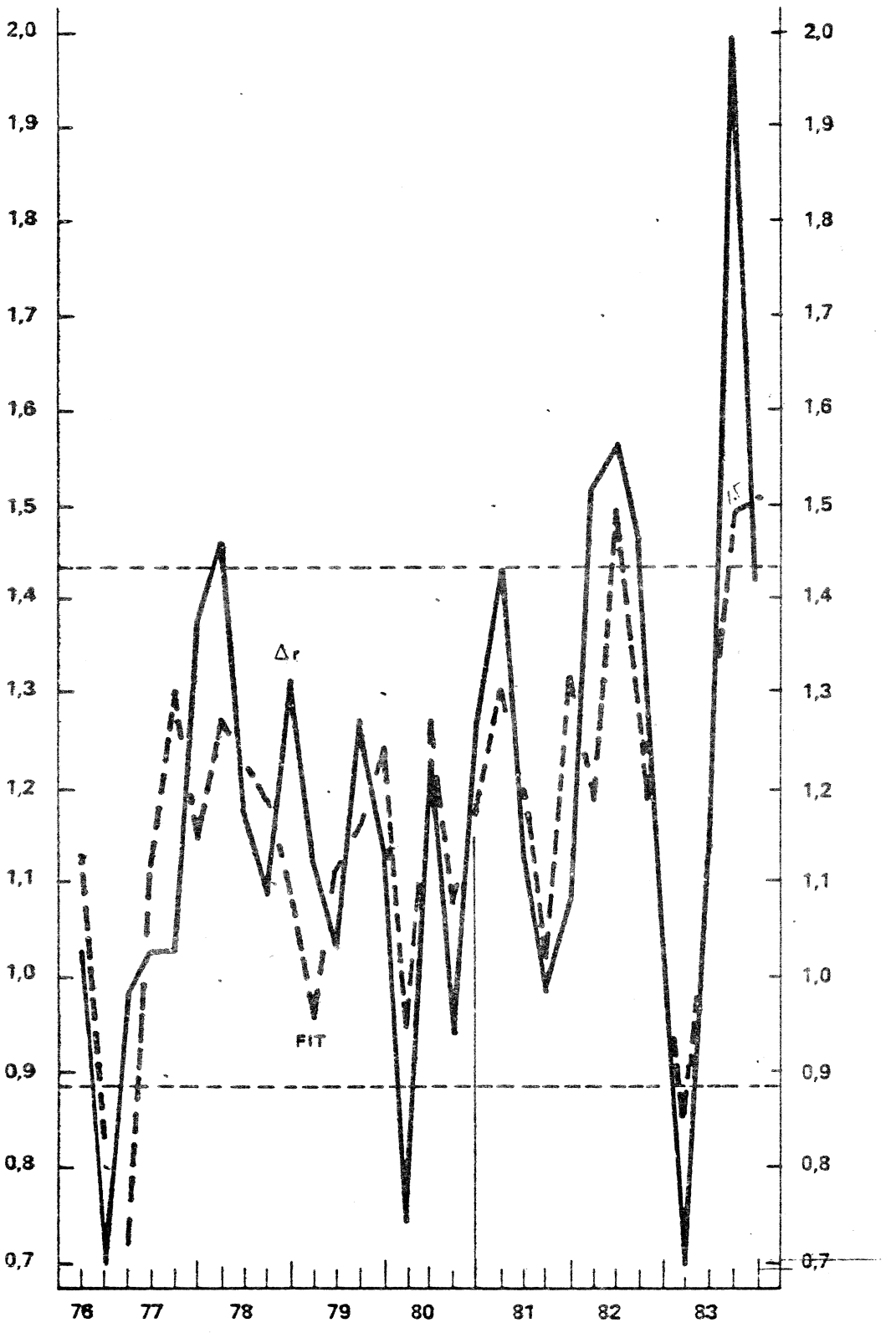
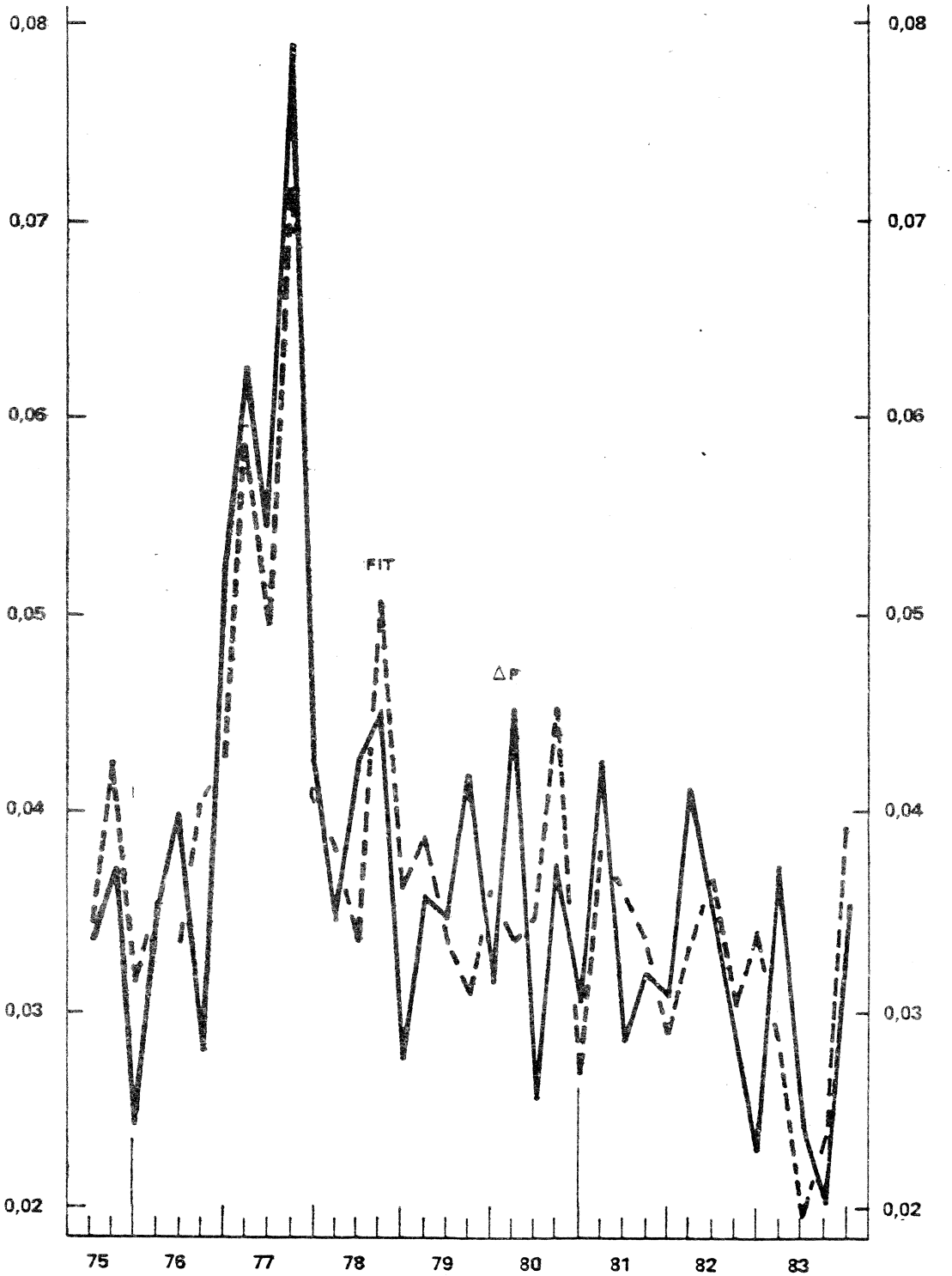


CHART 9



REFERENCES

ARIZTEGUI, J. and PEREZ, J., "Recent developments in the implementation of monetary policy". Documento de Trabajo 8411, servicio de Estudios, Banco de España, 1984.

BARRO, R., "Output effects of Government purchases". Journal of Political Economy 1981.

BERGES, A., "Teoría de mercados eficientes e integración internacional del mercado español de capitales". Revista de Economía Española, 1984.

CLARIDA, R. and FRIEDMAN, B., "Why have short term interest rates been so high?. Brooking Papers on Economic Activity. 2, 1983

DOLADO, J.J. and DURAN, J., "Estimación de un modelo monetario del tipo de cambio peseta/dólar". Información Comercial Española, 1983.

EVANS, P., "Do large deficits produce high interest rates? Forthcoming in American Economic Review, 1985.

FELDSTEIN, M. et al., "The fundamental determinants of the interest rate". Review of Economics and Statistics, 1970.

GALLI, G. and MASERA, R., "Government policies and the working of financial systems in industrialized countries". SUERF. Colloquium. Madrid 1983.

HAUSMAN, J.A., "Specification tests in econometrics". Econometrica 1978.

HEIN, S.E., "Deficits and inflation". Federal Reserve of St. Luis Review 63, March 1981.

HENDRY, H., et al., "Dynamic specification". Discussion Paper A 26. London School of Economics, 1982.

HENDRY, H., et al., "The econometric analysis of economic time series". International Statistical Review, 1983.

LUCAS, R., "Econometric policy evaluation: a critique". Journal of Monetary Economics, 1976. Carnegie Rochester Conference Series, Vol. 1.

MARTINEZ MENDEZ; P., "Monetary control by control of the monetary base: the spanish experience", in The Monetary Base Approach to Monetary Control, B.I.S., 1980.

MAULEON, I., "La demanda de activos de caja del sistema bancario en el período 1978-82: un estudio empírico". Estudios Económicos nº 36, Servicio de Estudios, Banco de España, 1983.

MAULEON, I., "Tipos de interés y tasa de inflación: un estudio preliminar. Mimeo, 1984.

MILLER, P., "Higher deficit policies lead to higher inflation". Federal Reserve Bank of Minneapolis, Quarterly Review, 1983.

MISHKIN, F., "The real interest rate: a multi-country empirical study". Canadian Journal of Economics, 1984.

O.C.D.E., Regulations Affecting International Banking Operations, 1981-II. Paris, 1982.

PEREZ, J., "El tipo de rendimiento de las obligaciones y demanda de depósitos". Estudios Económicos nº 9, Servicio de Estudios, Banco de España, 1977.

WADHWANI,S., "Inflation, bankruptcy and employment". C.L.E. Discussion paper 201. London School of Economics.

VIÑALS, J., "El desequilibrio del sector exterior de España: una perspectiva macroeconómica". Información Comercial Española, 1983.

DOCUMENTOS DE TRABAJO:

7801 **Vicente Poveda y Ricardo Sanz**: Análisis de regresión: algunas consideraciones útiles para el trabajo empírico (*).

7802 **Julio Rodríguez López**: El PIB trimestral de España, 1958-1975. Avance de cifras y comentarios (*). (Publicadas nuevas versiones en Documentos de Trabajo núms. 8211 y 8301).

7803 **Antoni Espasa**: El paro registrado no agrícola 1964-1976: un ejercicio de análisis estadístico univariante de series económicas (*). (Publicado en Estudios Económicos n.º 15).

7804 **Pedro Martínez Méndez y Raimundo Poveda Anadón**: Propuestas para una reforma del sistema financiero.

7805 **Gonzalo Gil**: Política monetaria y sistema financiero. Respuestas al cuestionario de la CEE sobre el sistema financiero español (*). Reeditado con el número 8001.

7806 **Ricardo Sanz**: Modelización del índice de producción industrial y su relación con el consumo de energía eléctrica.

7807 **Luis Angel Rojo y Gonzalo Gil**: España y la CEE. Aspectos monetarios y financieros (*).

7901 **Antoni Espasa**: Modelos ARIMA univariantes, con análisis de intervención para las series de agregados monetarios (saldos medios mensuales) M_3 y M_2.

7902 **Ricardo Sanz**: Comportamiento del público ante el efectivo (*).

7903 **Nicolás Sánchez-Albornoz**: Los precios del vino en España, 1861-1890. Volumen I: Crítica de la fuente.

7904 **Nicolás Sánchez-Albornoz**: Los precios del vino en España, 1861-1890. Volumen II: Series provinciales.

7905 **Antoni Espasa**: Un modelo diario para la serie de depósitos en la Banca: primeros resultados y estimación de los efectos de las huelgas de febrero de 1979.

7906 **Agustín Maravall**: Sobre la identificación de series temporales multivariantes.

7907 **Pedro Martínez Méndez**: Los tipos de interés del Mercado Interbancario.

7908 **Traducción de E. Giménez-Arnau**: Board of Governors of the Federal Reserve System-Regulations AA–D–K–L–N–O–Q (*).

7909 **Agustín Maravall**: Effects of alternative seasonal adjustment procedures on monetary policy.

8001 **Gonzalo Gil**: Política monetaria y sistema financiero. Respuestas al cuestionario de la CEE sobre el sistema financiero español (*).

8002 **Traducción de E. Giménez-Arnau**: Empresas propietarias del Banco. Bank Holding Company Act-Regulation «Y» (*).

8003 **David A. Pierce, Darrel W. Parke, and William P. Cleveland, Federal Reserve Board and Agustín Maravall, Bank of Spain**: Uncertainty in the monetary aggregates: Sources, measurement and policy effects.

8004 **Gonzalo Gil**: Sistema financiero español (*). (Publicada una versión actualizada en Estudios Económicos n.º 29).

8005 **Pedro Martínez Méndez**: Monetary control by control of the monetary base: The Spanish experience (la versión al español se ha publicado como Estudio Económico n.º 20).

8101 **Agustín Maravall, Bank of Spain and David A. Pierce, Federal Reserve Board**: Errors in preliminary money stock data and monetary aggregate targeting.

8102 **Antoni Espasa**: La estimación de los componentes tendencial y cíclico de los indicadores económicos.

8103 **Agustín Maravall**: Factores estacionales de los componentes de M_3. Proyecciones para 1981 y revisiones, 1977-1980.

8104 **Servicio de Estudios**: Normas relativas a las operaciones bancarias internacionales en España.

8105 **Antoni Espasa**: Comentarios a la modelización univariante de un conjunto de series de la economía española.

8201 **Antoni Espasa**: El comportamiento de series económicas: Movimientos atípicos y relaciones a corto y largo plazo.

8202 **Pedro Martínez Méndez e Ignacio Garrido**: Rendimientos y costes financieros en el Mercado Bursátil de Letras.

8203 **José Manuel Olarra y Pedro Martínez Méndez**: La Deuda Pública y la Ley General Presupuestaria.
8204 **Agustín Maravall**: On the political economy of seasonal adjustment and the use of univariate time-series methods.
8205 **Agustín Maravall**: An application of nonlinear time series forecasting.
8206 **Ricardo Sanz**: Evaluación del impacto inflacionista de las alzas salariales sobre la economía española en base a las tablas input-output.
8207 **Ricardo Sanz y Julio Segura**: Requerimientos energéticos y efectos del alza del precio del petróleo en la economía española.
8208 **Ricardo Sanz**: Elasticidades de los precios españoles ante alzas de diferentes inputs.
8209 **Juan José Dolado**: Equivalencia de los tests del multiplicador de Lagrange y F de exclusión de parámetros en el caso de contrastación de perturbaciones heterocedásticas.
8210 **Ricardo Sanz**: Desagregación temporal de series económicas (*).
8211 **Julio Rodríguez y Ricardo Sanz**: Trimestralización del producto interior bruto por ramas de actividad. (Véase Documento de Trabajo n.° 8301).
8212 **Servicio de Estudios. Estadística**: Mercado de valores: Administraciones Públicas. Series históricas (1962-1981).
8213 **Antoni Espasa**: Una estimación de los cambios en la tendencia del PIB no agrícola, 1964-1981.
8214 **Antoni Espasa**: Problemas y enfoques en la predicción de los tipos de interés.
8215 **Juan José Dolado**: Modelización de la demanda de efectivo en España (1967-1980).
8216 **Juan José Dolado**: Contrastación de hipótesis no anidadas en el caso de la demanda de dinero en España.
8301 **Ricardo Sanz**: Trimestralización del PIB por ramas de actividad series revisadas
8302 **Cuestionario OCDE. Servicio de Estudios. Estadística.** Cuadro de flujos financieros de la economía española (1971-1981) (*).
8303 **José María Bonilla Herrera** y **Juan José Camio de Allo**: El comercio mundial y el comercio exterior de España en el período 1970-1981: Algunos rasgos básicos.
8304 **Eloísa Ortega**: Indice de precios al consumo e índice de precios percibidos.
8305 **Servicio de Estudios. Estadística**: Mercado de Valores: Instituciones financieras. Renta fija. Series históricas (1962-1982).
8306 **Antoni Espasa**: Deterministic and stochastic seasonality: an univariate study of the Spanish Industrial Production Index.
8307 **Agustín Maravall**: Identificación de modelos dinámicos con errores en las variables.
8308 **Agustín Maravall, Bank of Spain and David A. Pierce, Federal Reserve Board**: The transmission of data noise into policy noise in monetary control.
8309 **Agustín Maravall**: Depresión, euforia y el tratamiento de series maníaco-depresivas: el caso de las exportaciones españolas.
8310 **Antoni Espasa**: An econometric study of a monthly indicator of economic activity.
8311 **Juan José Dolado**: Neutralidad monetaria y expectativas racionales: Alguna evidencia en el caso de España.
8312 **Ricardo Sanz**: Análisis cíclicos. Aplicación al ciclo industrial español.
8313 **Ricardo Sanz**: Temporal disaggregation methods of economic time series.
8314 **Ramón Galián Jiménez**: La función de autocorrelación extendida: Su utilización en la construcción de modelos para series temporales económicas.
8401 **Antoni Espasa y María Luisa Rojo**: La descomposición del indicador mensual de cartera de pedidos en función de sus variantes explicativas.
8402 **Antoni Espasa**: A quantitative study of the rate of change in Spanish employment.
8403 **Servicio de Producción y Demanda Interna**: Trimestralización del PIB por ramas de actividad, 1975-1982.
8404 **Agustín Maravall**: Notas sobre la extracción de una señal en un modelo ARIMA.
8405 **Agustín Maravall**: Análisis de las series de comercio exterior —I—.
8406 **Ignacio Mauleón**: Aproximaciones a la distribución finita de criterios Ji- cuadrado: una nota introductoria.
8407 **Agustín Maravall**: Model-based treatment of a manic-depressive series.
8408 **Agustín Maravall**: On issues involved with the seasonal adjustment of time series.

8409 **Agustín Maravall**: Análisis de las series de comercio exterior —II—.
8410 **Antoni Espasa**: El ajuste estacional en series económicas.
8411 **Javier Ariztegui y José Pérez**: Recent developments in the implementation of monetary policy.
8412 **Salvador García-Atance**: La política monetaria en Inglaterra en la última década.
8413 **Ignacio Mauleón**: Consideraciones sobre la determinación simultánea de precios y salarios.
8414 **María Teresa Sastre y Antoni Espasa**: Interpolación y predicción en series económicas con anomalías y cambios estructurales: los depósitos en las cooperativas de crédito.
8415 **Antoni Espasa**: The estimation of trends with breaking points in their rate of growth: the case of the Spanish GDP.
8416 **Antoni Espasa, Ascensión Molina y Eloísa Ortega**: Forecasting the rate of inflation by means of the consumer price index.
8417 **Agustín Maravall**: An application of model-based signal extraction.
8418 **John T. Cuddington y José M. Viñals**: Budget deficits and the current account in the presence of classical unemployment.
8419 **John T. Cuddington y José M. Viñals**: Budget deficits and the current account: An intertemporal disequilibrium approach.
8420 **Ignacio Mauleón y José Pérez**: Interest rates determinants and consequences for macroeconomic performance in Spain.

* *Las publicaciones señaladas con un asterisco se encuentran agotadas.*

Información: Banco de España, Servicio de Publicaciones. Alcalá, 50. 28014 Madrid.