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A QUANTITATIVE ANALYSIS OF THE EFFECTS OF CAPITAL CONTROLS: SPAIN, 1986-1990[*]

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ABSTRACT

This paper offers a quantitative assessment of the effectiveness of capital controls in Spain during the period 1986-1990. The analysis is based on a portfolio-balance model previously estimated for the Spanish economy, where the complete elimination of capital controls is simulated. Our results suggest that capital controls would have avoided a net capital outflow amounting to nearly a 4 per cent increase in the Spanish net foreign asset position, as a quarterly average, during the first five years of Spain's membership into the EU.

JEL Codes: C32, F21, F36

1. INTRODUCTION

It is a well known fact that governments frequently impose in practice some controls on international financial transactions, and this in spite of not being a popular issue in academic literature, more concerned with the case of perfect capital mobility [see Adams and Greenwood (1985) for an exception]. These controls are usually justified on two main grounds [see, e. g., Giavazzi and Giovannini (1989)]: (i) trying to isolate domestic interest rates from external developments in a regime of pegged exchange rates, and (ii) avoiding the occurrence of speculative attacks.

Capital controls have been extensively used not only by developing countries, but by industrialized countries as well. In fact, as it has been pointed out by several authors [see, e. g., Rogoff (1985) or Giavazzi and Giovannini (1986)], the use of capital controls by some countries (in particular France and Italy) was a very important factor behind exchange-rate stability during the first years of functioning of the European Monetary System (EMS), in absence of an effective coordination of monetary policies; see Giavazzi and Giovannini (1989) for an overview of the operation of capital controls in the EMS. Dooley (1996) provides a survey of the more recent literature on capital controls, and Obstfeld (1995) reviews the performance of international capital markets and the extent of perfect capital mobility.

The Single European Act envisaged the full elimination of capital controls in the European Union (EU) by July 1st, 1990, except for Spain and Ireland, which were exempted until December 31st, 1992, and Portugal and Greece, which were exempted until December 31st, 1995 (Spain removed them in fact by February 1992). However, as feared by several authors, free capital mobility in a system of pegged exchange rates such as the EMS, in which monetary policy coordination was far from complete, and expectations of exchange-rate stability vanished, led to a severe crisis in the exchange rate mechanism of the EMS after September 1992. Given the size of international capital flows, and the difficulty of setting defensive strategies by central banks against speculative attacks, several authors have proposed the introduction of some kind of capital controls, in the form of an explicit or implicit tax on short-term foreign exchange transactions (Eichengreen and Wyplosz, 1993). This has led to a renewed debate on the feasibility and desirability of throwing some "sand in the wheels of international finance" [see, e.g., Eichengreen, et al. (1995)].

The Spanish experience between the years 1986 through 1990 can provide an interesting case study in order to evaluate the operation of capital controls, for several reasons[1]. First of all, until their removal in February 1992 (and despite their transitory and partial reintroduction in September 1992, in the middle of the strong speculative pressures against the peseta), capital controls had been extensively used by the Spanish authorities, in particular on capital outflows and on short-term movements.

On the other hand, the Spanish economy enjoyed between 1986 and 1990 a period of protracted expansion (see Table 1), characterized by rates of growth above the European average for the Gross Domestic Product (GDP), gross fixed capital formation, and employment. The decrease in inflation and unemployment rates did not prevent, however, a worse performance regarding these variables as compared to the EU average. Finally, integration into the EU was associated with an increasing external opening, together with a readdressing of trade flows towards the rest of the EU, and a worsening in both the trade deficit and the current account, the latter being financed by a spectacular increase in capital inflows and in particular in foreign direct investment[2].

However, this overall highly successful macroeconomic performance was not free of problems. In particular, the strong increase experienced in capital inflows due to the high domestic interest rates (see Table 1), threatened the objectives of monetary policy through their effect on money supply. As a consequence, several measures to hinder speculative capital inflows were introduced by the Spanish authorities since 1987, at the same time that some kinds of outflows were liberalized [see Viñals (1992a)].

Although the degree of capital mobility in the Spanish economy would have been substantial for the last 25 years (Bajo-Rubio, 1998), there would have been some episodes in which capital controls might have been effective. The performance of capital controls in Spain between January 1982 and February 1992 is analyzed in Viñals (1992a) by means of the traditional method of computing deviations from covered interest parity exceeding 0.5 per cent, finding that capital controls had been binding 46 per cent of the time, being deviations stronger after the Spanish integration into the EU. In addition, he also used the more precise method of examining the differential between onshore and offshore interest rates, now for the September 1986-February 1992 period, obtaining that capital controls would have restricted capital flows 83 percent of the cases between both dates. By comparing his results with those of Giavazzi and Giovannini (1989), Viñals (1992a) concluded that the degree of capital mobility in Spain had not been substantially different from that prevailing in France or Italy.

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1 An assessment of the overall performance of the Spanish economy during the 1986-90 period can be found in the different contributions included in Viñals (1992b). The developments in the foreign sector are examined in Bajo-Rubio and Torres (1992).

In this paper we try to provide an alternative way of assessing the effectiveness of capital controls in Spain during the period 1986-1990. In a previous paper (Bajo-Rubio and Sosvilla-Rivero, 1995), we developed a portfolio-balance model, in which international capital movements were simultaneously determined along with the demand for and supply of money. By estimating the model for the whole period, and further simulating the complete elimination of capital controls from 1986 on, we should be able to quantify the degree of success of the Spanish authorities in hindering capital movements during the first years of the Spanish membership into the EU.

The paper is organized as follows. In Section 2 we discuss the theoretical framework of our portfolio-balance model, together with the estimation results for the period 1986-1990. Then, the results from the simulation of the full disappearance of capital controls from 1986 on are presented in Section 3, where some considerations on the applicability of the Lucas critique are also discussed. Section 4 concludes.

2. A PORTFOLIO-BALANCE MODEL FOR THE SPANISH ECONOMY: THEORETICAL ISSUES AND EMPIRICAL RESULTS

Our theoretical framework relies on the portfolio-balance approach, starting from the theory of portfolio selection developed, among others, by Markowitz (1959) and Tobin (1958, 1969), and firstly used to analyze the capital account by Branson (1968). A

[2] See Bajo-Rubio and Sosvilla-Rivero (1994) for an econometric analysis of foreign direct investment inflows in Spain.

comprehensive survey of these models when applied to an open economy can be found in Branson and Henderson (1985).

We assume a small country, where aggregate demand functions for the three assets in the economy (domestic money, and domestic and foreign bonds) are given, all of them in real terms, by:

$$M^d = m\,(\underset{-}{i},\ \underset{-}{i^* + \varepsilon},\ \underset{+}{Y},\ \underset{+}{W}) \tag{1}$$

$$B^d = b\,(\underset{+}{i},\ \underset{-}{i^* + \varepsilon},\ \underset{-}{Y},\ \underset{+}{W}) \tag{2}$$

$$EF^d = f\,(\underset{-}{i},\ \underset{+}{i^* + \varepsilon},\ \underset{-}{Y},\ \underset{+}{W}) \tag{3}$$

where M^d, B^d, and EF^d denote the demands for domestic money, domestically issued bonds, and foreign issued bonds, respectively (being E the exchange rate, defined as the home currency price of foreign currency); and i, i^*, ε, Y, and W are, respectively, the domestic interest rate, the foreign interest rate, the expected rate of depreciation of the home currency, the real level of domestic income, and the real value of domestic wealth. As can be seen from (1), (2) and (3), the demand for each asset would depend positively on its own return, and negatively on other assets' returns, since assets are considered gross substitutes (the return on domestic money is assumed to be zero). On the other hand, asset demands depend also on domestic income, reflecting the assumption that agents hold money for transactions purposes, and positively on total wealth, since assets are assumed to be "normal".

From the definition of wealth, this would be allocated among the three assets:

$$W = M^d + B^d + EF^d \tag{4}$$

which implies the familiar restrictions

$$m_i + b_i + f_i = 0$$

$$m_{i^*+\varepsilon} + b_{i^*+\varepsilon} + f_{i^*+\varepsilon} = 0$$

$$m_Y + b_Y + f_Y = 0$$

$$m_W + b_W + f_W = 1$$

where x_y denotes the partial derivative of x with respect to y.

The equilibrium conditions in the markets for money and domestic bonds would be:

$$M^d = M^s \tag{5}$$

and

$$B^d + B^{*d} = B^s \tag{6}$$

where M^s and B^s denote the real stocks of money and domestic bonds, respectively. We assume that domestic money is not demanded abroad, and B^{*d} is the foreign demand for domestically issued bonds, in real terms and measured in home currency, which depends on similar arguments than domestic demand:

$$B^{*d} = b^*(\underset{+}{i-\varepsilon},\ \underset{-}{i^*},\ \underset{-}{Y^*},\ \underset{+}{W^*}) \tag{7}$$

being now Y^* and W^* the real level of foreign income, and the real value of foreign wealth, respectively.

Adding and subtracting B^{*d} in the wealth restriction (4) we get

$$W = M^d + (B^d + B^{*d}) + (EF^d - B^{*d})$$

where the terms on the right-hand side are, respectively, the total demand for money, the total demand for domestic bonds, and the net foreign asset position of the home economy (*NFAP*),

i. e., a measure of the net financial claims on foreigners. Notice that the first difference of *NFAP* would be equivalent to the capital account of the economy. In this way, if $\Delta NFAP$ were positive a net capital outflow (or a net loan to the rest of the world) would take place, whereas if negative the home country would experience a net capital inflow (or a net loan from the rest of the world).

In virtue of the Walras's Law, only two of the three markets are independent so, omitting the domestic bonds' market, the following two equations would be enough to characterize asset demands:

$$NFAP = \underset{}{\varphi}\,(\underset{-}{i},\ \underset{+}{i^*},\ \underset{+}{\varepsilon},\ \underset{-}{Y},\ \underset{+}{Y^*},\ \underset{+}{W},\ \underset{-}{W^*}) \tag{8}$$

and

$$M^d = m\,(\underset{-}{i},\ \underset{-}{i^* + \varepsilon},\ \underset{+}{Y},\ \underset{+}{W}) \tag{1}$$

where (8) is obtained from (3) and (7).

To close the model, we specify an equation for the supply of money. Following the well-known money multiplier approach [see, e. g., Papademos and Modigliani (1990)], the supply of money would be equal to a multiple of the monetary base (i. e., the monetary liabilities of the central bank or "high-powered money"):

$$M^s = \mu\,(\underset{-}{h},\ \underset{-}{z},\ \underset{+}{i},\ \underset{-}{i_R},\ \underset{-}{i_{CB}})H \tag{9}$$

where H denotes the monetary base and μ is the money multiplier, which is made dependent on the currency-deposits ratio (h), the required reserves ratio (z), the economy's interest rate (*i*), the rate of return on reserves (i_R), and the effective cost of borrowing from the central bank (i_{CB}), and where the three latter variables affect μ via the excess reserves ratio.

In this way, equations (8), (1), and (9) make up a small model of the financial sector of a small open economy, embodying the equilibrium conditions in assets markets. A noticeable feature of this model specification is that, since the first difference of *NFAP* amounts to the capital account balance (see above), cointegration analysis will allow us to get estimates of both the *stock* component of capital movements in the long run (i. e., *NFAP*) and its *flow* counterpart in the short run (i. e., the capital account balance)[3].

We have estimated the above model with quarterly data for the period 1980.1-1990.4 (see the Appendix for the definitions and sources of the variables), using the two-step method proposed by Engle and Granger (1987)[4]. In this way, we first estimated the long run by means of several alternative procedures: Phillips-Hansen, dynamic ordinary least squares (DOLS), and Phillips-Loretan [see Phillips and Hansen (1990), Stock and Watson (1993), and Phillips and Loretan (1991), respectively]. And, secondly, a simultaneous-equations error-correction model was estimated to capture the short-run dynamics towards the long-run equilibrium, using the method of three-stage least squares (3SLS). The results for the long run and the short run are shown in tables 2 and 3.

3 A similar approach is followed by Baulant and Boutillier (1992) who, unlike this paper, adopt a single-equation framework, so not taking into account the interaction between capital movements and the money market.

4 All the variables used in the estimations have been tested for the presence of a unit root, both at annual and quarterly frequencies. The results reported in Bajo-Rubio and Sosvilla-Rivero (1995) do not suggest any stationarity at both frequencies for all of them, except for our proxy for expected depreciation, which turned to be a stationary variable.

As can be seen in Table 2, the results for the long run are quite similar for any of the procedures utilized. The estimated equations for the short run in Table 3 include the residuals from the Phillips-Hansen method, robust to the presence of serial correlation and second-order endogeneity bias (similar results were obtained for the rest of cases). The goodness-of-fit of the estimated equations can be seen in Figure 1, where the observed and fitted values from the equations in Table 3 are shown. Notice that 3SLS is an instrumental variable method for estimating systems of simultaneous equations where there can be endogenous variables in the right-hand side as well as contemporaneous correlation of the disturbances, providing consistent and asymptotically efficient estimates [see, e. g., Judge, et al. (1988) or Greene (2000)].

In order to test for the validity of the choice of the instruments, the specification test due to Sargan (1958) was computed, obtaining a value of 0.53 (asymptotically distributed as a $\chi^2(1)$ in our case) that does not reject the independence of the instruments and the errors.

Notice that the estimated equation for *NFAP* does not include foreign wealth, unlike the theoretical model. Leaving aside the difficulty of finding an adequate proxy, we have tried the variable used in Sosvilla-Rivero (1990) (the sum of money holdings, net private claims on government, and net claims on abroad, in real terms, for Germany and the US), but, although its coefficient showed the correct sign, it proved to be highly correlated with our proxy for foreign income. On the other hand, net foreign income has been proxied by the imports of the industrialized countries in real terms, which can be justified on the grounds that most of the economic relations of Spain are with those countries, at the same time that such a variable should follow nearly the evolution of world economic activity.

The short-run equation for *NFAP* also includes the variable *KC* (see the Appendix for the exact definition), which proxies the effects of capital controls by measuring deviations from covered interest parity. These deviations would signal the presence of unexploited arbitrage profits, which can be attributed to the active use of capital controls [see, e. g., Giavazzi and Pagano (1985) or Viñals (1992a)]. Notice that capital controls are not included in the long-run relationship since, as is usually asserted in the literature, even permanent controls would have only temporary effects[5].

The estimated equations for the demand for and supply of money use the *M2* definition. The long-run equation for the former includes, in addition to the alternative interest rate and the income level, a measure of the own rate on *M2* (i_M), and a dummy variable that would proxy the effect of financial innovation (*FI*) [as in Manzanedo and Sebastián (1990)].

Several cointegration test statistics are presented in Table 2: the Sargan and Bhargava (1983) Durbin-Watson residual-based test, the augmented Dickey-Fuller residual-based test (where the number of lagged differences of the residuals included in the regressions is chosen using Campbell and Perron's (1991) procedure, with the maximum lag set at four quarters), the Phillips and Ouliaris (1990) semiparametric modified test, and the Shin (1994) test (demeaned). Cointegration tests allow us to reject the null hypothesis of no cointegration in all cases, so that those equations can be tentatively thought as representing long-run relationships. In addition, the null hypothesis of no error correction is also rejected in all

5 Gros (1987) provides a formal assessment of the argument on the long-run ineffectiveness of capital controls, in terms of a model in which economic agents can evade the controls by incurring some costs: the interest differentials created by capital controls would provide an incentive for capital flows, which in turn would work to eliminate those differentials in the long run.

cases shown in Table 3, giving further support to those cointegration equations as long-run relationships [see Fry, et al. (1992)].

3. QUANTIFYING THE EFFECTIVENESS OF CAPITAL CONTROLS: SPAIN, 1986-1990

As mentioned in Section 1, the Spanish economy experienced a continued increase in capital inflows during the 1986-1990 period. This can be linked to the combination of a restrictive monetary policy aimed to fight against inflation, together with an expansionary fiscal policy (motivated by the expansion of social expenditures and public infrastructure programs) which led to interest rates higher than those prevailing abroad.

Figure 2 shows the evolution of the foreign assets held by domestic residents and total liabilities to foreigners, in real terms (denoted by *FAP* and *FLP*, respectively). As can be seen, the stock of foreign assets decreased during the period 1986-1987, and steadily increased since then, whereas, on the other hand, liabilities to foreigners showed a strong increasing trend since the second quarter of 1986. As a consequence, the net foreign asset position (i. e., the difference between *FAP* and *FLP*, denoted by *NFAP*), shown in Figure 3, after remaining stable during 1986, experienced a sharp decrease for the rest of the period.

In its turn, the rise in capital inflows resulted in increased foreign reserves, which jeopardized the objectives of the anti-inflationary monetary policy. This led to the Spanish authorities to introduce after 1987 several measures aimed to deter speculative capital inflows, at the same time that some kinds of outflows were liberalized. As mentioned above, their effects were analyzed in Viñals (1992a), where it is concluded that this effect had been particularly stronger between the second quarter of 1987 and the third quarter of 1990.

Figure 4 plots our proxy for capital controls, measured as deviations from covered interest parity, together with the ±0.5 per cent band, for the period 1986.1-1991.4 (i. e., one year ahead our period of analysis). As can be seen, and in line with Viñals's results, capital controls would seem to be binding from the second quarter of 1987 through the first quarter of 1991 (the exceptions being the first and third quarters of 1988, and the third quarter of 1990). Finally, from the second quarter of 1991 on, the figure would suggest a closer integration of the Spanish capital markets *vis-à-vis* the international ones.

The aim of this section is to evaluate the effectiveness of capital controls imposed by the Spanish authorities. To this end, we simulate a complete elimination of those controls (i. e., setting *KC* equal to zero) on the behavior of the system given by equations in Table 3, in which the error-correction terms are allowed to be continuously updated.

Before presenting the results, we will go through an alleged possible shortcoming of this procedure, which has been extensively quoted in the literature. This is the well-known "Lucas critique", which questions the appropriateness of using econometric models for policy simulation experiments, on the grounds that the model's parameters would not be invariant following a change in expectations held by economic agents (Lucas, 1976).

We have tried to address the Lucas critique by analyzing superexogeneity both directly via test of constancy and indirectly via test of structural invariance of the parameters in our model (Ericsson, et al., 1991).

In addition to the standard Chow test shown in Table 3, constancy has been tested by recursive least square estimation and the associated sequence of test statistics. Figure 5 shows the CUSUM tests proposed by Brown, et al. (1975), together with their ±2 estimated standard errors. As can be seen, since the test statistics move inside the critical lines, there seem to be no signs of parameter instability[6].

On the other hand, structural invariance and policy exogeneity were tested by using the procedure suggested by Charemza and Király (1988), which is based on testing recursive residuals of the model as being statistically independent from the examined variables. After applying this test to the short-run equations for *NFAP* and money supply, looking at the exogeneity properties of ε and *KC*, as well as *H*, *z*, i_R, and i_{CB}, respectively, we found F-statistics of $F(2,31)=1.47$ and $F(5,27)=0.50$. As can be seen, these test statistics are below their critical values and therefore do not suggest the rejection of the invariance hypothesis for those regressors.

The detailed results of the simulation are presented in Table 4 and Figure 6, where we show the change in *NFAP*, *M2* and *i*, computed as the difference between the simulated and the base series, in percentage for the first two series. Together with the central case (i. e., that directly following from the system of equations shown in Table 3, with the coefficient on *KC* equal to -0.48), we have also considered two more cases, where the coefficient on the variable *KC* takes the values -0.30 and -0.66 (i. e., the two-standard error lower and upper

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[6] Plots of the recursive coefficient estimates together with their ±2 sequentially estimated standard errors (not reported here, but available from the authors) show that these estimates vary only slightly relative to their *ex ante* standard errors, giving further support to our hypothesis of parameter constancy.

bounds). These two alternative cases will serve us as a sensitivity test of the results obtained in the central case, and will be used as confidence intervals. The simulation runs from the first quarter of 1986 to the fourth quarter of 1990.

Notice that, although capital controls would have been binding on inflows (as shown by the positive value taken by our proxy *KC*; see Figure 4), a liberalization of the capital account would increase both inflows and outflows, being on principle the net effect uncertain (Spiegel, 1990). However, as pointed out by some authors [see, e. g., Bacchetta (1992)], there could be presumed in the Spanish case that the effect on outflows would be dominating, since these had been more legally restricted, and given their still low value at that time, being their GDP share quite small as compared to other countries such as France or Italy). In fact, the disappearance of capital controls would have prevented the Spanish economy to keep positive interest rate differentials *vis-à-vis* the rest of the world, as it was the case during most of our period of analysis. Actually, following the full liberalization of capital movements in 1992, capital outflows experienced a strong growth, exceeding inflows in recent years (Bajo-Rubio and Montávez-Garcés, 1998).

Then, as shown in Table 4 and Figure 6, according to our simulation analysis the elimination of capital controls would have produced a net capital outflow, leading to an increase in the net foreign asset position or, in other words, net foreign liabilities would have been reduced (i. e., the capital account would have worsened). The effect would have been especially higher from the second quarter of 1987 and during 1989, that is, the periods where capital controls had been more binding (see above). This in turn would have raised domestic wealth, and hence money demand, the interest rate, and then money supply.

As a quarterly average, during the period 1986-1990 the level of *NFAP* following the higher net capital outflow would have been around 3.8 per cent above its baseline level in the central case, which would have amounted to 2.9 per cent of Spanish GDP. Turning to the sensitivity analysis, the lower and upper bounds of the increase in *NFAP* would have been around 2.1 and 5.7 per cent, amounting to 1.6 and 4.4 per cent of GDP, respectively. Even though the exact size of our numerical estimates should be taken with care, these figures would illustrate the important role played by capital controls in this episode of particular importance for the Spanish economy, according to our simulation results.

4. CONCLUSIONS

In this paper we have tried to evaluate the effectiveness of capital controls in Spain during the period 1986-1990. To this end, we have simulated the complete elimination of capital controls in a portfolio-balance model estimated for the Spanish economy, where international capital movements were simultaneously determined along with the demand for and supply of money.

Our results suggest that capital controls would have avoided a net capital outflow amounting to nearly a 4 per cent increase in the net foreign asset position of the Spanish economy, as a quarterly average, during the first five years of Spain's membership into the EU. So, and recalling the caution with which our numerical estimates should be taken, it would seem that capital controls would have played a noteworthy role during this crucial period for the Spanish economy.

Therefore, even though capital can flow through channels which are extremely difficult to monitor, so eroding the effectiveness of controls in the long run [see, e. g., Mathieson and Rojas-Suárez (1993)], there can be certain episodes in which capital controls can matter. In its turn, this would have additional effects for the performance of an economy.

For instance, in the case analyzed in this paper, capital controls would have helped to finance the current account deficit registered by the Spanish economy after its accession to the EU, due to the increasing trade deficit coupled with a continuous worsening in the services account (Bajo-Rubio and Torres, 1992). Furthermore, the existence of capital controls would have contributed to insulate domestic financial conditions from those prevailing abroad and therefore allowing national authorities to conduct an independent monetary policy, as shown, e. g., by the high degree of sterilization found for exchange-market interventions (Pérez-Campanero, 1990).

To conclude, notice that the new environment given by the full liberalization of capital movements in the EU in the context of the Economic and Monetary Union prevents the implementation of capital control measures by individual member states, so limiting the scope for an independent policy response by domestic authorities in the face of idiosyncratic shocks. This in turn calls for an increased coordination of economic policies, as well as for a reinforced role for fiscal policy.

APPENDIX: DEFINITIONS OF THE VARIABLES AND DATA SOURCES

FI = Dummy variable that proxies the effect of financial innovations, taking the value 0 from 1977.1 to 1982.4, 1 from 1983.1 to 1984.4, and 2 from 1985.1 to 1990.4

H = Monetary base (hundreds of billion Pta), in real terms

h = Ratio of currency to banks deposits

i = Yield on long-run government debt

i_{CB} = Bank of Spain's intervention rate

i_M = Interest rate on *M2*

i_R = Rate of return on required reserves

i^* = Long-run foreign interest rate, computed as a weighted average, according to their share on Spanish foreign debt, of the yields on long-run government bonds from the US, Switzerland, Germany, Japan, the UK and France

KC = Proxy for the effect of capital controls, measured as deviations from covered interest parity (end-of-month figures), and computed as the difference between the three-month Spanish interbank and Euro-dollar rates and the Pta-US$ three- month forward premium

M2 = *M2* definition of money supply (consisting of currency, and sight and saving deposits) (hundreds of billion Pta), in real terms

NFAP = Net foreign asset position of the Spanish economy, computed as the difference between total foreign assets held by domestic residents (net of official reserves) and total liabilities to foreigners (both in hundreds of billion Pta), in real terms

W = Spanish financial wealth, computed as the sum of total liquidity (liquid assets held by the public -*ALP*), net private claims on government (private ownership of government debt) and *NFAP* (all in hundreds of billion Pta), in real terms

Y = Spanish Gross Domestic Product (hundreds of billion Pta), in 1980 prices

Y^* = Imports of the industrialized countries (hundreds of billion US$), in real terms

z = Required reserves ratio

ε = Pta-US$ three-month forward premium, end-of-month figures

All the variables in real terms have been deflated by the consumption price index. The data used to compute our capital controls variable (Spanish interbank and Euro-dollar rates, and the Pta-US$ forward premium) come from BBVA, and have been kindly provided to us by Mayte Ledo. The Spanish data are taken from the Bank of Spain, except those for the net claims on government, that come from the IMF's *International Financial Statistics* (line 32an minus line 12a). Most of the Bank of Spain's variables appear in its *Boletín Estadístico*, except for i and i_M, taken from Cuenca (1994); i_{CB}, i_R and z, provided to us by José L. Escrivá; and Y, provided by Pilar L'Hotellerie. Regarding the foreign variables, the interest rates and the OECD consumption price index (excluding Turkey) are taken from the OECD's *Main Economic Indicators*, whereas the nominal imports of the industrialized countries come from the IMF's *International Financial Statistics*.

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TABLE 1: MAIN ECONOMIC INDICATORS 1986-90, SPAIN AND EU-12
(average of annual figures)

	Spain	**EU-12**
Gross Domestic Product (at constant prices, % change)	4.5	3.2
Gross fixed capital formation (at constant prices, % change)	11.7	5.9
Inflation (private consumption deflator, % change)	6.6	4.1
Employment (% change)	3.1	1.3
Unemployment rate (% of civilian labour force)	18.8	9.6
Current balance (% of GDP)	-1.3	0.4
Long-term interest rate (%)	12.9	9.5

Source: *European Economy* 54, 1993.

TABLE 2: LONG-RUN ESTIMATION

A) Net foreign asset position (dependent variable: $NFAP_t$)

Variables	Phillips-Hansen	DOLS	Phillips-Loretan
Constant	67.83 (280.7)	66.97 (9.45)	65.64 (9.69)
i_t	-1.60 (42.4)	-1.62 (-4.91)	-1.63 (-6.52)
$(i^*+\varepsilon)_t$	0.35 (15.0)	0.37 (3.36)	0.36 (3.00)
Y_t	-2.78 (220.4)	-2.76 (-11.50)	-2.79 (-10.73)
Y_t^*	5.61 (70.6)	5.60 (6.44)	5.62 (9.06)
W_t	0.14 (13.9)	0.13 (2.60)	0.15 (2.14)
R^2-adjusted	0.94	0.96	0.95
CRDW	1.37	2.10	2.15
CRADF	-4.98	-5.87	-5.94
$\hat{Z}_\alpha$	-28.26	-31.16	-32.01
C_μ	0.30	0.34	0.36

TABLE 2 (continued)

B) Money demand (dependent variable: $M2_t$)

Variables	**Phillips-Hansen**	**DOLS**	**Phillips-Loretan**
i_t	-1.00 (28.9)	-0.98 (-3.03)	-1.03 (-2.93)
i_{Mt}	4.68 (24.3)	4.67 (7.41)	4.66 (6.95)
Y_t	1.88 (346.7)	1.90 (12.11)	1.89 (11.53)
FI_t	-6.94 (94.1)	-6.92 (-9.61)	-6.95 (-8.27)
R^2-adjusted	0.91	0.90	0.89
CRDW	1.68	2.50	2.48
CRADF	-5.86	-6.24	-6.16
$\hat{Z}_\alpha$	-34.70	-35.76	-36.13
C_μ	0.29	0.30	0.31

TABLE 2 (continued)

C) Money supply (dependent variable: $M2_t$)

Variables	Phillips-Hansen	DOLS	Phillips-Loretan
Constant	61.50 (83.6)	61.40 (4.75)	61.54 (4.73)
i_t	1.77 (17.8)	1.78 (5.09)	1.77 (4.78)
i_{Rt}	-2.61 (193.4)	-2.62 (-7.86)	-2.62 (-7.57)
i_{CBt}	-0.89 (16.2)	-0.88 (-5.18)	-0.89 (-5.01)
H_t	0.59 (42.0)	0.60 (4.56)	0.60 (4.23)
R^2-adjusted	0.80	0.82	0.83
CRDW	1.66	2.19	2.22
CRADF	-6.02	-6.27	-6.34
$\hat{Z}_\alpha$	-42.44	-45.24	-46.22
C_μ	0.28	0.29	0.31

Notes:

(i) Figures in brackets below each coefficient are modified Wald test statistics with a limiting $\chi^2(1)$ distribution (in the Phillips-Hansen case), and t-ratios computed using standard errors corrected for the presence of moving average serial correlations (in the DOLS and Phillips-Loretan cases).

(ii) When estimating by the DOLS and Phillips-Loretan procedures, the number of leads and lags of the first differences of the right-hand side variables, as well as the lags of the cointegrating vector, are fixed by the rule of thumb l=INT($T^{1/3}$), where INT(•) denotes the integer value of the argument in brackets, and for our sample size l=3; see Stock and Watson (1993).

TABLE 3: SHORT-RUN ESTIMATION

A) Net foreign asset position

$$\Delta NFAP_t = -1.00 - 0.68\ \Delta i_{t-4} + 0.43\ \Delta i^*_{t-4} + 0.05\ \varepsilon_t - 0.68\ \Delta Y_t + 1.67\ \Delta Y^*_{t-3} + 0.11\ \Delta W_t - 0.48\ KC_t - 0.43\ \hat{u}_{1t-1}$$

(-4.04)(-6.35) (2.87) (2.21) (-2.04) (3.35) (5.14) (-5.33) (-7.12)

R^2-adjusted = 0.84, σ= 0.57, DW = 1.97, Q(4) = 4.17, LM(4,27) = 1.10, ARCH (4,27) = 1.11, N(2) = 1.23, CHOW (9,22) = 1.35

B) Money demand

$$\Delta M2_t = 1.19 - 5.73\ D1 - 0.55\ D2 - 1.97\ D3 - 0.27\Delta i_t - 0.42\ \Delta i^*_t + 4.85\ \Delta i_{Mt} + 1.23\ \Delta Y_t + 1.52\ \Delta Y_{t-4} + 0.06\ \Delta W_t - 0.18\ \hat{u}_{2t-1}$$

(4.31)(-15.36) (-1.82) (-6.33) (-1.88) (-2.25) (5.87) (3.81) (4.37) (1.85) (-2.98)

R^2-adjusted = 0.94, σ= 0.71, DW = 1.96, Q(4) = 2.02, LM(4,25) = 0.45, ARCH (4,25) = 0.57, N(2) = 1.34, CHOW (11,18) = 1.15

C) Money supply

$$\Delta M2_t = 3.73 - 7.56\ D1 - 1.15\ D2 - 3.85\ D3 - 1.16\Delta h_{t-4} - 0.43\ \Delta z_t + 0.59\ \Delta i_t - 0.26\ \Delta i_{Rt-4} - 0.18\ \Delta i_{CBt} - 0.07\Delta i_{CBt-2} + 0.17\ \Delta H_{t-4} - 0.14\ \hat{u}_{3t-1}$$

(19.74)(-27.33) (-4.64) (-14.53) (-5.11) (-8.52) (3.92) (-2.22) (-4.69) (-2.10) (3.42) (-3.21)

R^2-adjusted = 0.96, σ= 0.59, DW = 1.61, Q(4) = 6.42, LM(4,24) = 1.48, ARCH (4,24) = 0.53, N(2) = 0.84, CHOW (12,16) = 1.67

Notes:

(i) The system has been estimated by 3SLS. Figures in brackets below each coefficient are t-ratios.

(ii) In the bottom line of each equation, some diagnostic statistics for testing against various alternative hypotheses are reported: residual autocorrelation (DW, Ljung-Box Q and LM), autoregressive conditional heteroscedasticity (ARCH), skewness and excess kurtosis (N), and parameter stability (CHOW) taking as the breaking point the date of the Spanish integration into the EU (the first quarter of 1986), which are distributed as $\chi^2(\bullet)$ or $F(\bullet,\bullet)$ (degrees of freedom in brackets).

TABLE 4: EFFECTS OF AN ELIMINATION OF CAPITAL CONTROLS

A) Coefficient on KC = -0.48

	NFAP	M2	i
1986.1	0.1588	0.0021	0.0019
1986.2	0.4346	0.0048	0.0041
1986.3	0.2406	0.0010	-0.0013
1986.4	0.3274	0.0021	0.0004
1987.1	0.7434	0.0065	0.0051
1987.2	7.7668	0.0992	0.0926
1987.3	9.0459	0.1031	0.0879
1987.4	8.4935	0.0706	0.0487
1988.1	5.4611	0.0210	-0.0157
1988.2	4.4953	0.0076	-0.0241
1988.3	3.3727	-0.0044	-0.0346
1988.4	3.7140	0.0066	-0.0015
1989.1	6.1532	0.0490	0.0420
1989.2	6.4151	0.0449	0.0379
1989.3	5.1673	0.0182	-0.0021
1989.4	3.8858	-0.0099	-0.0288
1990.1	3.1302	-0.0161	-0.0298
1990.2	2.7324	-0.0131	-0.0217
1990.3	2.1905	-0.0182	-0.0228
1990.4	2.0250	-0.0132	-0.0149

TABLE 4 (continued)

B) Coefficient on KC = -0.30

	NFAP	M2	i
1986.1	0.1014	0.0013	0.0013
1986.2	0.2655	0.0030	0.0027
1986.3	0.1127	0.0003	-0.0014
1986.4	0.1875	0.0012	0.0003
1987.1	0.4567	0.0040	0.0035
1987.2	4.9077	0.0687	0.0643
1987.3	5.2292	0.0579	0.0447
1987.4	4.7279	0.0293	0.0143
1988.1	2.8331	0.0120	-0.0138
1988.2	2.3686	0.0030	-0.0155
1988.3	1.7376	-0.0016	-0.0212
1988.4	2.0384	0.0040	-0.0018
1989.1	3.5275	0.0302	0.0292
1989.2	3.5226	0.0239	0.0170
1989.3	2.7006	0.0073	-0.0017
1989.4	1.9739	-0.0012	-0.0201
1990.1	1.6162	-0.0110	-0.0165
1990.2	1.4361	-0.0075	-0.0092
1990.3	1.1091	-0.0098	-0.0135
1990.4	1.3176	-0.0073	-0.0054

TABLE 4 (continued)

C) Coefficient on KC = -0.66

	NFAP	M2	i
1986.1	0.2162	0.0028	0.0023
1986.2	0.6077	0.0064	0.0053
1986.3	0.3862	0.0015	-0.0010
1986.4	0.3952	0.0030	0.0007
1987.1	1.0592	0.0088	0.0065
1987.2	10.6500	0.1298	0.1151
1987.3	12.8636	0.1474	0.1297
1987.4	12.6208	0.1067	0.0910
1988.1	8.5045	0.0424	-0.0139
1988.2	7.0222	0.0146	-0.0275
1988.3	5.3682	-0.0032	-0.0445
1988.4	5.6992	0.0101	-0.0009
1989.1	8.7009	0.0764	0.0518
1989.2.	9.7265	0.0675	0.0590
1989.3	8.0480	0.0327	-0.0013
1989.4	6.2388	-0.0095	-0.0338
1990.1	4.6255	-0.0162	-0.0408
1990.2	4.3425	-0.0277	-0.0342
1990.3	3.2752	-0.0476	-0.0323
1990.4	3.2354	-0.0188	-0.0264

Note: For NFAP and M2, percent deviation from baseline; for i, deviation from baseline.

FIGURE 1: GOODNESS-OF-FIT OF THE ESTIMATED EQUATIONS

A) Net foreign asset position

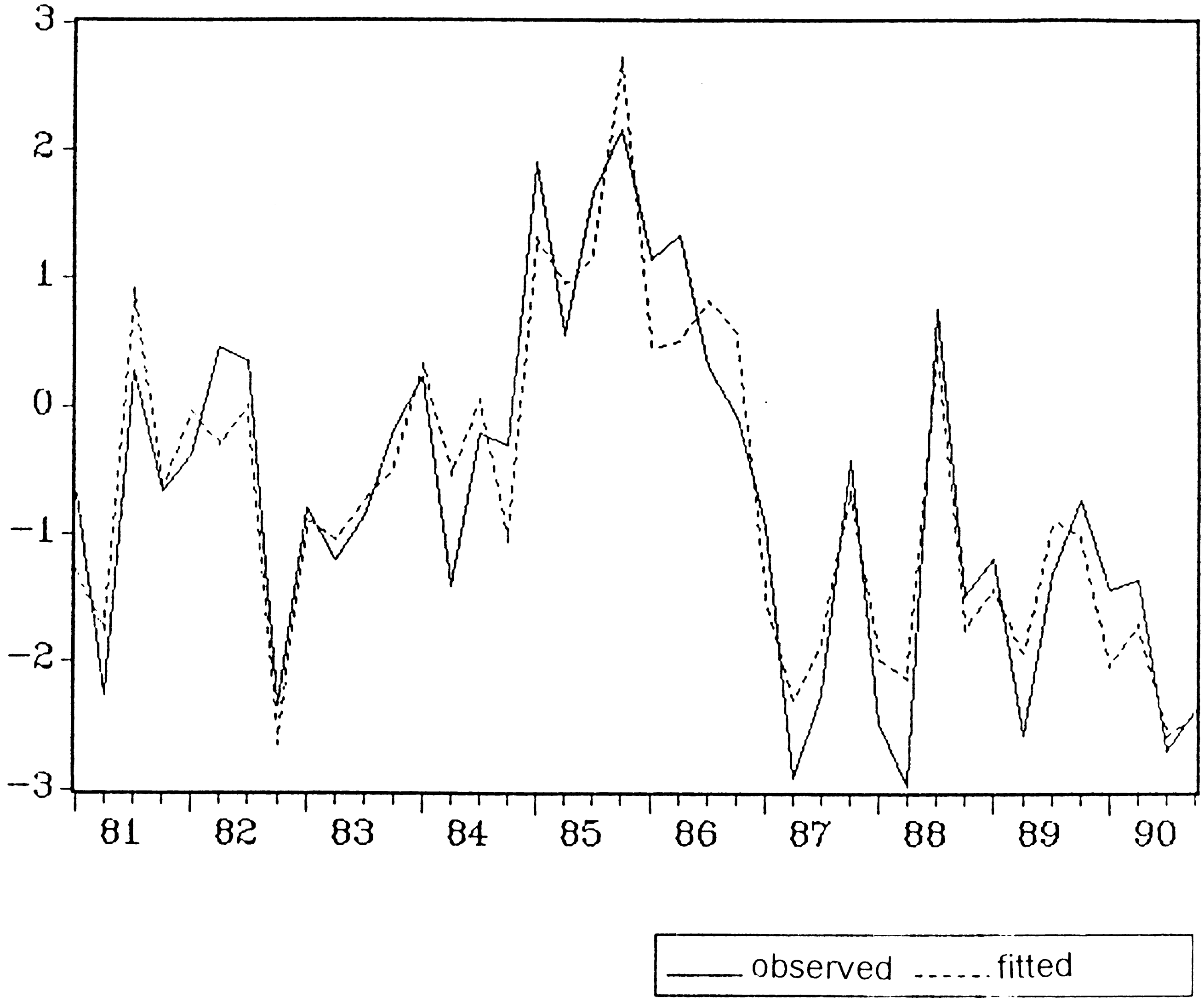

FIGURE 1 (continued)

B) Money demand

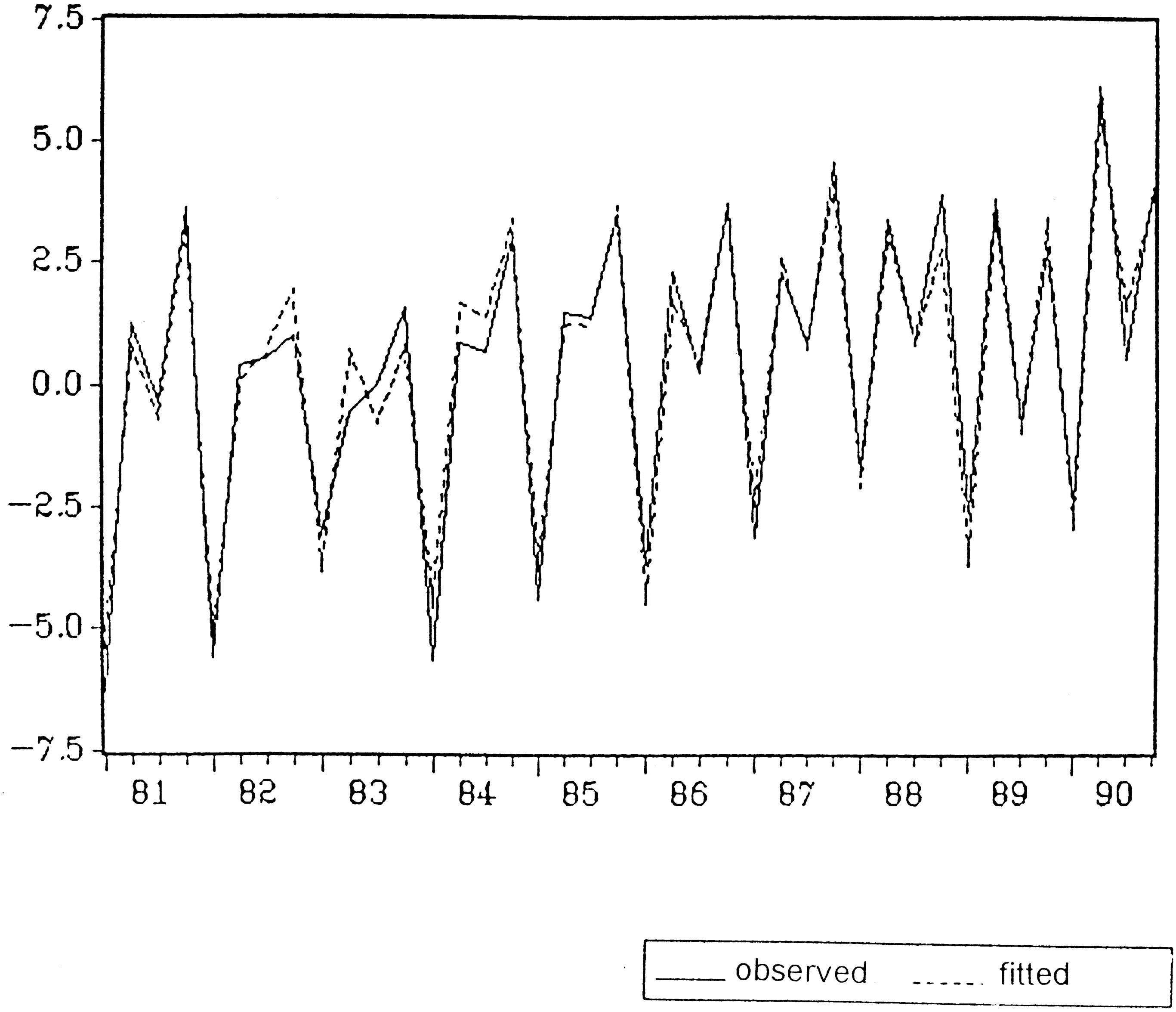

FIGURE 1 (continued)

C) Money supply

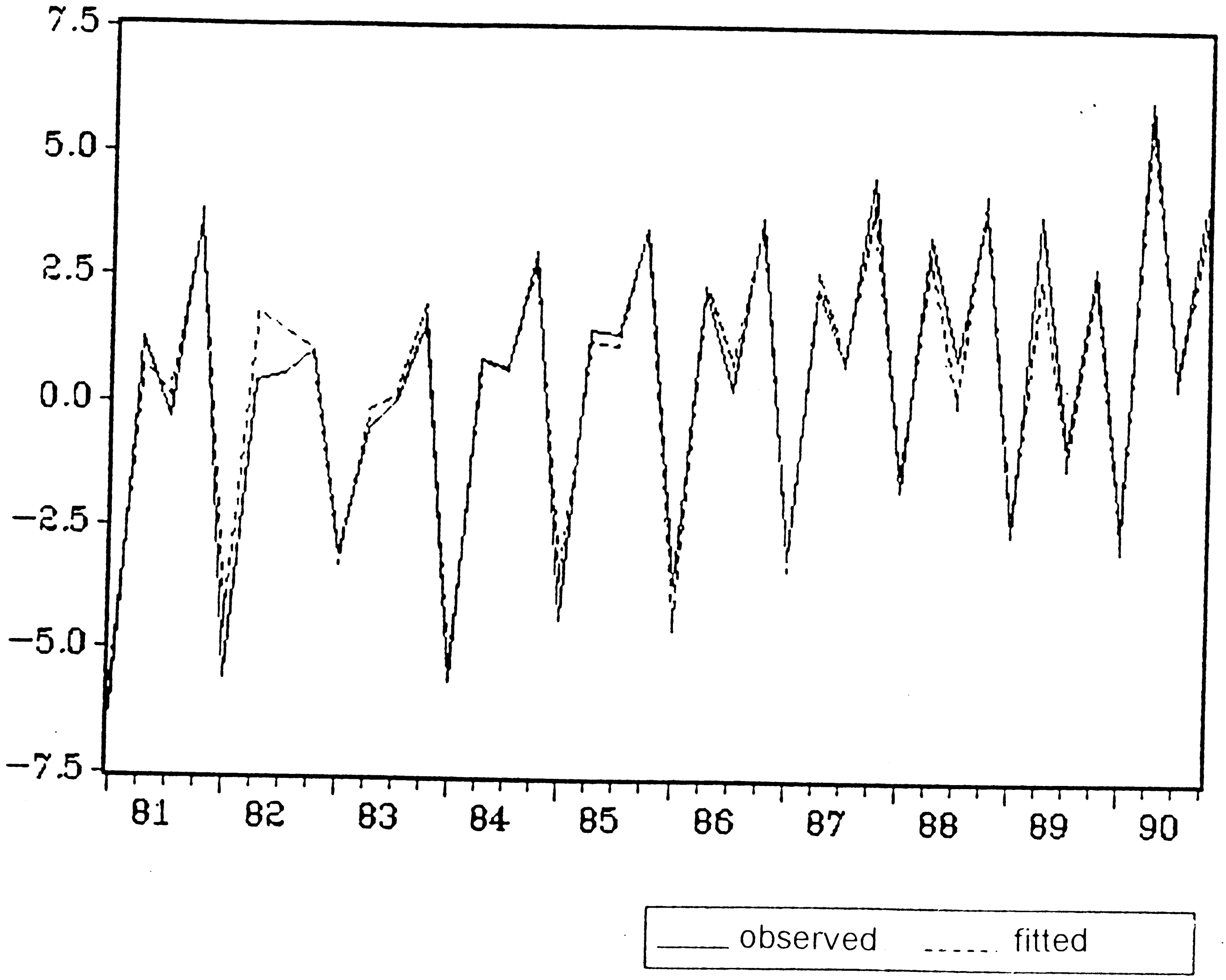

FIGURE 2: FOREIGN ASSETS HELD BY DOMESTIC RESIDENTS (FAP) AND TOTAL LIABILITIES TO FOREIGNERS (FLP)

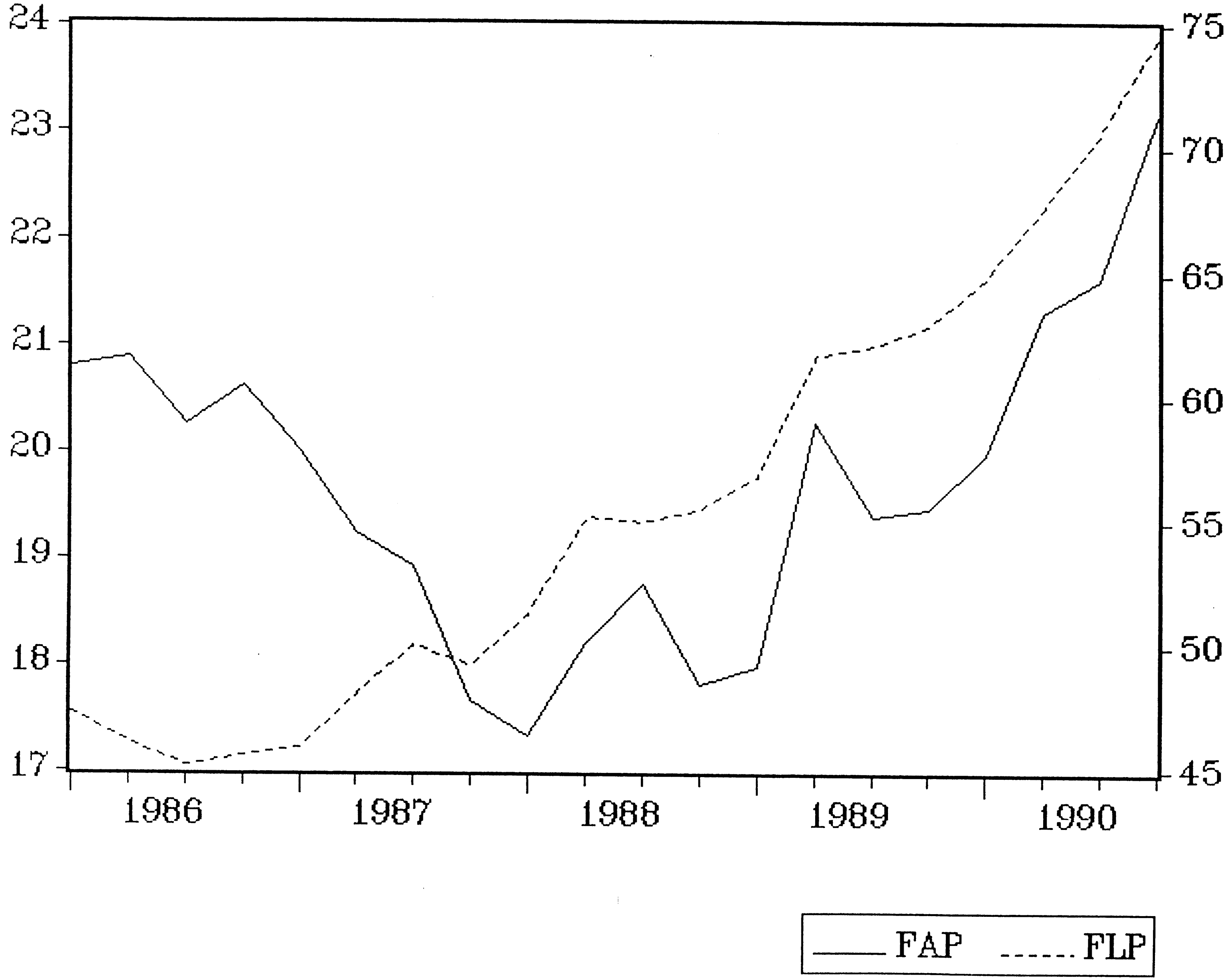

FIGURE 3: NET FOREIGN ASSET POSITION

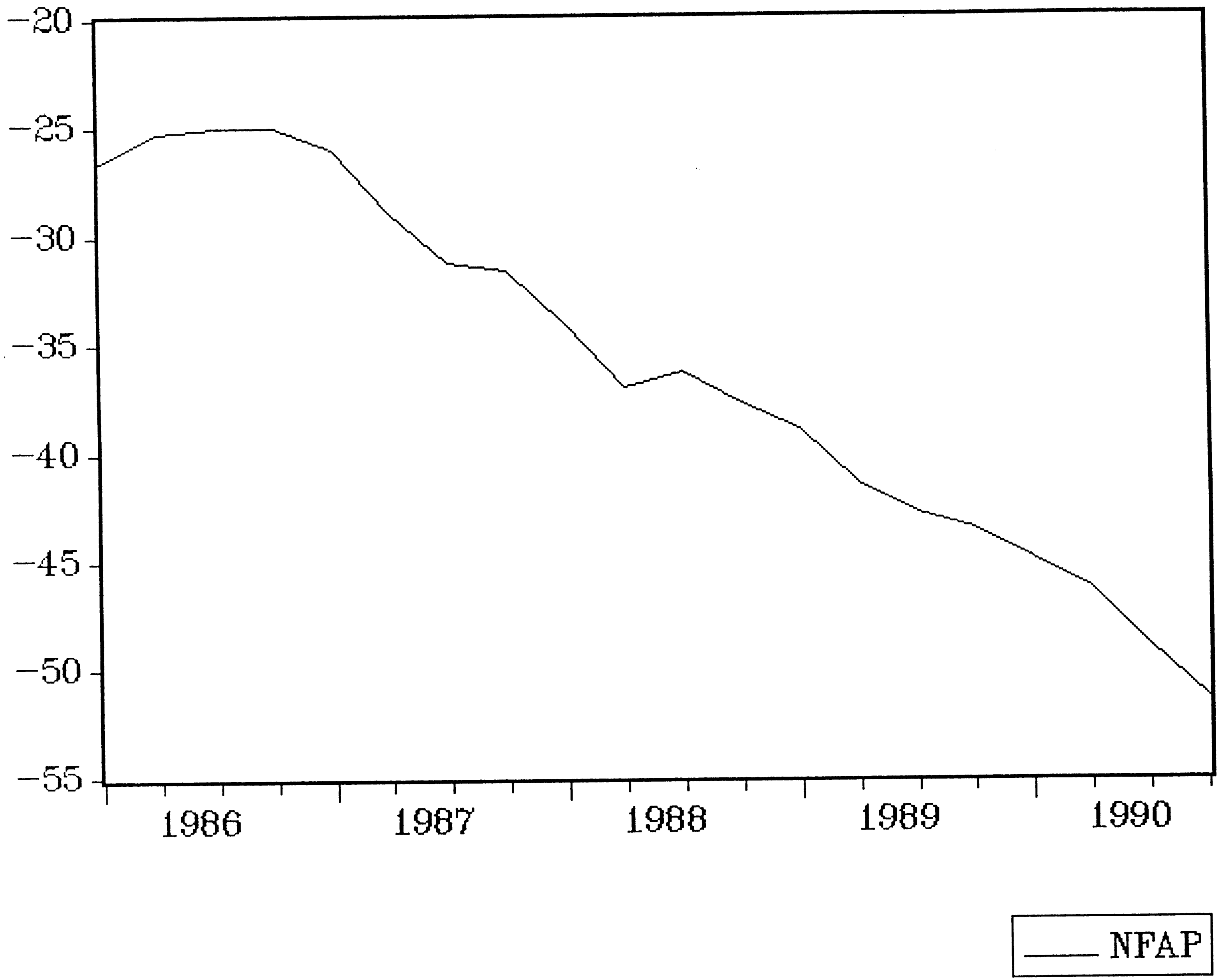

FIGURE 4: DEVIATIONS FROM COVERED INTEREST PARITY

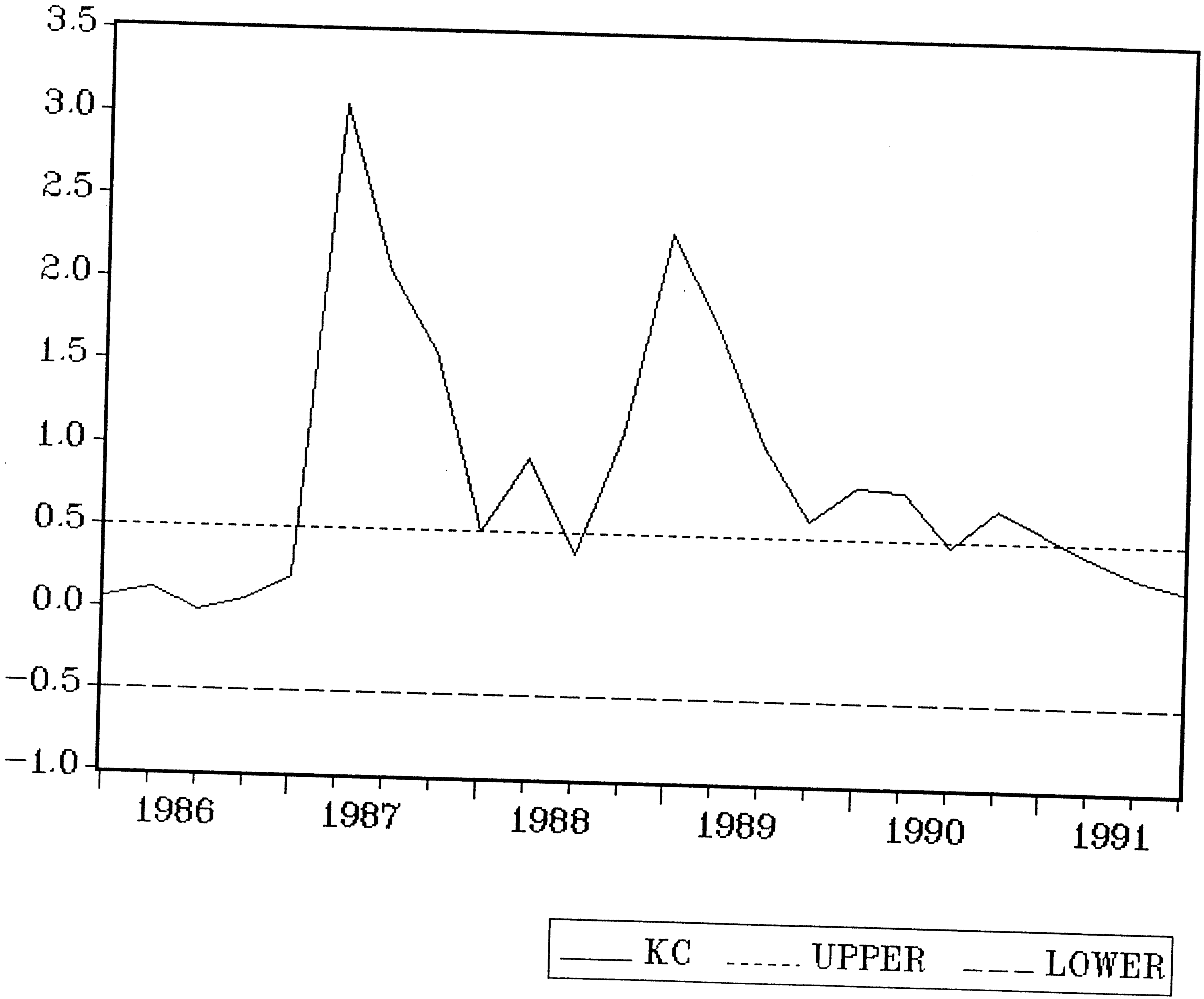

FIGURE 5: CUSUM TESTS

A) Net foreign asset position

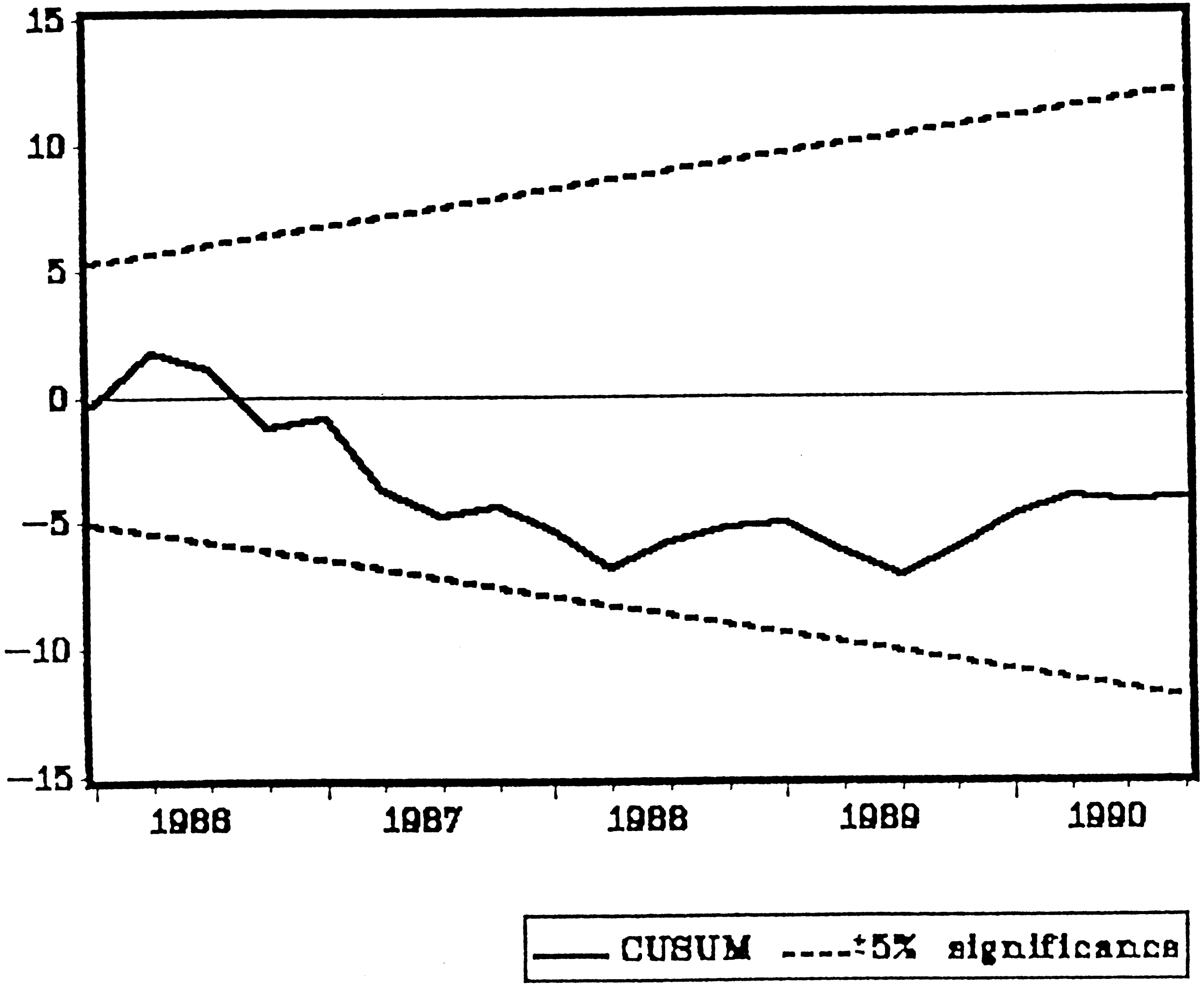

FIGURE 5 (continued)

B) Money demand

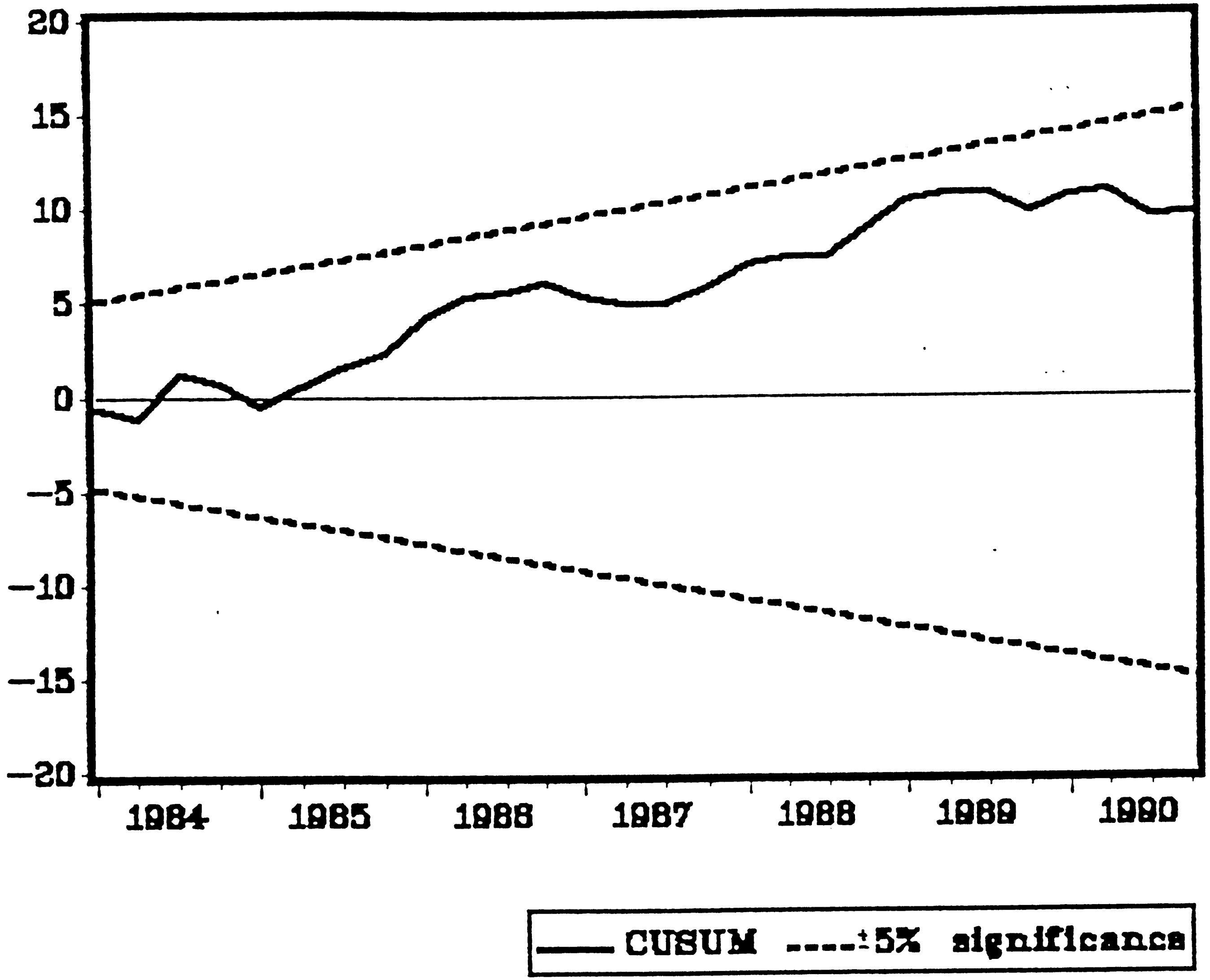

FIGURE 5 (continued)

C) Money supply

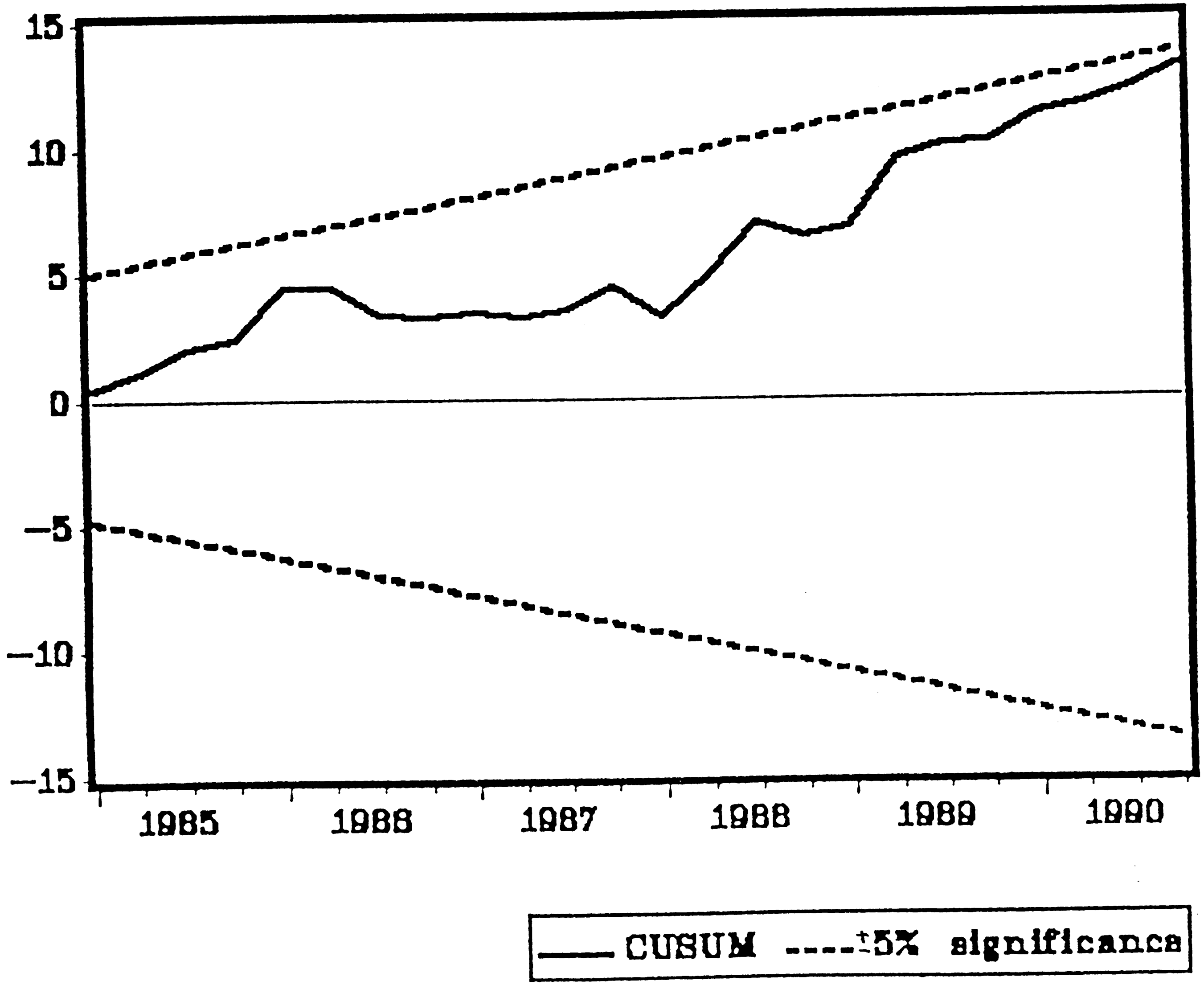

FIGURE 6: EFFECTS OF AN ELIMINATION OF CAPITAL CONTROLS

A) Net foreign asset position

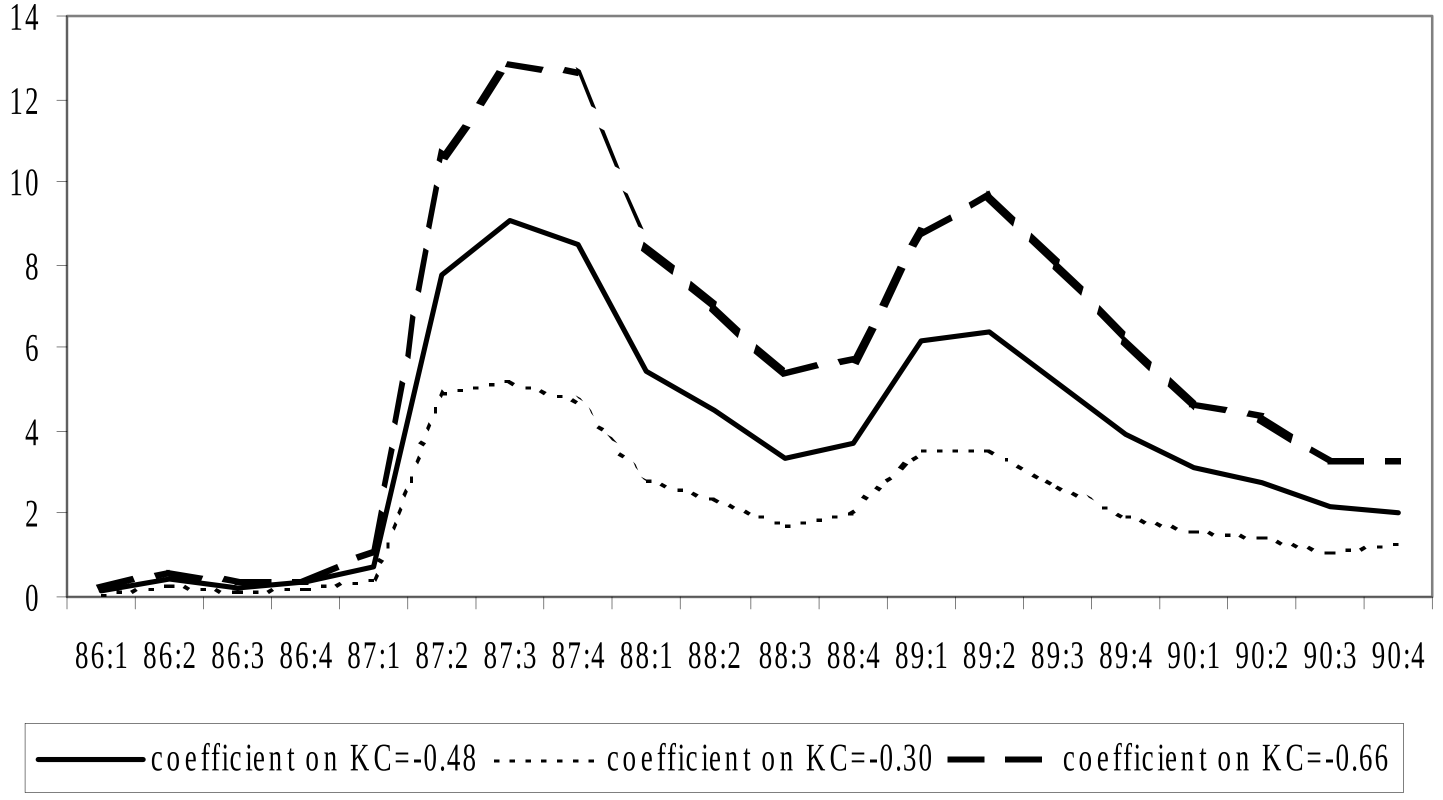

FIGURE 6 (continued)

B) M2

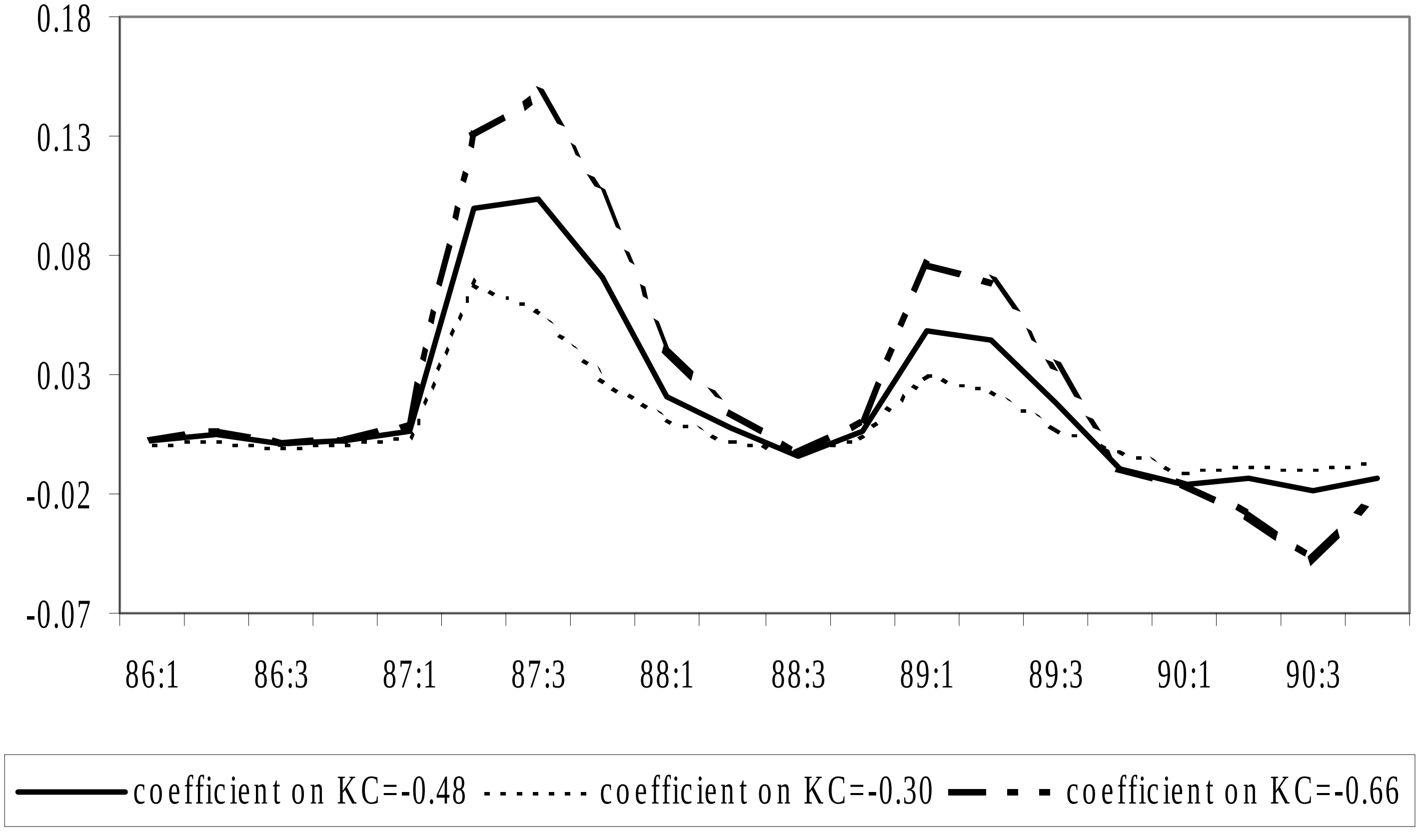

FIGURE 6 (continued)

C) Interest rate