The Macroeconomics of Developing Countries:

An Analysis of the Co-operation Financiere Africaine

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September 1992 [ie 1993]
D Phil



Acknowledgements

Writing this thesis would have been much more difficult without the help of a number of people, whom I would like to thank. My supervisor, Paul Collier, has provided a great deal of advice and encouragement. I have also benefitted from the comments and suggestions of David Bevan, Peter Sinclair and James Mirrlees, as well as numerous participants of Africa Centre seminars. The members of the Africa Centre itself have provided invaluable support over the last three years, for which I am very grateful.

The thesis also owes its existence to the facilities provided by Nuffield, Pembroke and St. John's Colleges, and to the untiring support of my extended family, especially Jo and my parents.

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Thesis submitted for the D Phil in Economics, Trinity 1992

Abstract

The CFA consists several African economies adhering to one of two common currencies, and one of two central banks. The rules of the monetary union provide for the pooling of foreign assets, and the regulation of monetary expansion in each country. The French treasury guarantees the convertibility of CFA Francs into French Francs at a fixed rate. The thesis examines the impact of CFA membership on the macroeconomic performance of member states, assessing the claim that CFA institutions have influenced capital and labour markets, and have modified short run adjustment to external shocks.

There are a number of reasons why CFA membership could facilitate higher investment. (i) The rules governing money creation may lead to greater monetary prudence, and so lower inflation and price variability, and less uncertainty for investors. (ii) Guaranteed convertibility means that firms will never be prevented from importing capital goods by a lack of foreign exchange. (iii) Convertibility may encourage a greater degree of integration between French and CFA capital markets, so that domestic investment is not entirely dependant on domestic saving. A model of investment is constructed to incorporate these effects, and tested using time series and cross-sectional data. Support is found for (i) and (ii), but not for (iii).

If African labour markets are characterised by nominal wage inertia, the enforced low inflation may lead to excessive real wages, and CFA membership may impair efficient allocation of labour. However, evidence suggests this characterisation is usually inappropriate.

The pegged exchange rate may lead to persistent external imbalances: devaluation is not an option in response to a negative trade shock. This will not be a problem as long as an effective substitute for devaluation is found. A CGE model is constructed to examine the viability of various devaluation substitutes, none of which are found to be adequate.

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CHAPTER 1

AN INTRODUCTION TO THE INSTITUTIONS AND MEMBERS OF THE FRANC ZONE

THE AFRICAN FRANC ZONE: AN INTRODUCTORY SURVEY

Monetary unions are in vogue. Not only in Europe, where the introduction of a single currency is an issue hotly debated by economists and non-economists alike, but also in the Southern Hemisphere. It has, for example, been the subject of debate at recent SADCC conferences. However, single currency areas and trans-national central banks are by no means a new phenomenon. At the end of the Second World War, with the European empires largely intact, many economies around the World participated in monetary unions based on the Pound Sterling, Escudo, Guilder and Franc.

As the various colonies achieved political independence in the late 1950s and early 1960s, most of these monetary unions were dissolved, the new nation states preferring complete economic independence, with their own currencies and independent central banks. Economically, they distanced themselves from each other as well as from their former colonial rulers. However, an exception to this general rule arose in western and central Africa, where most of the states newly independent from France chose to retain close economic links with the metropole. They retained the shared currency of French colonial Africa, and continued to adhere to the existing central banks.

In the light of contemporary arguments for and against international monetary unions, it is interesting and informative to compare the economic development of this "Franc Zone" with that of other countries in Africa. In this thesis, we will concentrate on the possible impact of Franc Zone membership on (per caput) income determination. Since

most social welfare functions include more than just the level of income, and since other analyses of the Franc Zone explicitly consider other factors in the determination of social welfare, this choice requires a preliminary comment.

Some authors (for example, Devarajan and Rodrik (1991)) include both real and nominal variables in their implicit definition of development. Specifically, inflation appears with income in the social welfare function which these authors use for welfare analysis. However, we contend that inflation ought to appear in a social welfare function only indirectly, as a determinant of present or future income. In this thesis, we will be concerned primarily with the impact of the monetary institutions on income. The rate of change and variability of prices will play an important part in our analysis, but the focus will be on the effect which nominal variables have on real variables. Social welfare will also depend on income distribution. The impact of Franc Zone institutions on income distribution are less obvious and more indirect than their effects on aggregate income. However, income distribution is also discussed in areas where it is possible that Franc Zone institutions do have an impact (for example, in chapter 9, on the distribution of income between those employed in the formal urban sector and the rest of the economically active population).

The existing literature relevant to analysis of the impact of the institutions of the Franc Zone can be split into three categories. First of all, there is a trade theory and open economy macroeconomic literature, including articles to which are sometimes appended non-econometric applications of a theoretical model. Secondly, there is a body of French literature in the "Latin" tradition: detailed institutional surveys accompanied by non-quantitative discussions of the possible impact of various aspects of the institutions in

question. Thirdly, there are a few econometric comparisons of Franc Zone members with other developing countries, which are often lacking in theoretical input. Our task will be to draw on all three branches, in order to construct economic models which will highlight institutional differences between members and non-members, and which can be tested on existing data.

First of all, we need to highlight those elements of Franc Zone institutions which are likely to have an economic impact. Here, we need to be careful to distinguish between what the Zone appears to guarantee on paper, and what actually happens in practice. In practice, it is likely that principles are not strictly adhered to, so the distinction between the institutions of members and non-members becomes blurred. The distinctions which remain, even in practice, will guide the construction of quantitative models which can be confronted with data. As we will see, the existing theory tends to be oriented towards the short run, whilst the richest data is more appropriate for the testing of hypotheses about the long run (i.e., periods of twenty years or more). In tackling this problem, we will bear in mind that there are two alternative approaches. One solution is to work on the long run theory, the other is to cast short run models in a form which allows something to be said on the basis of the relatively poor data.

In this chapter, we will look at the institutions of the Franc Zone, to see which are likely to have a bearing on the economic performance of member states. In order to give an idea of the context in which the institutions operate, we will also briefly discuss the political economy of these countries. We will end with a survey of the existing empirical work on the comparative performance of the members of the Franc Zone.

1. Institutions of the CFA

The Franc Zone of continental Africa - the Communaute or Cooperation Financiere Africaine (CFA) - consists of one hispanophone and thirteen francophone states, all but one of which are situated in West and Central Africa, though membership of the zone over the last thirty years has not been static. (At one point, it even included the French territorial collective of St. Pierre et Miquelon, off the Canadian coast, which for a short while issued the West African CFA Franc as currency!) The CFA is the major component of the worldwide Franc Zone, which also includes Monaco and some French overseas territories. The cornerstone of the Franc Zone is the use of currencies which the French treasury guarantees to exchange for French Francs at a fixed rate. Moreover, in continental Africa, member states are grouped into two regions, each of which has one central bank issuing a single currency, convertible with the French Franc at a rate of 50 FCFA : 1 FF.

The CFA evolved from the monetary institutions of the last phase of French colonial Africa.[1] In 1955, five years before independence, the Metropolitan French authorities devolved the right to issue currency onto two newly created institutions: the Central Bank of Equatorial African States and Cameroun, later renamed the Bank of Central African States (BEAC), and the Central Bank of West African States (BCEAO). These banks issued their own notes for use in French Equatorial Africa (including Cameroun) and French West Africa (including Togo). Their headquarters were originally in Paris, but later removed to Yaounde in Cameroun and Dakar in Senegal. On independence, the banks retained their

[1] See Bloch-Laine (1956) for a description of the Franc Zone in the French Empire.

function and their currencies, and the French treasury continued to guarantee convertibility at 50 FCFA : 1 (new) FF. All of the newly independent Central African states: Cameroun, Centrafrique, Congo, Gabon and Tchad, adhered to this monetary union under the auspices of the BEAC. These were joined in 1985 by the ex-Spanish colony of Guinee equatoreale. In West Africa, Togo and Guinee francaise seceded from the monetary union on gaining their independence, although Togo rejoined the union in 1963. The other states: Cote d'Ivoire, Dahomey (alias Benin), Haute-Volta (alias Burkina Faso), Mali, Mauritanie, Niger and Senegal, formed the Monetary Union of West African states (UMOA) under the auspices of the BCEAO. Mali, however, was independent of UMOA from 1962 to 1984, issuing its own CFA Franc, convertible at a rate of 100 FCFAM : 1 FF. Also, Mauritanie completely seceded from the Franc Zone in 1973. In a parallel organisation in Southern Africa, the states of Madagascar and Comoros shared a central bank issuing CFA Francs, although Madagascar seceded from the Franc Zone in 1973.

The Franc Zone is a complex array of contractual obligations on the part of the African states and France. We will concentrate on the main features of the Franc Zone constitutions which are likely to affect economic policy and economic performance. What are the commitments made, and are they binding in practice?

The obligations fall into two categories. First, there are the constitutional "principles" designed to achieve the goal of complete financial integration between member states. Under this heading fall the guarantees of convertibility between CFA and French Francs, and the fixed exchange rate. Maintenance of the principles implies a heavy obligation on the part of France, with some obligations on the part of the CFA. Secondly, there are the administrative structures to which member states bind themselves, and

which prevent (or at least, which are designed to prevent) African states free riding on metropolitan guarantees. These entail considerable loss of economic sovereignty on the part of the African states.

The constitutions of the central banks of the CFA describe the principles and institutional structures of the union. More details are to be found in Bathia (1986) and Vizy (1989). We will concentrate below on the details of the revised CFA constitutions of 1972-3, which devolved policy-making authority from the French treasury to the central banks.[2]

The members of the CFA and France agree to act to ensure the following:

(i) *Guaranteed convertibility* - Article 2 of the BEAC constitution states that the union is based on France's guarantee of unlimited convertibility of CFA Francs. Article 1 of the UMOA accord stipulates that France will help member states to ensure the free convertibility of their currency. In practice, this means that the French treasury will exchange CFA Francs for French Francs on demand. It also agrees to provide the CFA central banks with as many French Francs as are needed to ensure the smooth running of the zone's financial system. The scrabble for foreign exchange which typifies many African economies is absent from Franc Zone members.

If this guarantee of convertibility were absolute, then there would be no black market for forex. The official and "parallel" exchange rates would be the same. However,

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[2] See de la Fourniere (1973) for an account of the CFA before the 1973 reforms.

the rates do diverge somewhat. This divergence was particularly marked in 1988, when the official FCFA/$ rate was 285.25:1, and Ivorian Francs were selling at a rate of 360:1 on parallel markets.[3] The main reason for this divergence is probably that although the French treasury guarantees convertibility *now* at a certain exchange rate, there is a finite risk that the CFA Francs will be devalued, or that one or more countries will secede from the union. When rumours are rife, the implied risk of holding CFA Francs means that there is not full convertibility in practice. Nevertheless, the official and parallel market rates for CFA Francs are always of the same order of magnitude, which is in itself a major achievement, compared with other African currencies.

(ii) *Fixed exchange rate* - Article 9 of the BEAC constitution and Article 2 of the UMOA convention stipulate a fixed rate of 50 : 1. The rate has never been changed; indeed, this exchange rate between African and French currency dates back to 1948. The devaluation of the French Franc in August 1969 prompted the members of the CFA to negotiate a system of compensation for metropolitan devaluations. Each year, the French treasury would compensate for any loss of exchange by the CFA due to falls in the value of the French Franc - SDR rate, crediting the "Operations Accounts" of the central banks accordingly. (See below for a description of these accounts.) This agreement has been carried over into the floating exchange rate system, the Operations Accounts being credited when the French Franc depreciates. If the French Franc appreciates, the accounts are not debited, but the calculated gain by the CFA is deducted from any future credits.

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[3] Figures are taken from African Analysis (May 1988).

Again, there is a fixed exchange rate de jure, the sustainability of which will be credible as long as the pressure for devaluation does not become too large. This will depend inter alia on the external balances of the member states of the two unions, an issue to which we shall return.

(iii) *Free transferability* - Article 10 of the BEAC constitution states that "transfers of funds between member states and France will be unrestricted". Similarly, Article 6 of the UMOA accord describes the "freedom of financial relations between France and members of the Union". This obligation on the part of the African states is not without qualification, and the practice of member states is not always in harmony with the principle, a point to which we will return in later chapters.

(iv) *Harmonisation of rules governing currency exchange* - Article 14 of the BEAC constitution stipulates that "with the exception of modifications necessitated by local conditions..... states will try to implement the exchange policy of the Franc Zone". Article 6 of the UMOA accord notes that the "uniform regulation of the external financial relations of member states..... will be maintained in harmony with that of the French Republic". These regulations cover such things as the remittance of salaries abroad (i.e., outside the Franc Zone), foreign investment and borrowing from abroad. Again, with the relaxation of currency restrictions in France in order to conform to EEC regulations, there has been some divergence from the ideal of complete harmonisation of Franco-African exchange regulations. African governments have been loathe to allow so little restriction on currency movements. In the next chapter, we will look in more detail at this divergence.

In tandem with the Franc Zone rules governing financial flows, there are two

customs unions corresponding to the BEAC and UMOA zones: the Central African Customs and Economic Union (UDEAC) and the Community of West African States (CEAO). The CEAO is not coterminous with the contemporary UMOA, however, since the former includes Mauritanie and excludes Togo. These unions allow in principle the free flow of goods between member states and France. However, the UDEAC and CEAO are not perfect customs unions: restrictions on imports from other member states do exist. There have been a number of studies of the commercial openness of Franc Zone members, including P. Guillaumont (1988) and Geourjon (1988). Guillaumont looks at the ratio of exports to GDP, and finds that when differences due to different resource bases, population, etc., are taken into account, there is no significant difference between the CFA and other LDCs. Geourjon's paper includes a similar study using import ratios, with similar results. However, as we shall see, these import and export figures are highly unreliable.

The administrative structures of the Franc Zone are built around the BEAC and the BCEAO, which are the only institutions in the region granted with the power to issue CFA currency. They also implement monetary policy, and finance and regulate government and private banking activity. The regulations which the central banks are empowered to enact concern particular monetary aggregates. Overall control of monetary creation is sought through the close monitoring and regulation of the different components of the money stock. The Franc Zone constitutions make the central banks' roles and powers very clear; what is not so clear is how effective the central banks actually are in controlling the financial system.

We might stylise the monetary system of either zone in the following way:

$$M_F + M_S + M_Q \equiv NFA_{CB} + NGD_{CB} + NFA_{PB} + NGD_{PB} + PCR$$

where M_F ("fiduciary money"), M_S ("scriptural money") and M_Q ("quasi-money") are the components of the money supply[4] - banks' liabilities - and the terms on the RHS of the identity are the corresponding assets. NFA_{CB} and NFA_{PB} are the net foreign assets of the central bank and the private banking system; NGD_{CB} and NGD_{PB} are net endebtedness of the governments of the zone to the central bank and the private banking system. The main foreign creditor of CFA governments is the IMF. IMF funds are directed through the central bank, so IMF credit is counted as NGD_{CB} and corresponds to negative NFA_{CB}. PCR is credit allocated by the banking system to the private sectors of each economy. It can be disaggregated into credit rediscounted by the central bank and that credit which is not rediscounted. The identity applies to individual countries as well as to the zone as a whole, the central bank accounts being disaggregated by country. Control over the money supply is exerted through control over the different assets on the right hand side of the identity.

The administration of the Franc Zone is based on accounts held by the central banks in Paris ("Operations Accounts"). The central banks are required to hold 65% of their foreign assets (NFA_{CB}) with the French treasury. Similar restrictions guide the regulation of private banks' foreign assets (NFA_{PB}). These assets represent the pooled foreign reserves of the zone. The BEAC and the BCEAO each have accounts. Moreover, each central bank imputes shares in the Operations Account to each country, based on

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[4] These are the disaggregations used in official publications. Roughly, M_F corresponds to UK M_0, whilst $M_F + M_S$ corresponds to UK M_1.

national economic and financial data.[5] This facilitates the calculation of balance of payments statistics for each country. The rises and falls in the net foreign assets of each country correspond to surpluses and deficits on the balance of payments. A key feature of the Operations Accounts is that they can be in debit, the Franc Zone as a whole receiving credit from France. The interest payments on this credit are very low: 1% for a deficit less than FF 5mn., 2% for the FF 5-10mn. range and, for over FF 10mn., the mean Banque de France intervention rate for the quarter, which is usually around 6-8%. However, the burden on France of financing the system is not great, since the total money supply of the CFA amounts to only about 3% of the money supply of France.

The administrative structures of the Franc Zone are designed to "harmonize" the monetary policy of member states, so that the French guarantees are feasible. I.e., institutional restrictions prevent countries free riding on the system. Without any controls, free-riding would be easy. For example, without any institutional constraints, governments could create large current account deficits each year by increasing borrowing from private banks to finance government consumption of imports. This would take the form of a reduction in the net foreign assets of private banks (NFA_{PB}), to acquire the forex to pay for the imports, and a corresponding increase in NGD_{PB} as the private banks hand over the money. The government has generated a substitution of domestic assets for foreign ones in the domestic banking system, leaving the money supply unchanged. The consumption of the imports is financed by an increase in the country's debit on the Operations Account, a debt on which interest payments are negligible.

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[5] The net position of the central bank is not identical to the sum of the net position s of member states, since some assets of the bank are not disaggregated by country.

The central banks have a number of measures at their disposal aimed at preventing the deterioration of the Operations Accounts, and thus the extent to which CFA members are indebted to the French treasury.

(i) The central banks provide rediscount facilities to financial institutions of member states. These facilities can be restricted in an attempt to reduce the total credit created by these institutions (NDG_{PB} + PCR). Rediscount levels are set for each country, placing an upper bound on the total amount of rediscount credit allocated by the central bank to that country in a particular year. The assumption has been that these levels will control total credit creation, since banks will consider it too risky to lend more than a certain multiple of their rediscount facility. The central banks now perceive this policy to have been a failure, and in recent years, more direct controls on private banks' credit creation have been introduced. In 1979, the BCEAO put upper bounds on all "ordinary" credit created by banks (i.e., all credit with the exception of short run agricultural credit). In 1990, agricultural credit was included in these regulations. In the BEAC zone, there are "liquidity ratios" stipulating a lower bound on the ratio of banks' liquid assets to their short term credit creation. Credit which can be rediscounted by the BEAC is counted as a liquid asset, and is the main component of the numerator in the ratio. The current lower bound varies between 70% (Cameroun) and 80% (Tchad).

(ii) The central bank can operate a procedure called "ratissage" - "raking in". This involves the compulsory deposit of foreign assets of public and private bodies in the central bank in exchange for CFA Francs. The presumable motivation for this is to prevent governments running up foreign assets abroad whilst becoming increasingly indebted with respect to the Operations Account, a practice which the 65% rule is meant to prevent.

Ratissage is, however, seldom used.

(iii) The central banks control a wide interest rates in the domestic economy, which could in theory be raised to discourage borrowing by private agents and encourage saving. However, Franc Zone documents emphasise that interest rate policy is intended to promote long term saving. Interest rates are not perceived as a short run adjustment tool.[6]

(iv) The other key tool for controlling African deficits is the "20% rule". Credits to government from the central banks (NGD_{CB}) are limited to 20% of the government's fiscal receipts for the previous year. If the government wants to increase its expenditure, it must increase its revenue. Thus, *if the 20% limit is a binding constraint*, there is a link between credit creation and the budget deficit, and with government borrowing from abroad making up such a large fraction of total borrowing, between credit creation and the current account deficit.

These rules are enforced by the supra-national institutions. When the rules appear to have been broken, which is very seldom, penalties are introduced immediately (as was the case in Senegal in the mid 1980s, which had its monetary growth/fiscal receipts ratio reduced from 20% to 15%). However, the central banks' powers have not been successful in preventing the steady deterioration of the Operations Accounts, which represents credit from France to the CFA. There are two possible causes of this deterioration, which warrant further exploration.

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[6] See for example Secretariat du Comite de la Zone Franc (1990).

First, the links between private financial institutions' credit supply and balance of payments deficits has been rather indirect. Until recently, when a UMOA country became a debtor in the Operations Account, the only way of directly influencing its money supply which was both written into the constitutions and applied in practice was the alteration of rediscount ceilings. There was no direct link between private banks' credit creation and the current account deficit. Even now, reductions in the total credit ceiling of a country with a deteriorating position in the Operations Account are subject to the discretion of the central bank. Since the central bank is controlled by committees now dominated by representatives of member states,[7] it is quite possible that a current account deficit will remain unremedied.

Moreover, although official documents analyzing the growth of the Operations Account deficit[8] stress the weakness of the links between the monetary policy tools of the central banks and private credit creation, a large part of the total money stock is created directly by governments (NGD_{CB} and NGD_{PB}) and the central banks (NGD_{CB} and rediscounted PCR) themselves. Domestic credit expansion may have more to do with the unwillingness of the central bank and governments to control the rate of growth of the money stock as with the ineffectiveness of the policy tools at their disposal.

The second problem is that the balance of payments statistics reported by member states are often completely fictional. When a country experiences a positive trade shock, there is an incentive to avoid the rules which specify the depositing of the revenue in the

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[7] See Appendix 1.1 for a description of the institutional hierarchies of the two central banks.

[8] See for example Secretariat du Comite Monetaire de la Zone Franc (op. cit.).

Operations Account. Running up an Operations Account deficit is, as we have seen, not costly, whilst running up a surplus in offshore accounts / spending the revenue may have a high return. As a result, the governments of oil exporters (Cameroun, Congo, Gabon) and of coffee and cocoa-exporting Cote d'Ivoire engaged in massive under-invoicing of exports in the 1980s.

Yeats (1990) provides evidence of this. Comparing these countries' declared export values with the values declared by the importing countries, he finds the following discrepancies:

	A	B
Cameroun-EEC	35.9	555
Cameroun-USA	43.3	410
Congo-EEC	36.4	176
Congo-USA	54.2	540
Cote d'Ivoire-EEC	23.8	537
Gabon-USA	75.4	568

A: reported exports/corresponding reported imports (%); B: value of the discrepancy in $mn.

These figures are much larger than for the discrepancies of other African economies: elsewhere in Africa, there is not the same incentive for the government to under-invoice. The CFA has no way of policing such activity, so the link between the central bank policies, which are based on official accounts, and the true state of the economies of

member states is rather weak.

In order to see whether Franc Zone rules make any difference to the macroeconomy of member states, we will need to discover (i) what difference an ideally functioning system would make, and what effect perturbations of the rules would have; and (ii) how close the system actually is to the ideal, and how large the perturbations are.

2. The political economy of the countries of the Franc Zone

In analyzing the impact of the CFA on member states, one must bear in mind that the Franc Zone encompasses a wide variety of developing economies. Tables 1.1-1.3 show the variety in income levels and structure of production. There are three major oil exporters: Cameroun, Congo and Gabon, which had the highest per capita GDP of any Sub-Saharan nation in the 1980s. Cote d'Ivoire is one of the few African economies to be classified by the World Bank as "semi-industrialised". To the North of these countries lies the Sahel, the semi-arid verge of the Sahara, which includes Mali, Niger and Tchad, which are amongst the poorest countries in the world. Some of the countries of the Franc Zone are reliant on a number of mineral exports: not just oil, but also uranium, manganese and phosphates; others export the major world cash crops: coffee, cocoa and cotton. Other countries are subsistence economies, and in recent times of drought have come to rely on foreign food aid.[9]

Moreover, despite being in an economic and monetary union, the members of the CFA display a wide variety of political and economic ideologies. Cote d'Ivoire aspires to capitalism, being relatively disinclined to impose price controls and nationalize successful enterprises. The Ivorian norm is joint ownership of firms, with the state, private domestic agents and foreign interests all taking large shares. It is also one of the few countries in the world to oppose economic sanctions on South Africa, and the government newspaper describes the ANC as "terrorists". Congo and Benin, on the other hand, have in the past

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[9] See Moudot-Bernard and Labonne (1982) and INADES (1984).

adhered strictly to Marxism-Leninism, in so far as the ubiquitous IMF structural adjustment programmes have allowed. Independence was followed by widespread nationalisations of companies with foreign share ownership, as part of the "Africanisation" process.

Member countries are also divided by realpolitik. Tchad has been involved in a protracted territorial war with Libya, whilst the Banque Libyo-Malienne plays a large role in the Malian financial system, and Burkina Faso voices public support for the Libyan administration. (Relations between Mali and Burkina are very poor, however, following a six-day war between the two countries in 1985 over possession of the Agacher Strip.)

A notable feature of francophone Africa over the past year has been the shift from one-party rule to more democratic forms of government, although the extent of democratisation is still unclear. In recent months, a number of well-established leaders have fallen from power, some violently (for example Traore in Mali), and others more peacefully (for example Kerekou in Benin). Even the positions of veterans like Eyadema (Togo) and Houphouet (Cote d'Ivoire) are now insecure. If political systems change, then economic systems are likely to change also. What use then is economic analysis of the Franc Zone of the 1970s and 80s in guiding policy decisions in the 90s? An important point to remember is that the Franc Zone has always encompassed a variety of political and economic systems; if the members of this heterogenous group has any features in common, owing to their peculiar monetary system, these features are still likely to be relevant after political upheaval.

Appendix 1.2 illustrates the variety of the economic structure and recent economic history of the members of the CFA.

Descriptions of the insular economy of Comoros and of Guinee equatoreale are omitted. Neither of these economies will be included in the studies of subsequent chapters, in the first case because of the extreme paucity of economic data, and in the second because membership of the Franc Zone dates back only to 1985.

3. Evaluating participation in the Franc Zone: existing evidence

A number of studies have sought to determine whether membership of the CFA promotes or retards economic growth. Since economic data are usually available only annually in African countries, and the significance of economic determinants of short run performance is difficult to evaluate in the presence of highly variable geographical factors (for example, rainfall, humidity, temperature and unrecorded migration between censi), these studies tend to concentrate on long run growth trends. Thus, the empirical evidence is somewhat tangential to the popular literature on response to temporary trade shocks, and also to the Mundell critique of monetary unions, which concentrates on the short run objectives of price stability and full employment (Mundell (1961)). It would not be too far from the truth to say that all the "relevant" theory is for the short run, and all the evidence is for the long run. Later, we will try to plug this gap; in this section, we will simply review the evidence which appears in the existing literature.

The major studies which compare rates of growth of income are Devarajan and de Melo (1987a), Plane (1988a) and Elbadawi and Majd (1992). The main obstacle to obtaining significant statistical results is the great diversity of economies both inside and outside the CFA. Devarajan and de Melo's solution is to estimate a Generalised Least Squares model of the log of gross national product of 74 LDCs for the period, 1960-82. The model is of the form,

$$y_{it} = b_0 + b_1 D + g_0 T + g_1 DT$$

where y_{it} is lnGNP of the i^{th} country in year t, D is a dummy variable for membership of the CFA and T is a time trend. The model is estimated for eleven categories, grouping together oil importers and oil exporters, and countries with ex ante low and high per capita GNP, for Sub Saharan Africa as well as for the whole sample. In general, aggregate growth of CFA members is significantly lower than the aggregate for the rest of the sample, but this does not take account of the possibility of more adverse climatic and geographical conditions in Africa than elsewhere. When CFA members are compared with just the rest of Sub Saharan Africa, statistically significantly better performance by CFA members appears for the high income countries and for the high and low income countries pooled, whilst there is no statistically significant difference for low income countries alone. Comparing two subsamples, 1960-73 and 1973-82 (before and after the move to floating exchange rates in the international economic system and the reform of the BEAC/BCEAO) reveals more information. In the first period, the one significant result for Sub Saharan Africa is that low income CFA members grew more slowly, whilst in the second period the one (highly) significant result is the faster growth of high income CFA members.

This approach is open to the criticism that its treatment of the factors which determine economic growth is rather crude, allowing for no quantification of the effects of natural resources and geography on growth. It would not be difficult to compile a long list of possibly significant omitted variables.

Plane tries to avoid this criticism by beginning with a general model of economic growth for 61 LDCs for the period, 1962-81, and for two sub-periods. (The partition is for some reason between 1970 and 1971.) The dependant variable in the cross-country regression is the average rate of growth of GNP over the period. Significant explanatory

variables include ex ante population and population growth rate, a dummy for aridity of climate, variation in terms of trade, ex ante per capita GNP, the proportion of mineral extraction output in GDP, infant mortality rate and the proportion of the population with primary education. Plane then tests whether the cross-country residual is dependant on Franc Zone membership. Although the weighted average of residuals for the Franc Zone is positive, and the residual for Africa outside the Franc Zone negative, the difference is not significant.

This methodology is not itself without drawbacks, however. In particular, Plane makes a number of questionable assumptions about the independence of variables, for example, the independence of Franc Zone membership from such factors as climate (many of the most arid LDCs are in the Sahel) and previous macroeconomic performance (there has been some movement into and out of the CFA, and this may be determined partly by economic factors). Also, although the average residuals for each of the country groups are calculated using weights reflecting the size of each country, the original "baseline" equation used to calculate the "norm" for income growth gives each LDC equal weighting: the figure for Bhutan counts as one observation as does the figure for India.

Elbadawi and Majd address the problem of the non-independence of CFA membership from other determinants of growth. They use instrumental variables to estimate the likelihood of CFA membership in a Probit equation, and then go on to estimate economic growth by country as a function of the instrumental variable estimate plus other explanatory variables. The most striking conclusion of this study is that whilst CFA membership had a positive influence on growth in the 1970s, the contribution of Franc Zone membership to growth has been negative in the late 1980s.

However, the studies described above do not shed any light on the mechanisms by which the institutions of the CFA might affect the performance of its members' economies. Indeed, the Plane paper excludes a number of possible connections a priori, by assuming the independence of explanatory variables from Franc Zone membership. If a comprehensive explanation of the impact of CFA membership is to be found, we must provide an account of why its effect over the long term appears to have been positive, whilst in the very recent past, it has been negative.

There are a number of possible areas of investigation. These are drawn from common themes running through a number of informal theoretical works, such as den Tuinder (1978), Raffinot (1982), Lelart (1986), Gerardin (1986) and Penouil (1986). In each case, we will be interested in two issues. First, are the hypothetical advantages of Franc Zone membership actualised (we have seen that the reality of the CFA falls short of the ideal)? Secondly, if there are real differences between the members of the CFA and others in Africa, are these differences important in determining economic performance?

(i) The CFA financial system, linked as it is to the West by the participation of the French economy, may remove barriers to the flow of financial capital between member countries and MDCs. This will stimulate domestic investment if there is a relatively high marginal return to capital employed in the zone, but a relatively low propensity to save. Of course, it could also facilitate capital flight, and reduce domestic liquidity, to the detriment of investment and output. We must however remember that capital flows to and from CFA members are not completely unrestricted: it is important to know how large the divergence from the ideal of perfect capital mobility is.

ii) The fixed exchange rate system, and more importantly the guaranteed convertibility of CFA Francs into French Francs, may also encourage financial flows into Franc Zone. It may be that risks to foreign investors are less because of the stability in the exchange system which the CFA induces. A given return in FCFA guarantees a certain return in FF. However, the real expected return to a foreign investment project in terms of one's home currency will also depend on expected changes in relative prices at home and abroad. So it will be some "real" exchange rate, i.e., a relative price index, which is important. It is not obvious that a stable nominal exchange rate guarantees a stable real exchange rate. Here, not only financial, but also trade policy is important. Tariffs and quotas can have an impact on relative prices, and trading restrictions on companies operating within the African economy can affect their rate of return. Again, reality does not perfectly match the ideal of riskless conversion between currencies, and trade barriers do exist. How important is this divergence?

iii) The restrictions placed on member governments may in themselves lead to greater monetary and economic stability. The 20% rule may lead to greater fiscal prudence. For example, more of a windfall from a trade shock might be saved, and this higher savings ratio may correspond to a path of consumption over time which is closer to the social optimum. Inter alia, it may minimise Dutch Disease effects. This is a theme running through Devarajan and de Melo (1987b), Benjamin et al. (1989) and Devarajan (1991). Also, the supra-national control over the money supply may lead to lower and less variable inflation which, like the fixed exchange rate, may encourage higher investment. The argument that such restrictions improve economic performance may be motivated by a belief that governments are inefficient, but this is not the only reason why restrictions could improve performance. For example, low inflation might not be a time-consistent

policy for an unrestricted government.

iv) Membership of the CFA may have positive and negative effects on a country's external balance. On the one hand, current imbalances may be more difficult to correct because of the fixed nominal exchange rate; on the other, the Operations Account provides a means of short term financing of an external deficit without recourse to possibly damaging changes in relative prices in the economy. However, we have seen that it is quite possible for the structure of the CFA to lead to persistent balance of payments deficits, with no failsafe method of correcting Operations Accounts deficits. One explanation for the poor performance of CFA economies in recent years is that the 1980s were a period of particularly severe external shocks. It will be important to investigate in more detail the mechanisms by which the money supply evolves, and how this is linked with a country's external balance.

v) Another aspect of the short term adjustment problem is the possibility of nominal rigidities in domestic prices. Most importantly, if the nominal wage is rigid, then in times of recession (such as most of the 1980s for oil importers, with oil prices high and agricultural export prices low), when equilibrium real wages ought to be falling, there will be efficient adjustment only if there is enough inflation to bring down the real wage. An anglophone government, with control over the domestic money supply, can easily engineer such inflation, but not a government adhering to the CFA.

vi) It is important to remember that the economy's external balance is likely to be dependant on the government budget (if only because so much of government borrowing is from abroad). Budgetary problems will be reflected in external imbalances. For example,

if real wages are rigid in a Franc Zone member, and public employment fixed, then at least one component of government expenditure is fixed. With falling revenues resulting from falling export value, such a government could end up with a large budget deficit.

Similarly, a country with a fixed exchange rate may attempt to mimic a devaluation by altering import and export taxes: such a policy was attempted by Cote d'Ivoire in the 1980s. A lower export tax (= higher producer prices) and a higher import tariff will have the same effect as a devaluation on the relative prices of imports and exports facing private domestic agents. However, such a policy will also affect the government's budget, and if it happens to reduce revenue and increase the need for foreign borrowing, the original aim of the fiscal switch has been thwarted.

In this thesis, we will tackle these issues as follows. In the first, and larger, part, we will address the arguments concerning long term growth. The central hypothesis here is that the financial institutions of the Franc Zone in some way facilitate investment and thus growth, either by providing a facility otherwise denied to African economies, such as open accesss to Western capital markets, or by imposing an external constraint on government policy which would otherwise be suboptimal. More time will be spent on this part because relevant data is relatively abundant, and some econometric analysis is possible. We will try to construct models which not only show whether the Franc Zone leads to higher investment, but also, if it does, *how* it does.

In the second part, we will be concerned with arguments against the Franc Zone, which concern the possibility that the constraints on government policy which the monetary union enforces prevent efficient adjustment. Given the paucity of relevant data

in this area, this will not involve econometric analysis, and other ways of investigating hypotheses (iv-vi) above need to be found.

First of all, then, investment, beginning with a survey of the financial institutions of CFA members, and what authors have already said about their impact on investment.

APPENDIX 1: CFA ADMINISTRATIVE STRUCTURES

i) *The BEAC Zone* - At the apex of the BEAC structure is the Monetary Committee. This is composed of the finance ministers of member states, and meets annually. Its role is restricted to oversight of the application of the rules and policies of the zone. There is also a Mixed Monetary Committee, which is composed of Monetary Committee members plus French representatives, also meeting annually. The main policy-making body is the Administrative Council. This is composed of four Camerounian representatives, two from Gabon, one from each other member state and three from France. Decisions are made by a simple majority vote, except for major decisions, which require a 3/4 majority. This meets regularly to decide on general BEAC policy and to check the bank's statement of accounts. Under the Administrative Council are the National Monetary Committees. Each committee is made up of BEAC officials and national representatives sponsored by the government. This assesses the general financial needs of the economy, as a basis for setting upper bounds on credit allocated to private banks and enterprises. Decisions are taken at the level of the individual firm, with the setting of limits on the quantity of credit to the firm from private banks which the BEAC will rediscount. Individual officials of the BEAC: the Governor, Censors and National Directors, have a purely administrative role.

ii) *The UMOA Zone* - The highest authority in the BCEAO is the Conference of Heads of State. This meets at least once a year to decide on issues not resolved by the Council of Ministers. Decisions require a unanimous vote. The Council of Ministers (two from each country) decides general BCEAO policy. In recent years, much of its time has

been taken up by credit arrangements with international organisations such as the IMF and World Bank. Again, a unanimous vote is required. It plays a much more active role than its BEAC counterpart. The Council of Ministers nominates the Governor of the BCEAO, who serves for a period of six years. Endowed with more authority than the Governor of the BEAC, he implements not just the decisions of the councils, but also his own decisions in areas which the councils do not have time to cover. The Administrative Council and National Credit Committees are similar to those of the BEAC, although with less authority, since the higher organs of the administration play a more active role.

APPENDIX 1.2: THE MEMBERS OF THE CFA

Burkina Faso - Burkina is still a one-party state, with a long history of coups and coup attempts. The lack of foreign resources in this Sahelian economy allows little room for manoeuvre in terms of economic policy. The most lasting change which any of the short-lived governments have made is the change in name from the colonial Haute-Volta. Burkina has become increasingly indebted, due to its need to import food and the scarcity of resources for production of exports, coupled with the high transport cost involved in exportation from this landlocked country. A high population density compared with other Sahelian economies compounds the problem. Most of Burkina's export revenue comes from cotton, the hardiest of the main cash crops. There is little industry. Trade with other Franc Zone members is not extensive: over 80% of recorded exports are to Nigeria.

Benin - the 1972 coup which brought to power the Parti de la Revolution Populaire in Dahomey, changing the country's name, gave rise to the expression, "Marxism-Beninism", implying only a nominal adherence to communist ideology. However, the regime did introduce a wide range of price controls on agricultural products, under the auspices of the state agricultural marketing board, CARDER, and nationalize the banking system and many private enterprises. (The banking system was reprivatized in 1989). Agricultural productivity has improved in recent years, leading to virtual self-sufficiency in food. However, declining world prices of the main cash crop, cotton, have meant that the trade balance has failed to improve, and foreign debt is still high. Official figures still show a large trade deficit, but this does not include the considerable border trade with Nigeria.

The industrial sector is very small; the processing of palm oil is the main industry. Government revenue is dependent on import and export duties, and there is little domestically financed investment, either public or private. A $45mn. structural adjustment loan was negotiated with the World Bank in 1989. With the fall of Kerekou, Marxist-Leninist ideology was abandoned, and the new prime minister is an ex-employee of the World Bank. The impact of this change, save a return to the name Dahomey, is still unclear.

Cameroun - The United Republic of Cameroun is an amalgam of the old French colony and part of British Cameroons (the other part federated with Nigeria on independence). The larger, francophone, part of the country dominates the political and economic systems, and anglophone Camerounians in the West are now calling for secession. Up until now, serious unrest has been averted, mainly because of the relatively high per caput GNP which Cameroun enjoys, so even the underprivileged West is quite wealthy.

The growth of the Camerounian economy in the late 1970s and early 1980s was very rapid; at the end of the boom in international prices of its two main cash crops, coffee and cocoa, Camerounian oil came on stream, providing the lion's share of export earnings. The government inaugurated a five-year plan geared towards high levels of public investment, financed by part of the oil revenue. Gross domestic investment rose from FCFA 188bn. in 1977 to FCFA 418bn. in 1981. International loans were also taken out on the basis of expected future oil revenues: foreign debt rose from $860mn. to $2050mn. in the same period. However, when oil prices collapsed in 1986, Cameroun did

not hang itself on the expectation of plenty, since the government had secreted perhaps 3/4 of the oil revenue in American banks, a perturbation of BEAC rules, and public current expenditure had actually fallen in the 1977-81 period (Vallee (1989)). Relative to other Franc Zone members experiencing a commodity boom, Cameroun's trade deficit and growth in foreign debt over the 1980s were quite small. Devarajan and de Melo, (1987b) attribute this difference to a lower money supply (there being a large outflow of financial capital to America) - lowering private consumption of imports, along with low public consumption. However, this has not prevented the need for an austerity budget, total government expenditure falling by 19% between 1986/7 and 1987/8. Investment expenditure fell by 26% and around 16 000 redundancies were made in the public sector.

The government has large stakes in the new industries resulting from its investment programme, both in agro-industry and chemicals. However, problems in two of the major enterprises, the aluminium and pulping companies Alucam and Cellucam, have led to a greater emphasis on privatization.

Centrafrique - the post-colonial politics of Centrafrique have been dominated by the rise and fall of the dictator, Gen. Bokassa, who overthrew his cousin in a military coup and crowned himself emperor. After a notoriously bloody rule, he was ousted by French paratroopers. Centrafrique shares with the Sahelian economies a trade deficit due to large food imports. However, the French government has been happy to provide the capital to finance this deficit - perhaps because of its prolonged political and military involvement in the country - and the assets of the national branch of the BEAC have steadily increased. French aid has so far allowed the government of Centrafrique to snub the IMF and pursue

a large public sector deficit. The country's main exports are diamonds and cotton. More importantly, Centrafrique exports large quantities of CFA Francs. The net outflow of currency in 1982 was FCFA 15bn., the export of currency reaching some 70% of the country's total money supply and 20% of domestic expenditure. Most of this is exported to Cameroun, but some goes outside the CFA, to countries happy to receive the hard currency.

Congo - the sole political party of Congo since independence has been the Parti Congolais du Travail, which espouses a Marxist-Leninist ideology. Congo is highly dependent on oil revenue, its agricultural sector being confined to subsistence farming and forestry. Agriculture has been largely ignored by the government, although it employs about a third of the workforce, and there are large imports of food. Again, the oil price rise of 1979-80 led to a major public investment drive, with a projected FCFA 1,109bn. expenditure on development in the 1982 Five Year Plan. Growing foreign debt and slowdowns in economic growth in the mid 1980s, however, led to the negotiation of a $70mn. IMF structural adjustment loan in 1986. The government agreed to implement an extensive privatization programme, somewhat at odds with its official ideology. Despite the investment programmes, there has been little diversification of Congolese industry, and the world price of oil still determines the performance of the economy.

Cote d'Ivoire - President Houphouet-Boigny has ruled the country since before its independence from France, his Parti Democratique (sic) de la Cote d'Ivoire being until recently the sole legal political party. He rules over perhaps 60 ethnic groups, plus a large

foreign workforce, composed of Burkinabes, Malians and Guineans, who make up about a fifth of the economically active population. The revenue from exports of coffee and cocoa have financed a widescale industrialization of the economy, which is relatively highly diversified. The beverage boom of the mid 1970s led to a large public investment programme: gross domestic investment rose from FCFA 187bn. in 1975 to FCFA 627bn. in 1980. A further FCFA 2,200bn. of investment was planned for the period 1981-5, half to be financed out of public funds, but the collapse of international coffee and cocoa prices led to ever increasing debt and the negotiation of an IMF structural adjustment loan. Part of the problem was that the increase in investment led to an expansion of output only of the services sector, the increase in demand for tradeable commodities being met by increased imports.

In recent years, there has been pressure for the diversification of the agricultural sector away from coffee and cocoa, which are now relatively less profitable for the economy. However, official producer prices, set by the agricultural marketing board, CAISSTAB, for government purchase of the crop, remained high until 1989: the producer price of cocoa remained at FCFA 400/kg., whilst transport costs for the government were rising, and the world price was around FCFA 450/kg. Output of cocoa is still rising, following the drought and forest fires of the early 1980s: present production is now close to a million tonnes per annum. When the World Bank threatened to withhold loans, Houphouet was "persuaded" to see the advantages of lower producer prices. Clearly, there are limits to the extent to which the Cote d'Ivoire is a market economy.

Gabon - the Gabonese economy is highly orientated towards mineral exports, and

agriculture makes up only 10% of GDP, with only 0.5% of the land area of the country being cultivated (most of the rest of the country lies under dense rainforest). However, 3/4 of the population are employed in agriculture, which makes for an even more unequal distribution of income than is usual for tropical Africa. In the 1970s and 80s, oil was the main source of income, but with the fall in the world price manganese and uranium have become more important. Despite having the highest per capita GDP of any Sub Saharan economy by 1985, the collapse of oil prices led to austerity measures and structural adjustment loans for 1986-90.

Mali - 80% of Mali is either desert or semi-desert; economic activity is confined to the region around the River Niger. 3/4 of the labour force is employed in (mostly subsistence) agriculture, whilst 10% of the population is still nomadic. A series of droughts has led to a large trade deficit, with importation of many foodstuffs.[10] There have been IMF structural adjustment loans to Mali for a decade, but little to adjust. Nevertheless, there is a small industrial sector, accounting now for 10% of GDP.

Niger - 90% of the Nigerian population work about 3% of the land, the rest of the country being arid. Despite the Sahelian drought of 1984-5, however, the country is virtually self-sufficient in food. GDP growth rates of over 6% were achieved in the 1970s and 80s by exploitation of the country's uranium resources. The state shares the uranium

[10] Mali's true external balance is difficult to compute. Total external debt, resulting from borrowing to finance imports of basic consumer goods and food, is now around $2.31bn. However, the late president Traore is estimated to have secreted at least $2bn. of his "earnings" in foreign bank accounts.

mining industry with France, and controls most of the rest of the industrial sector. Relations between Niger and international aid organisations deteriorated over the 1980s, due to the government's refusal to implement the privatization schemes constructed by the Word Bank, which withheld a $50mn. loan in 1988.

Senegal - Senegal is the most advanced of the Sahelian economies, with industry making up 27% of present GDP. It is also the only country in the CFA to have had a multi-party political system, with regular elections and a fairly clean human rights record (at least, until the civil war in Casamance province). The country's trade position deteriorated in the late 1970s, after the collapse of world prices of Senegal's main mineral export, phosphate, and the increasing desertification of the north of the country. Like the Cote d'Ivoire, the rapid expansion of the services sector, which now constitutes over half of GDP, may have exacerbated the trade deficit. Overall per capita GDP has been stagnant for the last fifteen years, and increasing international indebtedness has necessitated the negotiation of international loans. There is a relatively liberal internal trade regime: there is, for example, no longer any state intervention in the marketing of the major cash crop, groundnuts. (The state marketing parastatal was wound up in 1985, facing severe losses, since only 200,000 tonnes of the 700,000 crop that year found its way into the state marketing system.)

Tchad - Tchad is one of the poorest countries in the world. Per capita GDP fell from $160 in 1977 to $110 in 1984, at the height of the drought, and has ow risen to its 1977 level. It incurs an annual food deficit of about 15,000 tonnes. Communications are

hindered by the lack of all-weather roads and navigable rivers, and by the protracted war with Libya. Some oil reserves are known to exist in the country, but the war has prevented adequate exploration. 3/4 of the meagre export earnings are produced by the state-owned cotton company.

Togo - with Senegal, Togo is the region's major phosphate exporter. Like Senegal, the service sector has come to dominate the output of the economy, though 2/3 of the labour force are employed in agriculture. There is a one-party state, and marketing of most products is controlled by parastatals. The phosphate industry is state-owned. However, the government is pro-Western, and does not espouse the ideology of neighbouring Benin. Foreign debt is around 100% of GDP, and since 1979, the government has been unable to meet its interest and redemption payments. Annual rescheduling negotiations are usually necessary, and austerity budgets have been pursued since 1980. President Eyadema's foreign bank accounts are thought to total $1bn.

TABLE 1.1: MAJOR EXPORTS OF CFA MEMBERS

Country	Commodity	Export value (F CFAbn.)
Benin	Palm oil	1.89
(1982)	Cotton	1.46
Burkina	Cotton	15.75
(1984)		
Cameroun	Oil	583.78
(1984)	Coffee	89.49
Cocoa		69.92
Centrafrique	Diamonds	13.52
(1984)	Coffee	10.55
Wood		9.05
Cotton		8.99
Congo	Oil	365.03
(1983)	Wood	18.30
Cote d'Ivoire	Cocoa	396.61
(1984)	Coffee	183.38

Gabon	Oil	751.60
(1984)	Manganese	41.50
Mali	Cotton	39.40
(1984)	Groundnuts	0.50
Niger	Uranium	94.18
(1983)		
Senegal	Oil products	43.19
(1984)	Groundnuts	40.14
	Fish	28.26
	Phosphate	25.82
Tchad	Cotton	42.11
(1984)		
Togo	Phosphates	40.94
(1984)	Cocoa	21.01

(Source: UN Handbook of Trade Statistics (1987)

TABLE 1.2: PER CAPITA GNP OF CFA MEMBERS ($US)

Country	1970	1980	1987
Benin	110	320	300
Burkina	60	200	200
Cameroun	180	760	960
Centrafrique	100	320	330
Congo	240	880	870
Cote d'Ivoire	270	1170	750
Gabon	670	3830	2760
Mali	70	240	210
Niger	160	430	260
Senegal	210	490	510
Tchad	100	160	150
Togo	140	430	290

(Source: World Bank World Tables (1989))

TABLE 1.3: COMPOSITION OF GDP OF CFA MEMBERS (%)

Country		1970	1980	1987
Benin	(i)	49.5	47.8	46.3
	(ii)	11.4	12.2	14.2
	(iii)	39.1	40.0	39.5
Burkina	(i)	44.0	41.3	40.1
	(ii)	23.0	20.0	19.1
	(iii)	33.0	38.7	40.8
Cameroun	(i)	33.5	28.4	23.8
	(ii)	19.9	28.0	30.8
	(iii)	46.6	43.6	46.4
Centrafrique	(i)	35.5	40.0	40.9
	(ii)	26.1	22.5	13.3
	(iii)	38.4	37.5	45.8
Congo	(i)	20.5	13.9	12.2
	(ii)	27.5	55.6	32.7
	(iii)	52.0	30.5	55.1

Cote d'Ivoire	(i) 40.3	33.4	35.7
	(ii) 23.4	19.9	25.5
	(iii) 36.3	46.7	38.8
Gabon	(i) 20.3	8.5	10.8
	(ii) 52.2	72.7	40.9
	(iii) 27.5	18.8	48.3
Mali	(i) 66.2	60.9	55.6
	(ii) 11.7	9.7	12.0
	(iii) 22.1	29.4	32.4
Niger	(i) 66.9	44.8	34.8
	(ii) 7.2	23.9	25.0
	(iii) 25.9	31.3	40.2
Senegal	(i) 27.2	19.1	26.0
	(ii) 22.8	24.9	32.1
	(iii) 50.0	56.0	41.9
Tchad	(i) 47.1	53.6	43.3
	(ii) 18.1	11.9	18.3
	(iii) 34.8	34.5	38.4

Togo	(i) 37.9	31.3	33.0
	(ii) 23.6	28.2	20.1
	(iii) 38.5	40.5	46.9

i: primary sector; ii: secondary sector; iii: tertiary sector; source: ibid.

CHAPTER 2

INVESTMENT AND FINANCIAL MARKETS IN THE FRANC ZONE

INVESTMENT AND FINANCIAL MARKETS IN THE FRANC ZONE

A claim made by a number of authors is that higher long run growth in the Franc Zone results from higher levels of investment. This may be because CFA members enjoy better financial markets, easier access to financial capital from abroad, or lower inflation. In this chapter, we will survey these claims, putting them in the context of (i) CFA financial institutions, and their regulation, (ii) the recent history of financial institutions in member countries and (iii) quantitative evidence on investment in the Franc Zone, such as it exists. In later chapters, we will present evidence which will hopefully shed light on some of the questions left unanswered here.

1. CFA financial institutions: regulation and performance

(i) Indicators of financial openness

Penouil (1986) notes the diversity of the members of Franc Zone in terms of access to foreign capital. Between 1970 and 1984, the total debt of the CFA increased fourteenfold, whilst that of the rest of Sub Saharan Africa increased tenfold, suggesting a greater expansion in credit to Franc Zone members. However, most of the increase in CFA credit was given to only a few countries: notably Togo, Cote d'Ivoire and the oil exporters (see Figure 2.1). In the Sahel, there is very little evidence of a rapid expansion in credit, apart from in Mali, where the official foreign debt - GDP ratio remains high. Moreover, in the CFA as in the rest of Africa, the countries most indebted in 1970: Cote d'Ivoire, Togo and Mali, remained at the top of the list in 1984. Countries with relatively little credit from abroad at the beginning of the period tended to remain at the bottom of the list.

There also seems to be a difference in the uses to which the foreign credit is put. In Cote d'Ivoire and the oil exporters, there has generally been a surplus in the visible Balance of Trade over the last twenty years; current account deficits arise when there are large imports of factor services (see Figure 2.2). This suggests that a positive capital account (i.e., a net inflow of foreign funds) has been financing investment. There is a high correlation between the import of factor services and the level of gross domestic investment. In other Franc Zone countries, where debt ratios and growth of debt are on the whole lower, the positive capital account has been financing a deficit in the Balance of Trade: i.e., foreign aid has been supporting the import of consumer goods. In fact, much of this is food aid to the arid countries of the Sahel.

In the light of the current problems faced by African economies with high debt burdens, one must be careful in using past capital account surpluses as a measure of an economy's healthy openness to foreign financial flows. However, as long as the future expected returns to an investment activity are at least as high as the initial loan, then the more is loaned, the better for the creditor economy. (Overprediction of future export prices is an often-quoted reason for the present problems facing countries such as Cameroun. If

prices had remained at their original high level, then net returns to investment financed by foreign borrowing might well have been positive.) In this case, the high debt ratios of the more industrialized Franc Zone members reflect an ex ante efficient response to a relatively large endowment of natural resources, which entails a relatively high domestic marginal productivity of investment. In members with little natural resource base, financial capital inflows are confined to aid packages to maintain domestic consumption at a base level.

This scenario of an efficient financial system in the CFA is contrasted by Penouil with the constraints faced by other African economies. Although some very resource-rich countries, such as Nigeria, have been able to attract loans from abroad, there are other economies where a generous endowment of natural resources is combined with a scarcity of foreign funds. The most extreme example of this is Ghana, which has a very similar resource base to Cote d'Ivoire, but has had very little foreign capital, even after the Nkrumah period of "self-sufficiency". Moreover, the ability of resource-poor economies to run trade deficits is much more restricted outside the Franc Zone. In Penouil's survey, half of the non-CFA economies had positive trade balances, and none had deficits relative to GDP as high as Benin, Burkina and Mali.

In the case of the poor countries, the greater credit to the CFA members might be explained by the increasingly negative Franc Zone Operations Accounts (see chapter 1), coupled with generous aid packages from France. However, this is less plausible with the more developed economies. Their foreign borrowing is of an order of magnitude greater than the Operations Account deficits, and since 1975, when French and EEC aid was redirected to the poorest African countries, the richer CFA members have had to look to the international financial community, and to the World Bank/IMF, for credit. Penouil's favoured explanation is that the institutions of the Franc Zone make its resource-rich members more creditworthy than others in Africa.

One possible reason for greater creditworthiness is that the disciplines of CFA membership lead to a more stable economy. Since a more stable economy is also likely to lead to a higher demand for investment goods, the higher supply of credit will be complimented by a higher demand. In particular, CFA inflation rates are typically much lower than those of other African economies, and it has been suggested that this is a direct result of the restrictions on monetary expansion enforced by the BEAC and BCEAO

(see Gerardin (1986) and Plane (1988b)). Table 2.1 shows how prices have changed in the Franc Zone, and how this compares with price changes in the rest of Sub-Saharan Africa. Higher inflation may lead to lower investment in a number of ways. First of all, rapidly changing prices may be more difficult to predict. Input and output prices will be more uncertain, and so investment in any particular project becomes riskier. (In anglophone Africa, high inflation is also associated with rapid exchange rate depreciation, so the risk is compounded for foreign investors, who will be valuing the return to the project in foreign currency. In the Franc Zone, of course, the perceived exchange risk is simply due to the likelihood of a restructuring of CFA institutions and devaluation.) Moreover, high inflation plus high nominal interest rates may imply the same real total cost of borrowing as low inflation plus low nominal interest rates, but the former implies high interest payments in real terms at the beginning of the loan, and low payments at the end of the loan. It is possible that this deters investment.

Penouil's data description is given some support by the econometric study by Mathonnat and Collange (1988). They consider a number of indicators of "financial openness" for three periods: 1962-4, 1970-2 and 1979-81. The levels of various indicators for the CFA and others in Africa are compared, then the indicators are regressed on a number of explanatory variables, and the residuals for Franc Zone members compared with those for the rest of Africa. Two key indicators are: the gap between investment and savings, "I - S", which measures the domestic investment being financed by foreign borrowing net of capital outflows (this is expressed as a fraction of GDP), and the total level of national debt (expressed as a fraction of GNP). Among the significant explanatory variables are: per capita GNP, the log of total population and the value of mineral extraction as a percentage of total output. They find that I - S is significantly higher for Franc Zone members for all three periods, and that the residual for the regression equation of this variable significantly higher for the period, 1970-2. Moreover, total debt is significantly higher for the period, 1979-81, although none of the residuals is significantly different.

However, these results are subject to a number of caveats. There are methodological queries analogous to those raised by the Plane study quoted in chapter 1. The models of I - S and total debt are far from perfect: the R^2 statistics for these variables

range between 0.1 and 0.64. Again, one might wish to question the assumptions of independence made. For example, in the light of Devarajan and de Melo's work, might CFA membership not be correlated with per capita income?

Moreover, it is not always the case that CFA members with a natural resource find credit to finance investment. Azam (1991) shows that investment did not follow directly from the positive external shock of the uranium boom in Niger in the late 1970s and early 1980s. Niger was able to finance investment only from trade receipts from uranium already sold, not from borrowing based on the future expected income from the uranium as yet unmined.

The link between investment and the hypothesised lower price and exchange rate instability enjoyed by Franc Zone members also remains unclear. The most comprehensive study of exchange rate instability in the Franc Zone is Paraire (1988). He shows that both the nominal and real effective exchange rates of CFA members, as he defines them, have exhibited less instability than the exchange rates of other Sub Saharan African countries. The effective exchange rates are calculated by taking a weighted average of bilateral rates. The weights are based on the total value of imports and exports of each country with each trading partner.[1] The real exchange rates compare the nominal rates multiplied by domestic and foreign consumer price indices. Using different measures of variability, Paraire concludes that in all cases, the variability of Franc Zone effective exchange rates is significantly lower than for the rest of Africa, although the difference is less marked in the case of real exchange rates.

However, it is not clear which exchange rate is relevant to the evaluation of the riskiness of loans to a country. If, for example, creditors are concerned primarily with the dollar returns to the industrial sector which the loans are financing, then the most appropriate "exchange rate" to use might be a relative industrial price index. It also seems inappropriate to use weights based on current account transactions to calculate a measure of instability which is meant to explain the capital account. For some countries, loans come from international institutions, so weighting based on bilateral trade flows might not be appropriate.

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[1] It is not made clear in the paper whether these values are denominated in home currency units.

So the dichotomy between the CFA and others in Africa in terms of financial openness is not so marked as some have claimed, and ambiguities remain. A survey of the institutional regulations of the Franc Zone also reveals that its relative financial openness is not a foregone conclusion.

(ii) Regulation of financial flows

In principle, membership of one of the monetary unions commits a state to ensure the free movement of assets between the national economy and other member states, including France. However, the constitutions of the unions allow for certain exceptions to the general rule. UMOA regulations allow for the imposition of restrictions on the movement of assets within and out of a country "when the government thinks that this is necessary". Occasionally, this clause is invoked, as in Senegal in 1981. In the BEAC zone, there are more general restrictions on the movement of assets. For example, there is a limit on the quantity of CFA banknotes which anyone can export from a member state, even to another member of the union. (Although all BEAC notes are legal tender in each member state, every country's regional BEAC office prints notes imprinted with a national differentiating symbol, in order to facilitate the surveillance of currency movements. Even so, large movements of currency sometimes escape the notice of the authorities, a point which is discussed below.)

Moreover, the mechanics of transferring assets into and out of the Franc Zone are sometimes quite complex. If, for example, a French agent wishes to transfer a large sum of money to the bank account of an Ivorian in Abidjan, the transaction has to be in the form of a "transfer in treasury". The sum is debited from the French agent's bank account and credited to the Banque de France in Paris. The same amount is then debited from the Banque de France and credited to the BCEAO in Dakar, whence it is transferred to the BCEAO regional office in Abidjan, and finally to the private bank account of the recipient. This process is sometimes subject to considerable delays. Delays also occur in movements of assets out of the Franc Zone. ABECOR advises European exporters:

> "Although Franc Zone membership has been conducive to smoother payments, the pressure on international liquidity brought about by sustained current

account deficits has led to payments delays, and the situation should be kept under review."[2]

The export of assets from the Franc Zone is also subject to a number of taxes. There is a 0.25% tax on short run loan capital exiting the CFA (both regions). In addition, each country can impose a national surtax; the highest is that of Congo, 0.75%. Even assets moving from one CFA member to another are subject to a 0.1% tax. In the complex financial transactions of the sort described above, an asset can end up being taxed two or three times on its journey out of its country of origin.

In addition, governments impose a number of regulations on the asset holdings of private agents as well as of banks, which are not entirely in keeping with the principles of the Franc Zone. Vizy (op. cit.) notes that most CFA governments require that their exporters hold their export receipts in their own country. Private banks are "encouraged" not to hold more money abroad than is necessary to meet their current requirements. Export receipts from Africans living abroad must be repatriated within a few weeks. Pressure is put on banks to hold all their assets in the national financial system, rather than in neighbouring Franc Zone members. These regulations are designed to prevent Latin American style capital flight, but they also restrict the movement of capital within the Franc Zone and between the CFA and France. The reason that "ratissage" has not worked in halting the deterioration of the operations accounts may be that an informal policy of ratissage is permanently employed by all the governments of the CFA. Clearly, the practice of financial regulation falls some way short of the ideal of complete freedom in movement of capital.

(iii) Credit regulation

As noted in chapter 1, there are extensive credit regulations imposed by the two central banks. The intention of these regulations is doubtless to control the money supply of each country. However, in limiting the allocation of credit, they may also affect levels of investment. The regulations outlined below indicate some differences between the two regions.

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[2] ABECOR report on the Sahel, 1986

the BEAC - the central Administrative Council sets limits each year on the total level of credit which private banks in each country will be able to rediscount with the BEAC. There are separate limits for "short run" and "medium run" credit (i.e., for 0-2 and 2-10 years respectively), which are based on the advice of the National Monetary Committees and the regional BEAC offices. The limit is not a fixed quantity of CFA Francs, however, since the level of rediscountable credit for exports and agricultural goods is indexed to the annual output of these sectors.

In addition, limits are set on the level of rediscountable credit available to each private bank, and also to each individual firm! The latter is based on a dossier prepared each year by the firm's principal bank.

There are also limits on the fraction of a particular credit contract that the BEAC will rediscount. In agriculture, the fraction is 15% during the harvest and 100% during the marketing period. The rate is 80% for credit to buy food, build houses and invest in national companies. For general investment in rural and urban areas,the rates are 50% and 30% respectively.

The BEAC also operates liquidity ratios (see chapter 1) and reserve assets ratios, one taking into account just rediscountable credit, and one for non-rediscountable credit. In 1987, the rates for rediscountable credit were 5% in Cameroun, Centrafrique and Congo, and 7% in Gabon and Tchad. For non-rediscountable credit, the rates were 5% in Cameroun, and 10% in the other countries.

In addition, the central bank imposes different rediscount interest rates on different kinds of credit. There is a basic rate, which is now 9%, and a preferential rate for "priority sectors", i.e., for agriculture and for firms owned and controlled by CFA nationals with assets of less than F CFA 100m., which is 6%. Also, a penalty rate of 16% is imposed on private banks' accounts with the BEAC that are in debit.

the BCEAO - until 1975, the BCEAO regulations were similar to the BEAC regulations. However, the rapid rise in non-rediscountable credit in the early 1970s led to

a restructuring of the system, with the abandonment of liquidity coefficients, rediscount limits and distinction between rediscountable and non-rediscountable credit. The BCEAO is now much less ready to rediscount ordinary credit (apart from agricultural loans), and refinancing of bank loans takes place on a fledgling UMOA money market (see below). BCEAO regulations now concern the total level of credit available to an economy.

Each year, the central bank allocates to every UMOA member a total credit ceiling. This ceiling is based on the advice of the National Credit Committees, with economic predictions provided by an IMF macroeconomic model. The National Committees decide the allocation of this total between the government and private banks. Moreover, the BCEAO oversees the allocation of credit to individual firms. All requests for loans of over FCFA 30m. (100m. in Cote d'Ivoire and Senegal) must be vetted by the regional office of the BCEAO. The regional director can refuse the request, or allow only a loan smaller than that requested. Firms are sometimes advised to seek foreign sources of funding, instead of credit from the domestic financial system.

For those loans which are still rediscountable, there are also ceilings on the fraction of the loan which is to be rediscounted. The rate is 90% on credit for private housing, 75% for investment in agriculture and 65% for investment which promotes industrial development. However, loans for the seasonal agricultural cycle are rediscounted at 100%.

In addition to these regulations, each member of UMOA imposes restrictions on the way that its private banks may allocate credit. Maxima are stipulated for the fraction of credit going to disfavoured sectors, and minima on credit to priority areas. The following rates for Cote d'Ivoire and Senegal are typical.

Cote d'Ivoire:	minima - industry (41%), primary sector (7.5%) maxima - tertiary sector (20.8%)
Senegal:	minima - industry (30%), housing (10%), building/public works (9.5%), agriculture (6%), transport/communication (5%) maxima - commerce (20%)

Thus, in Senegal, over 60% of a bank's loans must be allocated to certain sectors. It remains to be seen whether such restrictions seriously inhibit the flow of capital in the CFA.

2. The recent history of the monetary system of the Franc Zone: une vraie crise?

The 1980s have seen a number of financial crises in the CFA which have called into question the ability of the banking system to fulfil the role envisaged for it by the constitutions of the central banks. Among the more notable banking collapses have been the following.

Benin - from 1974 to 1989, there was a state monopoly of the banking system, all foreign banks having been nationalized in the early 1970s. However, in 1989 a number of French administrators were asked to intervene in Benin on behalf of the CFA. Two of the main banks, the Banque Commerciale du Benin and the Banque Beninoise pour le Developpement, had been liquidated, the cause of their bankruptcy being ascribed to "corruption and mismanagement".

Cameroun - in the early 1980s, a number of foreign banks were attracted to Cameroun by the discovery of oil there: Chase Manhattan, Bank of America and First National Boston having large operations in the country. By 1989, all of them had left again. There had been a severe liquidity crisis in 1987: a number of government parastatals made large withdrawals to cover their costs as Camerounian terms of trade further deteriorated, and many banks suffered from default on domestic loans.

Cote d'Ivoire - in the late 1980s, two major banks were bankrupted: the Banque Ivorienne de Construction and the Banque Nationale pour l'Epargne et le Credit. The Ivorian government had a 35% holding in the former and a 100% holding in the latter. Again, the cause was claimed to be a lack of liquidity in the system.

Senegal - in 1988 there was a comprehensive restructuring of the banking system. Seven of the ten branches of the Banque Internationale de l'Afrique Occidentale - Senegal were closed, and the Union Senegalaise de Banque was saved only by a rescue plan offered by the French Credit Lyonnaise. Large debts to these two institutions among others were owed by now defunct parastatals and "political personalities". A proposal for the merger and scaling down of a number of Senegalese development banks led to a strike by bank employees.

Tchad - all private banks suspended their operations in Tchad in 1980, and F CFA 1.6bn. in savings deposits was frozen. Two have since reopened, but between 1980 and 1986 there were no banking facilities outside the capital, N'djamena.

Given its lack of natural resources and the continuing war with Libya, it is not surprising that the Tchadian financial system is very poorly developed. But what of the other Franc Zone states?

Officials have pointed to a lack of funds in the private banking sector, which has become more and more acute over the 1980s. Antoine d'Arzujan, an administrator of the BIAO, puts the blame in Cote d'Ivoire on the increasing demands made on the private banking sector by the government and its parastatals:

> "Commercial banks are not financially equipped to fund exports. There is pressure on banks to fund the gap between producer prices and import prices."[3]

That is, in the absence of extra credit from the BCEAO, the government is funding its budget deficit (caused partly by high producer prices) by borrowing from the domestic private sector. Not only is this causing crowding out, but it is jeopardising the survival of the private banking system. Boisseau (1984) lays the blame with the BCEAO for imposing too strict a credit policy in the country, noting a decline in the liquidity ratio (i.e., the inverse of the velocity of circulation) from 29.1% in 1979 to 26.3% in 1983.

Capital flight is another possible cause of the liquidity crisis, although it is not (yet?) of Latin American proportions. A report of the North-South Export Consultants (17.12.1988) claims that the Franc Zone is no longer acting as a brake on capital flight. However, this flight does not reflect the absence of controls on capital movements, but rather the fear of more stringent controls in the future. NSC report a breakdown of full convertibility of the CFA Franc, with growing delays in the international transfer of funds and temporary cessations of all international transactions. As Vallee (op. cit.) points out, a fixed exchange rate does not remove all exchange risk when there is still the possibility of devaluation, a fear which Houphouet-Boigny has done nothing to allay in taking the trouble to deny repeatedly in public that there is any possibility of a repegging of the CFA

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[3] Economist intelligence Unit Country Report 1989

Franc.

In Cameroun, even the National Monetary Committee, the guardian of monetary prudence, has complained about the lack of credit in the domestic financial system. In part, this is due to the government's policy, noted in chapter 1, of depositing its oil revenue illicitly in American banks. The oil boom in 1979/80 generated a large rise in Camerounian income, but this was not accompanied by an increase in funds available in the domestic economy. This may have curbed the growth of imports, but it also weakened the domestic banking system. At the height of the boom in 1984, the private banking sector provided only 7% of the credit given to private firms, the rest coming from government agencies such as the Societe Nationale d'Investissement. When oil prices fell in 1986, the government eased the necessary reduction in its current and capital expenditure by withdrawing FCFA 100bn. from private banks, citing "urgent needs" (i.e., the salaries of the 7% of the labour force working in the public sector and earning 25% of the national income). Repayments to banks for past loans was reduced, so that by 1988, the government was FCFA 250bn. in arrears. The ability of Franc Zone financial institutions to facilitate investment in the area is called into question by the recent financial history of some of the member states.

3. Quantitative indicators of financial performance

Little quantitative work has been done on assessing the quality of CFA financial institutions, and on the value of the investment which they deliver. However, on the basis of existing figures and studies, it is possible to make the following observations.

(i) Qualitative measures of the financial system

There are a number of indicators which might point to the quality of the financial systems of Franc Zone members, relative to others in Africa. One possible indicator is the ratio of the money stock (less notes and coins) to nominal income. In an economy where there are few financial transactions, where there is little saving or borrowing, the ratio will tend to be lower. Table 2.2 shows the ratio, $(M_2 - M_0)/GDP$, of some African economies, and the diversity which exists between them. Again, there is a dichotomy between the countries with a large natural resource base and the poorer, less developed economies. A number of Franc Zone countries have very high ratios, most notably Cote d'Ivoire, but the countries of the Sahel tend to have very low ratios. No Franc Zone country compares with the most financially sophisticated of anglophone economies, Kenya and Zimbabwe. However, the growth of the ratio appears on the whole to be more rapid amongst francophone than amongst anglophone countries, which are "catching up" with anglophone Africa. A possible explanation for this is that the Franc Zone countries inherited a less well developed financial system at independence, but that their post-independence institutions have favoured financial deepening.

In the less developed economies, where the ratio is low, most of the money is in a very liquid form. In some, the majority of the money supply is still in the form of cash. This is indicated by Table 2.3, which shows different countries' M_2/M_0. In the resource-rich economies, there is a preponderance of financial assets, indicating a more active banking system. Here, there seems to be a divergence between UMOA and the BEAC region. The dominance of liquid forms of money in the poorer economies is less marked in UMOA than in central Africa: Benin, Burkina and Mali rely less on cash than do Centrafrique and Tchad. Moreover, among the others, Congo, a member of the BEAC region, possesses surprisingly

little quasi-money, compared with other of the more developed Franc Zone economies. One possible explanation for this is the existence of a money market just in the BCEAO zone. This market has been in operation since 1975, dealing with assets with a maturity of up to three months. It is highly regulated, the interest rates being determined not by the market but by the Governor of the BCEAO, and all transfers being between special accounts at the central bank headquarters in Dakar; but it does allow for some reallocation of reserves from banks with excess funds to those facing a deficit. The dichotomy between the two regions is perhaps an indication of the greater financial maturity of the UMOA region.

Another indicator of the maturity of the domestic financial system which has been proposed by some authors is the country's savings ratio, i.e., total domestic savings as a fraction of GDP. The argument is that in a well-developed banking system, people will save in order to equalise their expected marginal utilities of consumption in each time period, and savings will be quite high. If banking facilities are more primitive, people will be constrained to consume most or all of present income, due to the absence of savings facilities, and the savings ratio will be lower.

Boissonade and Guillaumont (1988) compare the savings ratios of CFA countries with those of the rest of Africa, considering public and private saving separately. Using the appropriate savings ratio as the dependent variable, both actual savings ratios and residuals from a cross-country regression equation are compared, for the period, 1979-81. Among the significant explanatory variables in the equations are per capita GNP, population, exports of nonfactor goods and services and the rate of growth of GDP. Neither private savings nor the appropriate residual are significantly different in the Franc Zone as compared with the rest of Africa. However, the usefulness of this measure of financial deepening is questionable: if banking facilities improve, might people not also borrow more?

(ii) Measures of investment performance

The major econometric study which actually compares rates of investment in the Franc Zone with those of others in Africa is S. Guillaumont (1988a). The methodology is

analogous to the other comparative studies above, with comparisons both of gross domestic investment as a fraction of GDP and of the residual from an investment regression equation. Three periods are considered: 1962-4, 1970-2 and 1979-81. The explanatory variables in the regression are mineral exports as a fraction of GDP and per capita GNP. GDI/GDP turns out to be significantly higher in the CFA in the first period, and the regression residuals in the second and third periods.

However, comparisons of countries' ICORs (i.e., a measure of the average annual growth of real GDP as a fraction of average real GDI/GDP for the period, which is a measure of productivity of investment) show that productivity is significantly lower in the Franc Zone than elsewhere in Africa. This should not necessarily be interpreted as an indication of francophone African inefficiency. If the level of investment overall is higher, then one would expect the marginal (and average) productivity of investment to be lower. This is a plausible explanation of the Guillaumont results: (adjusted) ICOR differences between the CFA and the rest of Africa are in the order of 2-5%, as are the differences in I/Y. (Direct comparison between the two groups of results is not possible because for some reason the sample periods are different.)

4. Questions to be answered

The results which we have in the existing literature can be summarised as follows:

(i) There is tentative evidence that financial capital flows more readily into Franc Zone members than it does into other African countries, although quantitative evidence is scarce and based on econometric models relying on strong assumptions. It should also be remembered that the experience of the different Franc Zone members has been varied. Large financial inflows (as a percentage of GNP) are to be expected in the poorest CFA members, which receive substantial foreign relief aid. However, the large inflows into the relatively wealthy members remain to be explained.

(ii) Nominal effective exchange rates are more stable in the Franc Zone than elsewhere; it is possible that some measures of "real" exchange rates also indicate greater stability in the CFA. Moreover, inflation is lower.

(iii) There is similarly tentative evidence that domestic investment in the CFA is ceteris paribus higher than elsewhere.

(iv) The institutional literature suggests that whereas in principle the institutions of the Franc Zone guarantee free movement of financial capital between member states, in practice there are a number of factors which inhibit movement. It is not immediately obvious how important such factors are. Similarly, although the domestic financial system of a CFA member is meant to facilitate efficient and costless reallocation of investment, in practice the monetary authorities exert a considerable degree of control over potential investors and the amount to be invested.

In short; there are pieces of tentative and disconnected evidence that the institutions of the Franc Zone affect a number of the key macroeconomic aggregates of its members. However, no-one has tried to fit the pieces together, to see if nominal exchange rate stability really does lead to relative price stability and if this stability really does lead to higher investment, nor investigated the reasons for these results. Neither has there been a test of the magnitude of financial integration between the different members

of the Franc Zone and metropolitan France, nor an investigation of the potentially complex links between this integration and the level of domestic investment.

We need to consider the possibility of two different routes to higher investment. First, financial market integration leads to financial inflows which lead to more domestic investment. Secondly, the fixed FF-FCFA exchange rate results in lower price instability which in turn leads to a higher propensity for investment in domestic projects. (In this case, we need to discover which prices are relevant, and the mechanism by which their instability leads to lower investment.) The strength of these links will depend partly on the extent to which the ideals of the Franc Zone correspond to practice. In particular, the facilitating of higher investment will depend on the health of the domestic financial system. In chapters 4-8, we will investigate the determination of investment, concentrating mainly on the two Franc Zone countries where data are relatively abundant - Cameroun and Cote d'Ivoire - in order to investigate these links. The case of Cameroun will be particularly interesting, given the dramatic deterioration of the financial system in the late 1980s (see above).

However, most CFA member states do not report enough data for the testing of a full scale model of investment. An alternative approach, followed in chapter 3, uses a technique developed by Obstfeld to determine whether there is a high degree of integration of CFA financial markets with metropolitan French markets.

TABLE 2.1: INFLATION IN THE FRANC ZONE AND ELSEWHERE IN AFRICA

(Figures show GDP deflators, 1980 = 100)

Country	1967	1977	1987
Benin	36	72	172
Burkina	43	74	135
Cameroun	35	80	164
Centrafrique	31	70	170
Congo	40	73	118
Cote d'Ivoire	29	81	125
Gabon	19	60	124
Mali	30	75	130
Niger	36	75	135
Senegal	42	77	178
Tchad	44	77	143
Togo	32	70	160
Gambia	35	86	228
Ghana	4	28	1612
Kenya	39	83	198
Nigeria	18	69	206
Sierra Leone	34	71	2482
Tanzania	28	74	475
Zambia	38	65	577
Zimbabwe	41	71	227

(source: World Bank World Tables 1989)

TABLE 2.2: FINANCIAL DEEPENING IN THE FRANC ZONE AND ELSEWHERE

(Figures show M_2 - M_0 as a percentage of GDP)

Country	1967	1977	1987
Benin	5	17	15
Burkina	3	11	16
Cameroun	7	16	13
Centrafrique	7	8	6
Congo	10	10	13
Cote d'Ivoire	14	25	20
Gabon	9	14	18
Mali	8	6	12
Niger	2	7	12
Senegal	8	19	16
Tchad	3	6	10
Togo	7	17	31
Gambia	7	12	20
Ghana	15	18	8
Kenya	22	33	36
Nigeria	6	16	23
Sierra Leone	7	11	8
Tanzania	14	21	18
Zambia	19	35	30
Zimbabwe	--	--	48

(Source: ibid.)

TABLE 2.3: STRUCTURE OF MONEY SUPPLY IN THE FRANC ZONE

(Figures show M_2/M_0)

Country	1967	1977	1987
Benin	1.97	3.53	4.94
Burkina	1.45	2.41	2.92
Cameroun	2.05	3.75	3.96
Centrafrique	1.72	1.83	1.45
Congo	2.40	2.17	2.50
Cote d'Ivoire	2.11	3.82	3.05
Gabon	2.72	4.26	4.83
Mali	1.66	1.53	2.14
Niger	1.84	2.52	3.21
Senegal	2.55	3.32	3.30
Tchad	1.59	1.65	1.61
Togo	2.19	3.01	3.39

FIGURE 2.1 - PER CAPUT CREDIT TO CFA MEMBERS ($)

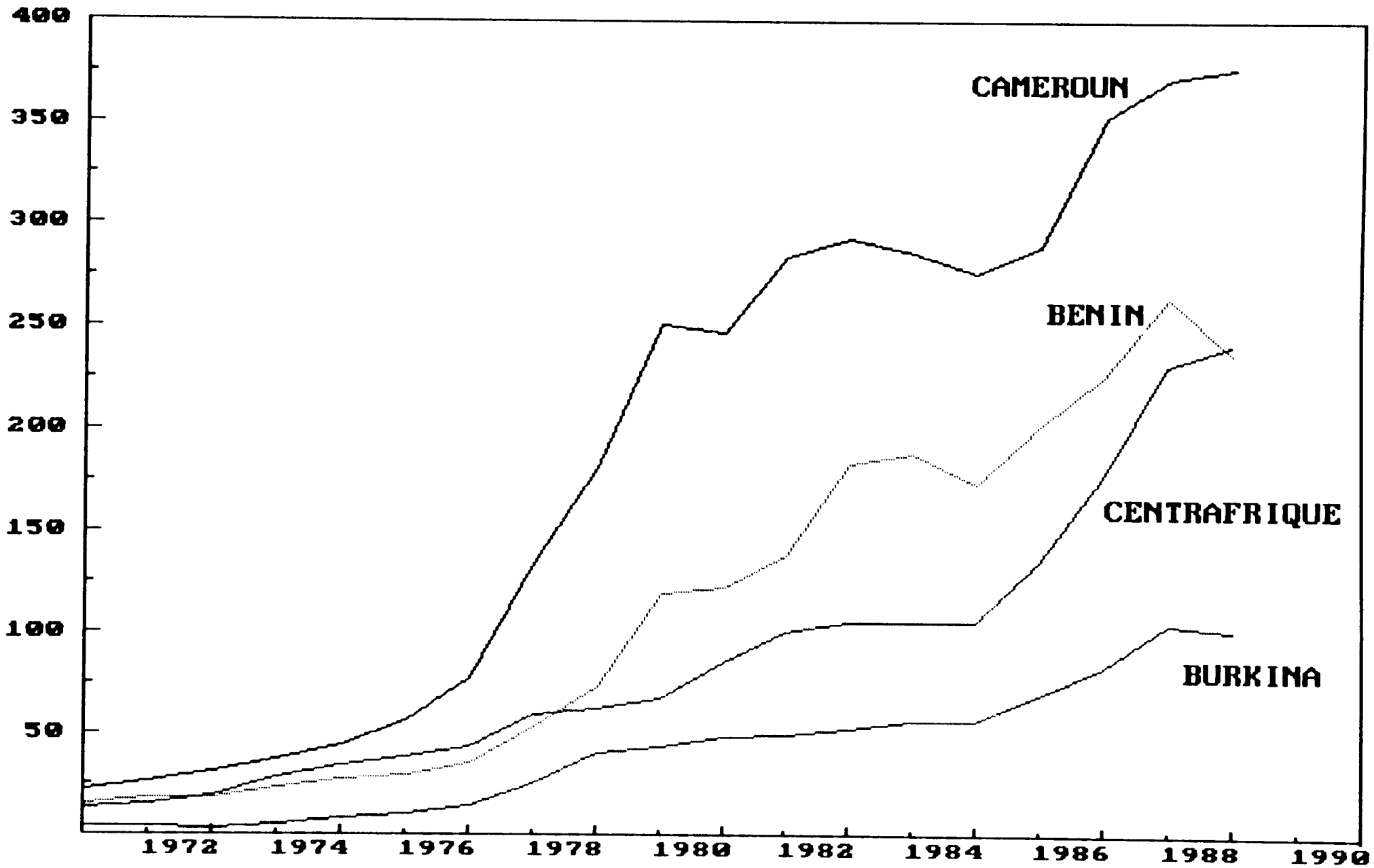


FIGURE 2.1 - PER CAPUT CREDIT TO CFA MEMBERS ($)

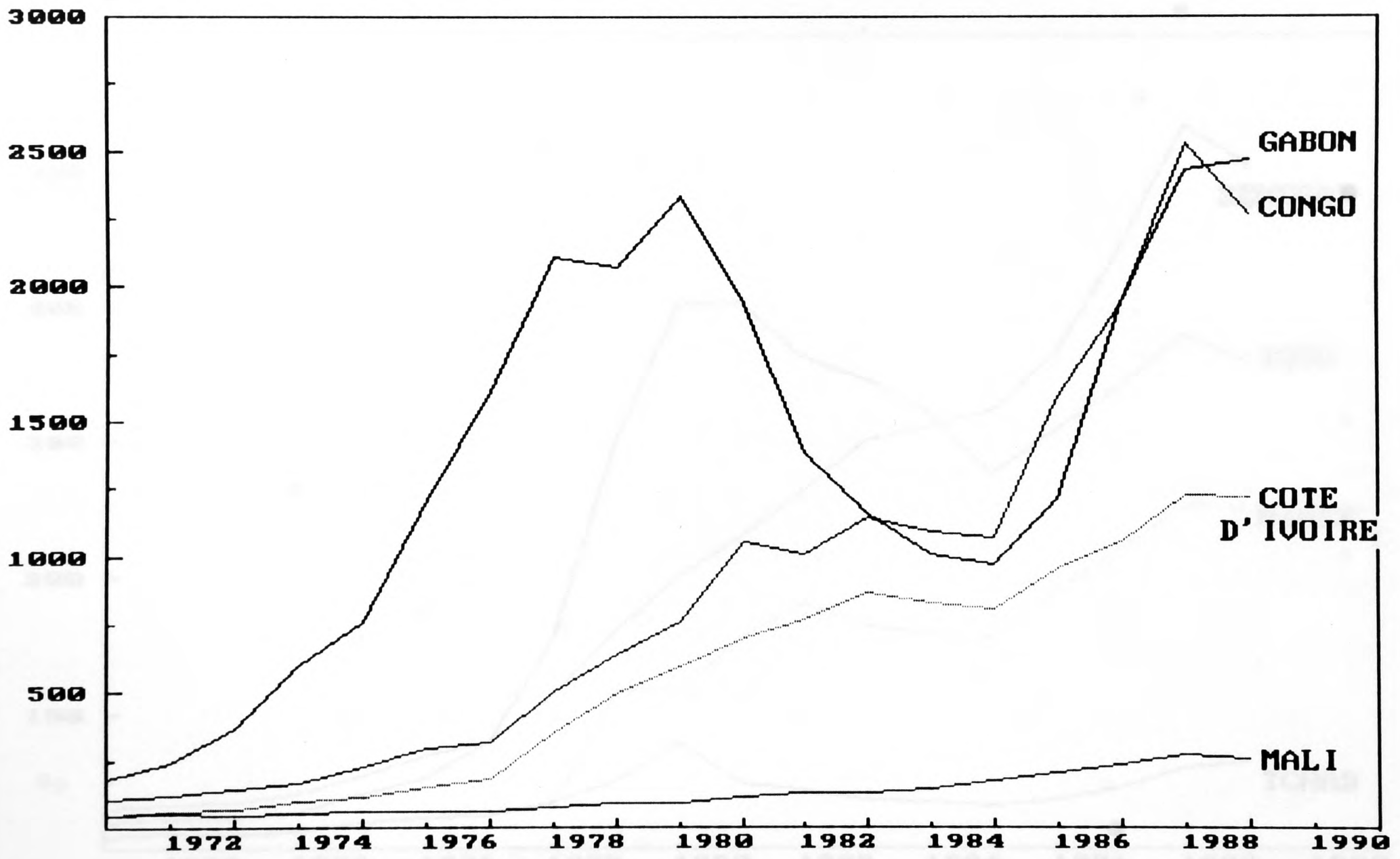


FIGURE 2.1 - PER CAPUT CREDIT TO CFA MEMBERS ($)

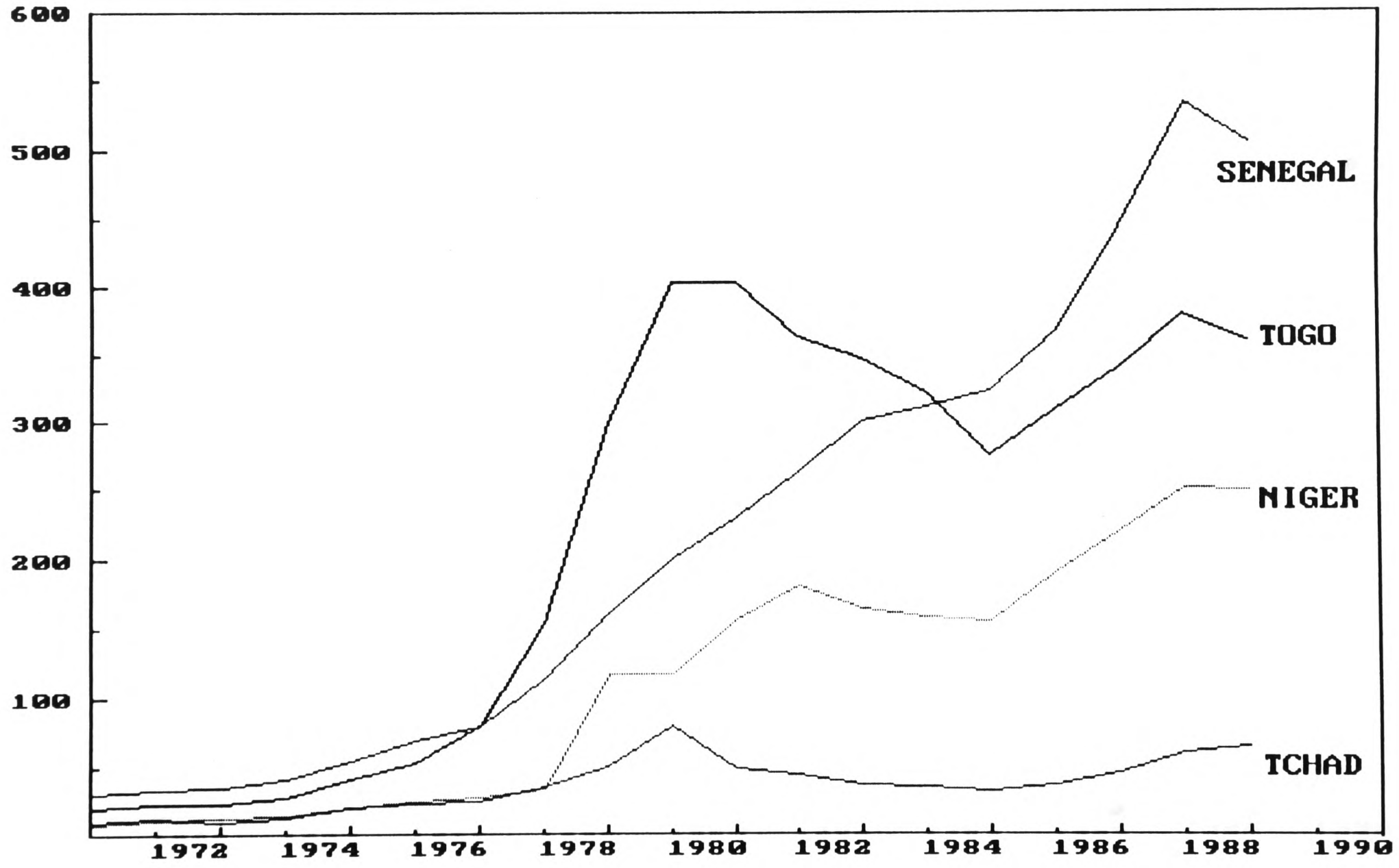


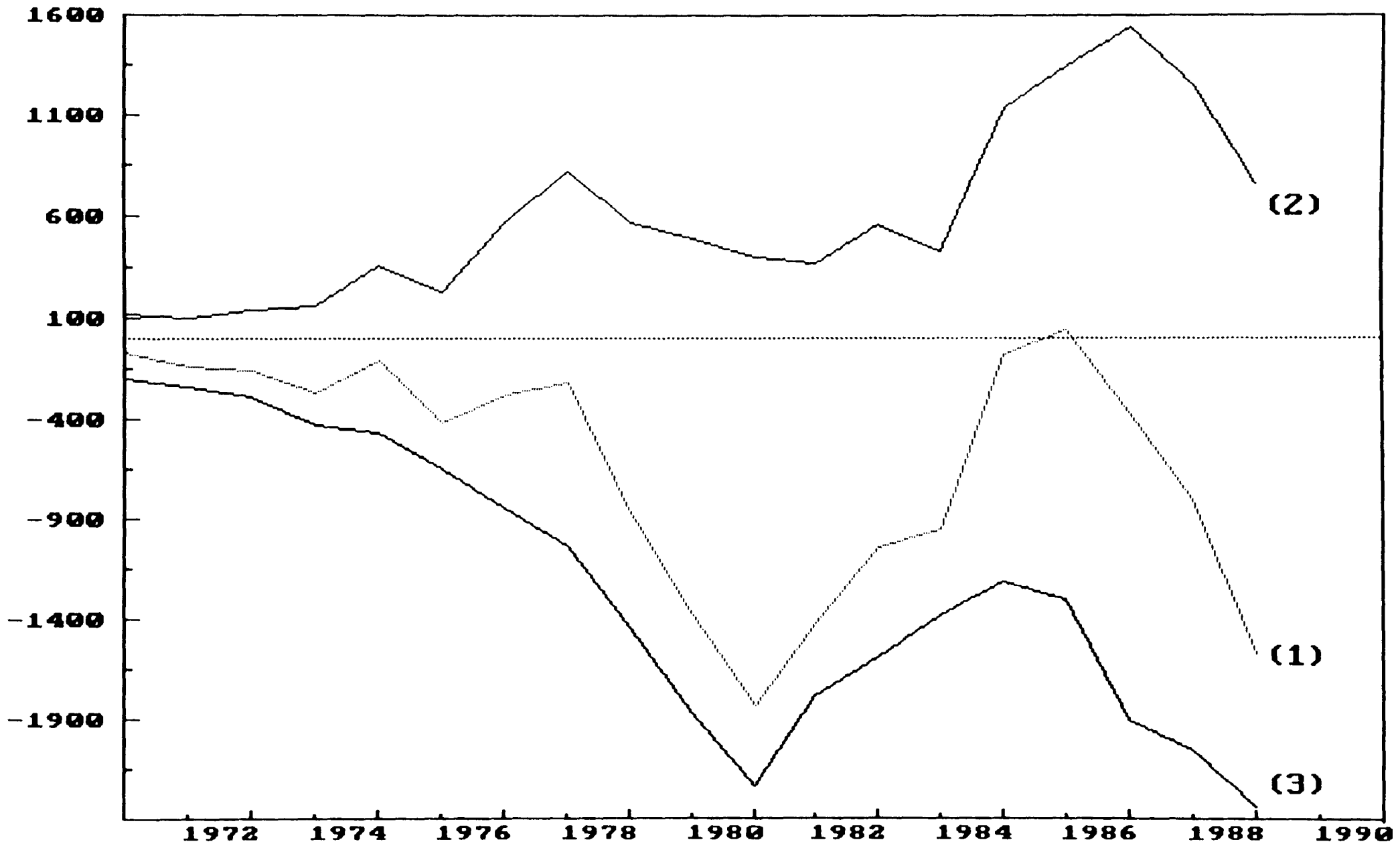
FIGURE 2.2 - CAMEROUN (1) CURRENT A/C (2) MERCHANDISE A/C
(3) NON-MERCHANDISE A/C ($MN)



FIGURE 2.2 - CONGO (1) CURRENT A/C (2) MERCHANDISE A/C
(3) NON-MERCHANDISE A/C ($MN)



FIGURE 2.2 - COTE D'IVOIRE (1) CURRENT A/C (2) MERCHANDISE A/C
(3) NON-MERCHANDISE A/C ($MN)



CHAPTER 3

TESTS OF CAPITAL MARKET INTEGRATION IN THE FRANC ZONE

CAPITAL MARKET INTEGRATION IN THE FRANC ZONE

We have seen that there is reason to believe that European capital markets *might* be more integrated with Franc Zone markets than with those of other countries in Africa, owing to the special institutions which are designed to guarantee the free movement of financial capital between the CFA and metropolitan France. In this chapter, we will seek to discover whether there is in fact a high degree of integration between members of the Franc Zone and France.

As we have already noted, whether a country enjoys a large inflow of financial capital or a high level of foreign investment is a different issue from whether it is free of impediments to the movement of capital, since freedom of movement could just as easily lead to capital flight as to an inflow of resources. To test the hypothesis that Franc Zone institutions remove barriers to foreign investment, we need a model of capital market integration. If the hypothesis is correct, Franc Zone members ought to exhibit a higher degree of integration with the West than other African economies.
First of all then, we need to find a model which test for capital market integration.

There exists a large literature on capital market integration between Western economies. These generally employ some kind of "asset pricing" model. A sophisticated example is Jorion and Schwartz (1986). However, these models are very data-demanding: they require detailed information on rates of return on domestic and foreign stock exchanges. Such information is not available for African economies, so this approach is not used here.

Another approach is to examine whether there are any significant links between domestic investment and domestic saving. If an economy's capital market is integrated with the international market, domestic investment should, it is hypothesized, be entirely independent of domestic saving. Domestic firms will borrow on the World capital market and domestic investors will invest on the World market. Each will face an international interest rate. At the opposite extreme, if firms have no access to international sources of capital, and investors cannot save abroad, investment will identically equal savings, as in the ISLM model. An example of this approach is Blanchard (1983). However, this

methodology is suspect. For example, independence of savings and investment depends not just on tradability of capital, but also on tradability of goods. If there is a domestic industry consuming capital and producing an internationally nontraded good, then domestic output, and therefore domestic investment, will depend on domestic consumption, which is likely to be correlated with savings. In order to make use of the idea of looking for a link between investment and savings, it is necessary to produce a complete investment function, including all determinants of investment for which savings might be a proxy.

In particular, domestic investment may depend not just on the degree of capital market integration with Europe, but also on other factors in which we are interested, for example, relative price stability. Using the savings-investment approach, we cannot examine capital market integration without an extensive treatment of these other factors. For this reason, this approach is left to later chapters. However, even the savings-investment approach is quite data-demanding, and cannot be applied to some of the Franc Zone members where data are poorest. For these, some other technique must be found.

A third approach, which avoids many of the complexities of the first two, has been suggested by Obstfeld (1986), and used by others (see for example Artus (1987)). This focuses on a comparison of real interest rates between different countries, using data on consumption, prices and nominal exchange rates.

1. Theoretical background to the model

Obstfeld's idea is to test capital market integration by comparing interest rates. If there is complete integration, then interest rates should not vary significantly from country to country. If both domestic and foreign agents trade a particular asset on a single market, then both groups should buy and sell the asset at a common price (one market entails one price). If there is a common market for all assets in the two countries, then all nominal interest rates will be the same, even if real interest rates differ because of different rates of inflation.

The major problem in applying this idea in an empirical model is that data on domestic market interest rates, other than the basic bank lending rate, are often difficult to find, so that computation of an aggregate nominal interest rate is impossible. One would first have to collect data on the returns to various securities, and then use accurate weights to construct an aggregate interest rate. (The type of security prevalent in one country is not always the same as that prevalent in another, so direct comparison of "similar" securities in different countries is unlikely to be an option.) One answer to this problem is to use a more indirect method to compute national interest rates, using data on consumption which is more readily available.

Figure 3.1 illustrates the basic idea. It shows an indifference curve for a typical consumer, reflecting preferences between consumption in the present (C(t)) and consumption in the future (C(t+1)). Given the real interest rate ex ante, a utility-maximising consumer would consume at point a, where the indifference curve is tangential to the budget line implied by the interest rate, consuming C(t)a this period and C(t+1)a next period. If there were a higher interest rate, then consumption would be at point b, with less consumed now (C(t)b) and more in the future (C(t+1)b). So, if we know the shape of the indifference curve, and we know C(t) and C(t+1), then, assuming that the budget constraint has not shifted between the two periods, we can calculate the real interest rate, since the slope of the indifference curve in equilibrium is the same as the slope of the budget line, which is 1/(1+R). If we also know what the domestic rate of inflation is, we can work back to the nominal interest rate.

In order to make use of this idea, we need to tackle a number of analytical

problems. How do we deal with the possibility of different shaped indifference curves? How do we know when the budget constraint has shifted? The Obstfeld approach to these problems is given in the formal model below.

Suppose that the following assumptions hold:

i) Domestic residents habitually consume a basket of goods which has a price P(t); foreigners habitually consume a basket of goods which has a price P*(t).

ii) Everyone maximises her expected utility according to the equation:

$$(1) \quad \max V(t) = E(t)[\sum_{\tau=t} b^{\tau-t} U(C(t))]$$

where C(t) is consumption at t and E(t)[] is an expectations operator. b is a constant denoting the subjective rate of time preference.

Suppose that the real return in (t+1) to a non-risky domestic asset bought at t is R(t+1) for domestic residents and R*(t+1) for foreigners. If domestic residents buy it, then in equilibrium, their expected return should be such that:

$$(2) \quad E(t)[R(t+1)bU'(C(t+1))/U'(C(t))] = 1$$

If foreigners can buy it, then the following equation should hold:

$$(3) \quad E(t)[R^*(t+1)bU'(C(t+1))/U'((Ct))] = 1$$

Now, if the nominal interest rate on the asset is i(t), then:

$$(4) \quad E(t)[R(t+1)] = E(t)[(1 + i(t))P(t)/P(t+1)$$

for domestic residents, and for foreigners

$$(5) \quad E(t)[R^*(t+1)] = E(t)[(1 + i(t))e(t)P^*(t)/e(t)P^*(t+1)]$$

where e(t) is the nominal exchange rate. From this it follows that:

$$(6)\quad 1/(1 + i(t)) = E(t)[(P(t)/P(t+1))bU'(C(t+1))/U'(C(t))]$$
$$= E(t)[(e(t)P^*(t)/e(t+1)P^*(t+1))bU'(C^*(t+1))/U'(C^*(t))]$$

where C^* is foreign consumption per capita. Assuming that the utility function takes the form,

$$(7)\quad U() = C(t)^{1-\Omega}/(1 - \Omega)$$

where Ω is a measure of risk aversion in consumption, it follows with constant income that:

$$(8)\quad (P(t)/P(t+1))(C(t)/C(t+1))^{\Omega} - e(t)P^*(t)/e(t+1)P^*(t+1))(C^*(t)/C^*(t+1))^{\Omega} = 0$$

when expectations are fulfilled. Denote the LHS of (8) by z(t). With Rational Expectations it follows that:

$$(9)\quad z(t) = u(t)$$

where u(t) is a stochastic error term. z(t) will differ from zero only randomly, as agents' mispredictions of prices and the exchange rate are entirely random. Moreover, with Rational Expectations, the only changes in consumers' income which will affect the budget constraint are random, unpredictable changes, which will again move z(t) away from zero in an entirely random way; so the model can be used even when changes in income are observed. It does, however, rely very heavily on the assumption of Rational Expectations, a point to which we will return later.

A test of capital market integration, under the above assumptions, is thus to estimate:

$$(10)\quad z(t) = \alpha + \Sigma\beta_n z(t\text{-}n) + \Sigma\underline{\delta}_n'\underline{x}(t\text{-}n) + u(t)$$

where $\underline{x}(t)$ represents a vector of parameters and α a constant. No significant coefficients

should emerge.[1] Obstfeld himself assumes that no other variable will be significant, and imposes a priori the restriction $\underline{\delta}_n = (0,\ldots,0)$. In the next section, we will follow Obstfeld in imposing this restriction, and in a later section, we will see if relaxation of the restriction makes any difference.

[1] One rejoinder here might be that even if all coefficients did turn out to be insignificant, we would still have to demonstrate that the reason for this was not that all the data were inaccurate, in order to claim that there was capital market integration. However, we note that (i) non-rejection of the null does not strictly justify the assertion that there is integration, anyway (basic statistical theory); (ii) in all cases, it turns out that the null can be rejected.

2. Empirical evidence: the basic Obstfeld model

Before the Obstfeld technique is applied to the Franc Zone, a few observations are in order. The model is specifically a test of whether foreign investors have the same access to domestic assets as domestic residents. There is also the question of whether domestic residents have access to foreign bonds. However, this does not directly affect domestic investment opportunities, and in the Franc Zone, where $e(t)/e(t+1) = 1$ when the foreign country is France, the two tests are identical. (Of course, it might be claimed that this is a weakness of the model.) Also, the test as it stands does not admit any degrees of capital market integration, just showing whether we can reject the hypothesis of 100% integration or not. However, since work on European markets (Obstfeld (op. cit.); Artus (op. cit.)) shows that the hypothesis of complete integration cannot be rejected for many pairs of developed countries, what we have is a test of whether CFA financial markets are, with respect to ease of capital movement, of a European standard.[2] Also, even if the hypothesis of capital market integration is rejected, we are left with a model of $z(t)$ which may shed light on domestic capital markets.

It is also quite possible, amongst the poorer Franc Zone members, that capital markets of different regions of the country are not integrated. Whilst it is not necessary that everyone have a bank account for a country to have an integrated financial system (in many areas, for example, there are informal moneylenders who intermediate between farmers in remote villages and the bank in the nearest town), the absence of a developed banking system is likely to make segmentation of financial markets more likely. If markets are segmented, and those consumers without access to urban financial facilities make up a considerable percentage of the population, the null hypothesis will be rejected. So what we have is a test of whether financial markets are both integrated with foreign markets and available to the majority of domestic consumers. This is an appropriate test to make: it is of little use for a small enclave of a country to have financial markets integrated with markets abroad, but not with the rest of the country.

It is also important to remember that there is still one parameter in the model which

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[2] However, given the criticisms of Obstfeld's assumptions discussed below, the results on European capital markets should be regarded as only preliminary.

is unobservable: Ω. It is therefore necessary to estimate z(t) equations for a number of different values of Ω. Following the existing literature, we will select a range of different values between 0.5 and 25.0. It is highly unlikely that people are either more or less averse to risk than this. In fact, one can reasonably expect Ω to take a value of 2-3 (see Obstfeld (op. cit.)).

It should be noted that the choice of a reported variable to proxy the theoretical C(t) is not trivial. This is the real value of the consumption of a typical person in the economy. Thus, public consumption should probably not be included in the measure of C(t): expenditure on executive Mercedes may enter into private utility functions, but expenditure on the Army is unlikely to do so. (Not surprisingly, government accounts are not conveniently disaggregated in this way.) Private consumption alone is used in the tests below. Reported real private consumption in national accounts is unreliable, as it is often used as a balancing item for the components of real GDP. Thus, it is necessary to take nominal consumption, and deflate by the reported consumer price index used as a proxy for P(t). This is not entirely satisfactory - for example, expenditure patterns of wealthy European residents of a country may differ markedly from that of poorer nationals, and CPIs for different groups are not always available. However, we can find no better alternative. The private agent is taken to be an individual person, not a household. The latter may be theoretically superior: two year-olds do not have the same level or pattern of consumption as adults; neither are they likely to optimize an intertemporal utility function. However, whilst estimates of the sizes of total populations are readily available for the construction of a per caput series, more detailed demographic information is often not.

Figures 3.2-3.11 show the series for z(t) constructed for the various countries considered. Series are plotted for different values of Ω between 1.5 and 3, to show the range in which z(t) is likely to fall. A glance at the figures shows that z(t) is not persistently away from zero for any of the countries. However, it is interesting that the deviations from zero are smallest in the two most industrialised countries (and the largest in terms of GNP): Cameroun and Cote d'Ivoire. With the average deviation in Niger several times larger than that in Cote d'Ivoire, it is unlikely that the former enjoys capital market integration, even if the more developed, latter economy does. Also, z(t) is more often than not positive than negative. Since the variable is essentially measuring (1/R - 1/R*), this implies that R is often less than R*, although it is still to be seen whether this difference

is statistically significant. Note also that the deviations of z(t) from zero in Ghana and Nigeria are towards the top of the range experienced by CFA members, but of the same order of magnitude.

This may at first seem surprising: although the typical (financially closed) African economy is often supposed to have official interest rates fixed at very low levels, parallel market rates are assumed to be much higher than those in Europe, since funds are so scarce. However, the parallel rate in a financially closed economy will depend not just on the supply of funds, but also on demand, which may be low because of limited investment opportunities. For example, if public investment is high, private investment opportunities may be more limited, and the marginal return to investment lower. In this regard, it is interesting that z(t) in Cote d'Ivoire began a marked rise in the late 1970s, when the extensive government investment programme was getting under way. The interaction of the supply and demand for funds is an issue to which we shall return.

It remains to see if the hypothesis that z(t) follows a random walk around zero can be rejected. The first model we estimate (by OLS) is the one used in all the existing literature, $z(t) = \alpha + \Sigma\beta_n z(t\text{-}n) + u(t)$: Model A in Table 3.1. In each case, the foreign country is France (if the Franc Zone countries' capital markets are not integrated with the French, they are unlikely to be integrated with that of any other MDC). Eight Franc Zone countries have sufficient data for the test - in the BCEAO region: Burkina Faso, Cote d'Ivoire, Niger and Senegal; in the BEAC region: Cameroun, Centrafrique, Congo Republic and Gabon. By way of an extra-zonal comparison, the same test is applied to Ghana and Nigeria. The annual data set runs from 1967 to 1987. Thus, the earliest observation for $C(t)/C(t+1)$ is in 1968. Data on consumer price indices and nominal exchange rates for France, Ghana and Nigeria come from the International Financial Statistics Yearbook (various editions). Data on population and consumption come from the World Bank World Tables (1987,1990). The model was estimated with PC-GIVE.

The results quoted show confidence limits in percentage points for α and the z(t-n) jointly, where n = (i) 1 to 4, or (ii) 1 to 2. Thus, a figure of 10 or less shows that the parameter is significant at 10%. The t ratio on α in the equation, $z(t) = \alpha + u(t)$, is also given (for this model, the sample size is 20). For Burkina Faso, Centrafrique, Congo Republic, Cote d'Ivoire, Niger, Senegal, Ghana and Nigeria, the z(t-n) are insignificant, but the α significant for Ω of more than about 1.5 when the insignificant variables are omitted.

For Cameroun and Gabon, lags of z(t) are significant. On the basis of this model, the hypothesis of capital market integration is rejected for all countries, both CFA members and others, and even for those countries, Cameroun and Cote d'Ivoire, in which deviations of z(t) from zero have been relatively small.

However, the a priori restriction that $\underline{\delta}_n = (0,...0)$ is a serious deficiency in this model: it does not really allow for testing of the assumption of Rational Expectations. If expectations are not rational, then trends in income could affect changes in consumption from one period to the next, as people revise their estimation of lifetime income (e.g., if expectations are in some way "adaptive"). The fact that lags of z(t) are important in explaining z(t) in oil exporters, where the income shocks over the sample period were the greatest, is perhaps an indication that there are significant income terms here which are being omitted. The lags may be important because past z(t) is correlated with past income, which is also important in explaining present z(t).

An increase in income would increase consumption and so the apparent (but not actual) real interest rate. Since z(t) is inversely related to C(t+1)/C(t), the coefficient on the term for change in income should be negative. Moreover, if z(t) does not follow a random walk, other variables may be significant, even if α or z(t-n) are not. Significance of these variables would lead to the rejection of the hypothesis of full integration. Also, if the capital market integration hypothesis is rejected, these variables may shed some light onto the determinants of domestic interest rates. It is necessary then to augment the Obstfeld model in order to provide a more reliable test of capital market integration.

3. Empirical evidence: the augmented Obstfeld model

In order to construct a more robust test of the hypothesis that interest rates in the Franc Zone are not significantly different from those in France, real income terms must be included, along with variables which might influence z(t), if financial markets are not in fact integrated.

On theoretical grounds, we can think of a number of factors which will influence z(t) if the null is false: (a) both factor income (terms of trade-adjusted real GDP) and non-factor income (for example, borrowing from abroad), for reasons discussed above; (b) the degree of domestic financial integration; (c) risk - the riskier it is to lend to a country, the lower lending is likely to be to that country; (d) in the absence of complete integration, the domestic demand for funds will also affect relative interest rates.

Model B in Table 2 therefore includes the following variables, all derived from World Bank World Tables.

(i) A real per caput factor income term, Y. The nominal series used to construct this term is nominal GDP at factor cost in the National Accounts statistics. As a measure of private nominal disposable income, this will be reasonably accurate as long as average tax rates (on which data are limited) remain more or less constant. The GDP deflator is used to construct a real income series, and adjustment is made for terms of trade changes: a rise in the terms of trade will increase domestic residents' purchasing power, even if their GDP at constant prices remains the same.[3] As the dependant variable is constructed with C(t-1)/C(t), so the income term used is Y(t)/Y(t-1). As discussed above, we would expect the coefficient on the income term to be negative.

ii) The ratio of total foreign debt to GDP, D/Y, with lags. In the absence of capital market integration, this might be important because:

(a) If there is a risk of default on foreign commitments, the domestic interest rate may vary positively with the stock of debt: a higher ratio being associated with a higher

[3] Terms of trade adjustment figures are quoted in World Bank World Tables.

risk and therefore a lower supply of credit to the domestic economy. With the introduction of risk, we are moving away from the classical paradigm of the basic Obstfeld model.

(b) On the other hand, negotiation of more international credit (a higher $\Delta D/Y$) may lower domestic interest rates as the supply of credit for investment increases, producing a negative correlation. Again, if the credit is for consumption purposes, $\Delta D/Y$ may represent disposable private income, increasing domestic consumption and so the apparent real interest rate as calculated above.

(iii) The liquidity ratio, M/Y. This is defined as the ratio of M_2 in World Tables to nominal GDP. As noted in chapter 2, it is the most industrialised members of the CFA, those with the highest per caput GNP, which have the highest ratios. A high ratio may reflect a high degree of domestic financial market integration, and a relatively well developed financial system.

(iv) The ratio of the domestic industrial value added deflator to that of France, P_I/P_I^* (1980 = 1). This is may work as a measure of the return to investment activities at home compared to the return abroad. If P_I/P_I^* is higher, the demand for funds in the domestic economy may well be higher too. Thus the domestic interest rate may rise with respect to the foreign interest rate, so the coefficient on P_I/P_I^* will be negative.[4]

(v) The absolute value of the first difference of (iv), $|\Delta P_I/P_I^*|$.[5] A polynomial lag of $|\Delta P_I/P_I^*|$ is a measure of the variability of returns to domestic investment activities relative to those abroad. (It is assumed that the returns to investment in France are relatively stable, so that an increase in $|\Delta P_I/P_I^*|$ reflects an increase in the riskiness of domestic investment. A high variability may deter investment, reduce the demand for funds, and so the real interest rate, so the coefficient on $|\Delta P_I/P_I^*|$ ought to be positive.

Before proceeding to estimation of the augmented equations, a number of remarks are in order. First of all, the purpose of the estimation is to see if the null hypothesis of capital market integration can be rejected. In this respect, the reason for the inclusion of

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[4] Although a priori it may equally well be the case that a higher ratio reflects relative uncompetitiveness and a resulting low demand for funds.

[5] For a discussion of this term, see chapter 5.

the income term in the equations is different from the reason for the inclusion of the other terms. The significance of the coefficients in the basic model of section 3 was not enough to ensure rejection, since inclusion of an income term might render them insignificant. In this case, the hypothesis *is not* rejected, since the significant income terms show to what extent z(t) is an inaccurate indicator of the real interest rate gap. The true gap has still not been shown to differ systematically from zero.

Secondly, if, in addition to the income terms, other variables prove to be significant, then, unless it can be shown that these terms are in some way reflecting changes in private disposable income (which is possible for D/Y, but not for the others), the null hypothesis *is* rejected. In this case, even taking into account real income effects, the real interest rate gap has been shown to differ predictably from zero.

The purpose of the estimation is not to construct an accurate forecasting model of the behaviour of z(t) over time. In fact, the data are not really sufficient for this more demanding task, which would involve a general-to-specific reduction procedure, beginning with the inclusion of all possibly significant variables (including ones not mentioned above) with all possibly significant lags, and comparing different functional forms. There are not enough degrees of freedom for this with only about twenty observations. It is enough for our purposes to show that the addition of some variable or other to the equation,

$$(11)\ z(t) = \Sigma\pi_n(Y(t\text{-}n)/Y(t\text{-}n\text{-}1))$$

is significant. This is enough for rejection of the null hypothesis.

Now if OLS is used as an estimator, the coefficients of individual explanatory variables, and their standard errors, may be biased, since it is quite possible that variables such as M/Y are not independent of the others. Given the paucity of data in some of the countries studied, it is difficult to find adequate instruments for IVE or similar methods of estimation. Nevertheless, even with OLS, it is possible to test the joint significance of a set of explanatory variables by observing the improvement in R^2 which their addition brings. Collinearity will not affect the R^2 statistic.

Strictly, our null hypothesis is that all coefficients other than those on the income

terms are zero. It can be easily shown[6] that the correct test statistic for this hypothesis is:

$$[SSE(i) - SSE(ii)][n - k]/rSSE(ii) \sim F_{r,[n-k]}$$

where SSE(i) is the sum square error under the null, SSE(ii) is the sum square error when coefficients on the extra explanatory variables are allowed to be non-zero, r is the number of restricted coefficients under the null, n is the sample size and k the number of regressors. The smaller SSE(ii) relative to SSE(i) (i.e., the larger the corresponding R^2), the more likely the hypothesis is to be rejected.

If other variables are to be added to equation 11, then there are not enough degrees of freedom for four lags, as was possible in the basic model. In this section, we restrict ourselves to two. Thus, Tables 3.2-3.10[7] (Model B) show the improvement in goodness of fit gained by adding the set of extra explanatory variables to

$$(12)\ z(t) = \pi_0 Y(t)/Y(t-1) + \pi_1 Y(t-1)/Y(t-2) + \pi_2 Y(t-2)/Y(t-3)$$

If all lags of variables (ii-v) are included, then we do not have a very powerful test; there are so many extra variables that any random selection of an equal number of variables is likely to increase R^2 substantially, and therefore the chances of making Type II errors with respect to our null are high. However, it is possible for each country to find small subsets of (ii-v) which substantially increase R^2. These are the variables indicated in the tables. Note that lags of z(t) and the constant may also be included in the set of extra explanatory variables. In certain cases, dummy variables are also included: in Burkina Faso, Ghana and Senegal for the effects of drought in the 1980s, capturing possibly changes in perceived permanent income which per caput GNP series do not pick up, and in Congo for the oil price shock of 1981 (Congo is an oil exporter, so the oil price shock will have changed the return to Congolese investment). Since the regression coefficients may be biased, they are not reported. R^2 (i) is the R^2 statistic for equation 12, and R^2 (ii) is that produced after the addition of the extra variables.

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[6] See for example Kmenta (1986), pp 247-8.

[7] There is not enough data to construct this model for Gabon, so the tables show the results for only nine countries.

In all cases, the increase in R^2 is significant at least 5%. The hypothesis that there is free flow of financial capital between France and CFA members can be rejected as strongly as it can in the case of anglophone Ghana and Nigeria. Liquidity ratios and foreign debt ratios are important factors in explaining the wedge between French and African interest rates; in a number of countries (Niger, Senegal, Ghana), relative price stability is also an important explanatory factor.

4. Conclusion

An examination of the history of Franc Zone institutions in the previous chapter suggested that there may be a number of impediments to the free flow of funds between member countries. This chapter has shown that such impediments are indeed restricting the flow of funds. The econometric technique we have chosen rejects the hypothesis of complete capital market integration between France and the Franc Zone.

However, in order to measure degrees of integration, another technique must be used. It may be possible to estimate an investment function for some countries, and see to what extent investment depends on saving. A complete model of investment ought also to include other variables reflecting the ways in which the CFA might differ from other African countries, for example, some measure of relative price stability. Already, we have seen that inclusion of price stability terms help to explain the variance in real interest rates between France and a number of Franc Zone members. However, this will not be possible in all of the countries included in the study here: detailed industrial data do not exist for countries like Burkina Faso.

In the next few chapters, we shall investigate more fully the interaction between savings and investment, and how this is affected by Franc Zone membership. First of all, we need to construct a model of investment. The next chapter will provide the theoretical background for the investment model.

TABLE 3.1: MODEL A - $z(t) = \alpha + \Sigma\beta_n z(t-n) + u(t)$

	value of Ω									
	0.5	0.75	1.0	1.5	2.0	3.0	5.0	7.0	12.0	25.0
BURKINA FASO				probability (%)						
n = 1 to 4										
z(t-n)	75	86	91	81	67	56	55	61	75	92
α	44	46	46	46	43	36	26	20	14	13
n = 1 to 2										
z(t-n)	37	49	55	58	58	57	58	64	82	100
α	23	28	32	34	34	32	25	21	17	17
n = 0, t =	1.74	1.73	1.68	1.61	1.61	1.69	1.95	2.18	2.45	1.99
CAMEROUN				probability (%)						
n = 1 to 4										
z(t-n)	77	55	47	39	35	31	26	27	29	48
α	21	40	58	84	97	70	37	22	11	11
n = 1 to 2										
z(t-n)	22	12	9	7	6	6	5	5	6	22
α	35	58	73	95	88	63	31	15	3	1
n = 0, t =	0.57	0.46	0.34	0.17	0.04	0.18	0.56	0.90	0.60	2.38
CENTRAFRIQUE				probability (%)						
n = 1 to 4										
z(t-n)	78	66	64	65	68	74	81	86	95	99
α	95	63	45	32	26	23	21	21	23	29
n = 1 to 2										
z(t-n)	56	53	53	53	52	51	48	49	64	93
α	91	56	40	27	21	14	9	8	10	24
n = 0, t =	0.50	0.88	1.09	1.33	1.49	1.69	1.95	2.06	1.95	1.29

CONGO				probability (%)						
n = 1 to 4										
z(t-n)	28	23	20	17	15	14	13	13	28	87
α	7	4	3	2	2	1	2	3	6	16
n = 1 to 2										
z(t-n)	16	19	21	22	22	21	21	25	41	76
α	11	11	11	8	6	4	2	1	2	10
n = 0, t =	1.25	1.28	1.32	1.43	1.55	1.78	2.12	2.31	2.32	1.65

COTE D'IVOIRE				probability (%)						
n = 1 to 4										
z(t-n)	27	20	18	23	32	49	68	76	85	95
α	73	54	43	35	33	34	34	34	33	28
n = 1 to 2										
z(t-n)	18	11	8	8	11	21	40	52	68	90
α	58	45	38	31	27	22	17	15	12	9
n = 0, t =	1.08	1.62	2.06	2.67	3.01	3.32	3.49	3.52	3.46	3.08

GABON				probability (%)						
n = 1 to 4										
z(t-n)	76	28	10	3	2	3	5	7	12	25
α	97	77	53	26	17	13	16	21	34	66
n = 1 to 2										
z(t-n)	81	38	19	9	7	7	10	15	30	66
α	69	42	24	9	5	2	1	1	2	9
n = 0, t =	0.55	0.78	0.92	1.10	1.23	1.43	1.69	1.84	1.90	1.58

NIGER					probability (%)					
n = 1 to 4										
z(t-n)	87	90	90	92	94	98	100	100	100	100
α	35	25	21	19	21	23	26	26	28	32
n = 1 to 2										
z(t-n)	76	67	58	60	67	81	100	100	100	96
α	4	2	2	2	3	5	9	12	20	30
n = 0, t =	3.01	3.37	3.39	3.23	3.08	2.88	2.58	2.30	1.70	1.10

SENEGAL				probability (%)						
n = 1 to 4										
z(t-n)	90	49	54	79	85	88	91	92	91	89
α	48	53	67	77	72	59	42	31	15	9
n = 1 to 2										
z(t-n)	72	59	75	99	95	79	65	61	59	70
α	29	15	11	10	10	9	8	6	5	6
n = 0, t =	1.76	2.36	2.64	2.79	2.81	2.81	2.88	2.96	2.99	2.41

GHANA				probability (%)						
n = 1 to 4										
z(t-n)	90	83	74	50	53	71	73	59	39	83
α	42	33	18	19	26	35	36	31	23	28
n = 1 to 2										
z(t-n)	58	65	40	50	74	96	64	37	19	50
α	45	11	8	4	5	12	24	31	34	26
n = 0, t =	0.81	3.61	1.51	1.94	2.16	2.36	2.52	2.57	2.46	1.87

NIGERIA				probability (%)						
n = 1 to 4										
z(t-n)	7	9	11	18	31	62	89	85	53	77
α	80	44	29	30	37	35	21	14	8	14
n = 1 to 2										
z(t-n)	1	4	10	27	44	61	61	50	43	80
α	71	62	55	42	31	15	7	6	11	28
n = 0, t =	0.22	0.40	0.59	0.94	1.27	1.83	2.50	2.64	2.15	1.30

TABLE 3.2: MODEL B - BURKINA FASO

Expl var	Values for Ω					
	1.0	1.5	2.0	3.0	5.0	7.0
R^2 (i)	0.148	0.104	0.093	0.098	0.123	0163
z(t-2)	x	x	x	x	x	x
M/Y(t-1)	x	x	x	x	x	x
D/Y(t)	x	x	x	x	x	x
D/Y(t-1)	x	x	x	x	x	x
D1981	x	x	x	x	x	x
D1985	x	x	x	x	x	x
CONST	x	x	x	x	x	x
R^2 (ii)	0.959	0.958	0.937	0.905	0.881	0876

TABLE 3: MODEL B - CAMEROUN

Expl var	Values for Ω					
	1.0	1.5	2.0	3.0	5.0	7.0
R_2 (i)	0.154	0.119	0.110	0.112	0.140	0180
z(t-2)	x	x	x	x	x	x
M/Y(t)	x	x	x	x	x	x
M/Y(t-1)	x	x	x	x	x	x
$\Delta P/P^*(t)$	x	x	x	x	x	x
CONST	x	x	x	x	x	x
R^2 (ii)	0.887	0.899	0.880	0.841	0.773	0709

TABLE 3.4: MODEL B - CENTRAFRIQUE

Expl var	Values of Ω					
	1.0	1.5	2.0	3.0	5.0	7.0
R^2 (i)	0.202	0.235	0.257	0.286	0.322	0339
z(t-1)	x	x	x	x	x	x
z(t-2)	x	x	x	x	x	x
M/Y(t)	x	x	x	x	x	x
M/Y(t-1)	x	x	x	x	x	x
M/Y(t-2)	x	x	x	x	x	x
D/Y(t)	x	x	x	x	x	x
D/Y(t-1)	x	x	x	x	x	x
D/Y(t-2)	x	x	x	x	x	x
CONST	x	x	x	x	x	x
R^2 (ii)	0.864	0.903	0.921	0.937	0.930	0907

TABLE 3.5: MODEL B - CONGO

Expl var	Values of Ω					
	1.0	1.5	2.0	3.0	5.0	7.0
R^2 (i)	0.111	0.110	0.118	0.142	0.190	0222
z(t-1)	x	x	x	x	x	x
M/Y(t)	x	x	x	x	x	x
M/Y(t-1)		x	x	x	x	x
M/Y(t-2)	x	x	x	x	x	x
D/Y(t)	x	x	x	x	x	x
D/Y(t-2)	x	x	x	x	x	x
D1981-2	x	x	x	x	x	x
CONST	x	x	x	x	x	x
R^2 (ii)	0.940	0.956	0.959	0.956	0.972	0959

TABLE 3.6: MODEL B - COTE D'IVOIRE

Expl var	Values for Ω					
	1.0	1.5	2.0	3.0	5.0	7.0
R^2 (i)	0.171	0.267	0.333	0.405	0.462	0487
M/Y(t)	x	x	x	x	x	x
M/Y(t-1)	x	x	x	x	x	x
M/Y(t-2)	x	x	x	x	x	x
D/Y(t)	x	x	x	x	x	x
D/Y(t-1)	x	x	x			
D/Y(t-2)	x	x	x	x	x	x
P/P*(t)	x	x	x			
P/P*(t-1)	x	x	x	x	x	x
P/P*(t-2)	x	x	x	x	x	x
CONST	x	x	x	x	x	x
R^2 (ii)	0.941	0.960	0.947	0.869	0.824	0801

TABLE 3.7: MODEL B - NIGER

Expl var	Values for Ω					
	1.0	1.5	2.0	3.0	5.0	7.0
R^2 (i)	0.436	0.384	0.351	0.314	0.274	0242
z(t-1)	x	x	x	x	x	x
M/Y(t)	x	x	x	x	x	x
M/Y(t-2)	x	x	x	x	x	x
D/Y(t)	x	x	x	x	x	x
P/P*(t)	x	x	x	x	x	x
P/P*(t-2)	x	x	x	x	x	x
$\lvert\Delta P\rvert$(t)	x	x	x	x	x	x
CONST	x	x	x	x	x	x
R^2 (ii)	0.893	0.889	0.871	0.848	0.820	0789

TABLE 3.8: MODEL B - SENEGAL

Expl var	Values of Ω					
	1.0	1.5	2.0	3.0	5.0	7.0
R^2 (i)	0.404	0.427	0.422	0.412	0.412	0417
z(t-1)	x	x	x	x	x	
M/Y(t-1)	x	x	x	x	x	x
D/Y(t-1)	x	x	x	x	x	x
P/P*(t)	x	x	x	x	x	x
P/P*(t-1)			x			
P/P*(t-2)		x	x	x	x	x
$\|\Delta P\|$(t)	x	x	x	x	x	x
$\|\Delta P\|$(t-1)		x	x	x	x	x
D1984	x	x	x	x	x	x
CONST	x	x	x	x	x	x
R^2 (ii)	0.800	0.930	0.977	0.973	0.962	0947

TABLE 3.9: MODEL B - GHANA

Expl var	Values of Ω					
	1.0	1.5	2.0	3.0	5.0	7.0
R^2 (i)	0.433	0.432	0.380	0.286	0.170	0112
z(t-1)			x	x	x	x
z(t-2)		x		x		x
M/Y(t)			x	x	x	x
D/Y(t)	x	x	x	x	x	x
D/Y(t-1)	x	x				
$\|\Delta P\|$(t)	x	x	x			
D1981	x		x	x	x	
D1985				x		
CONST	x		x		x	x
R^2 (ii)	0.808	0.910	0.968	0.979	0.861	0806

TABLE 3.10: MODEL B - NIGERIA

Expl var	Values of Ω					
	1.0	1.5	2.0	3.0	5.0	7.0
R^2 (i)	0.187	0.273	0.339	0.418	0.438	0379
z(t-1)					x	x
M/Y(t)		x	x	x		
M/Y(t-1)					x	x
M/Y(t-2)					x	x
D/Y(t)		x	x	x	x	x
D/Y(t-1)	x	x	x	x	x	x
P/P*(t)	x	x	x	x	x	x
P/P*(t-1)	x				x	
P/P*(t-2)					x	x
CONST	x	x	x	x	x	
R^2 (ii)	0.931	0.949	0.931	0.852	0.914	0884

FIGURE 3.1

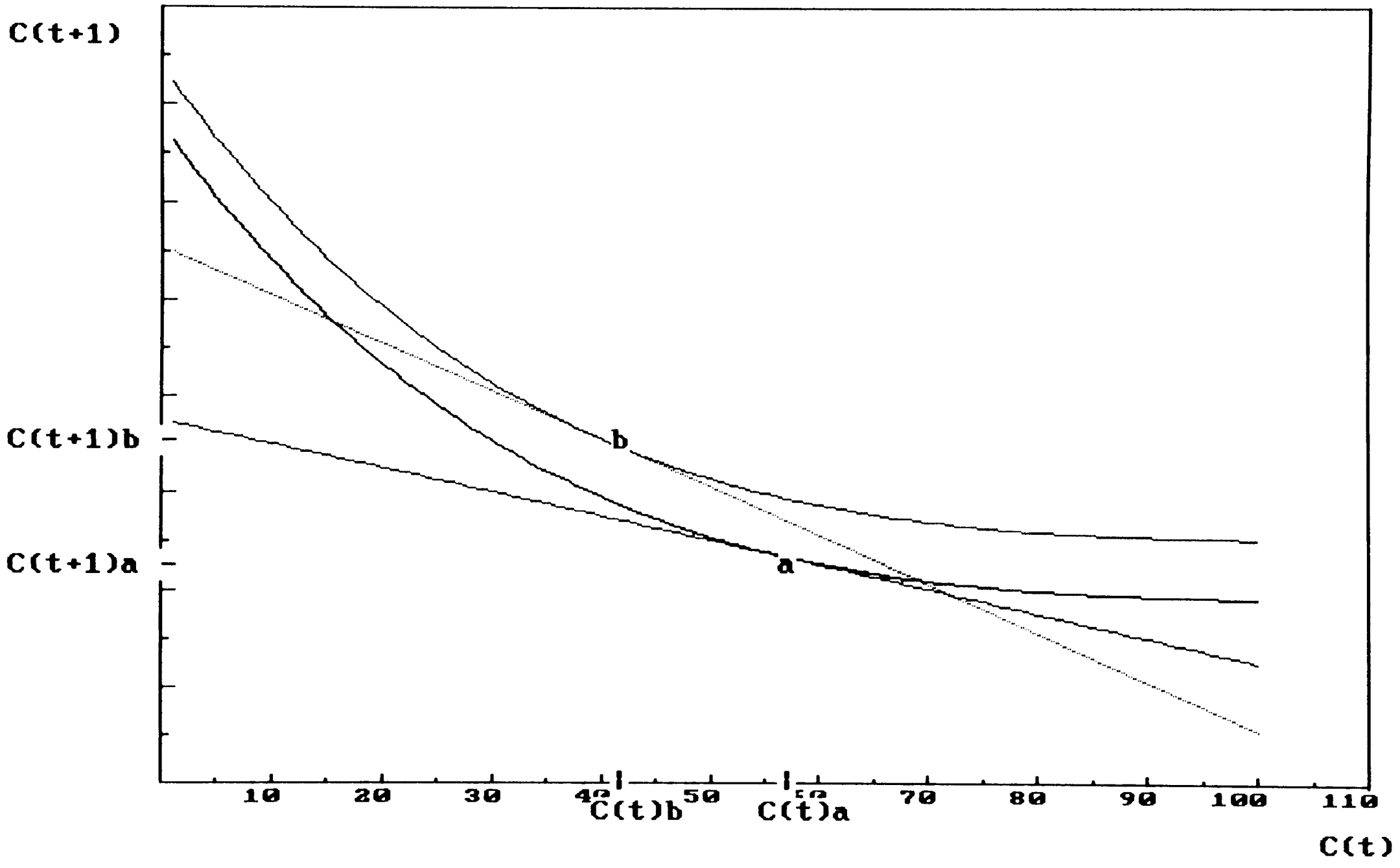


FIGURE 3.2 - Z(T) BURKINA FASO

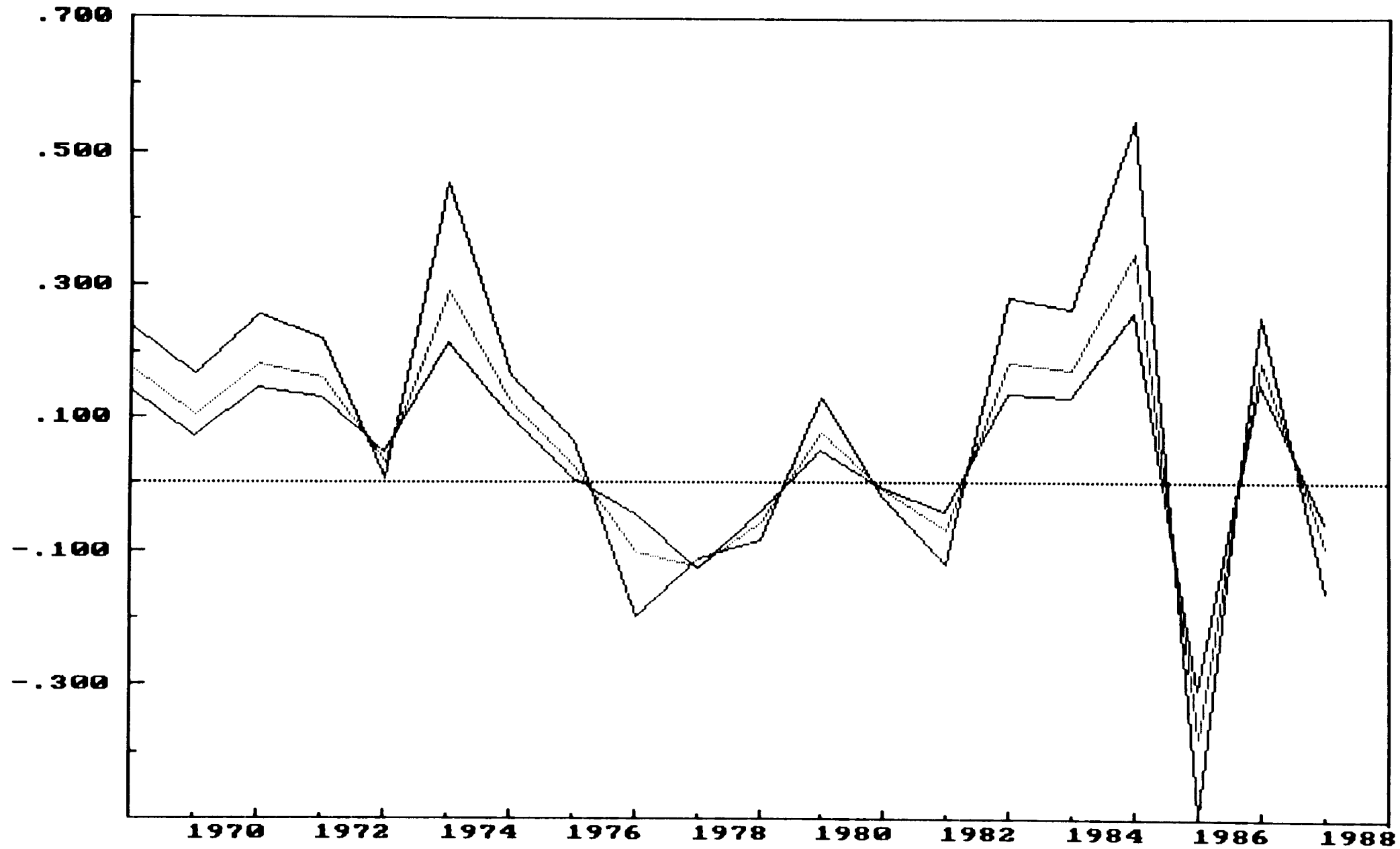


FIGURE 3.3 - Z(T) CAMEROUN

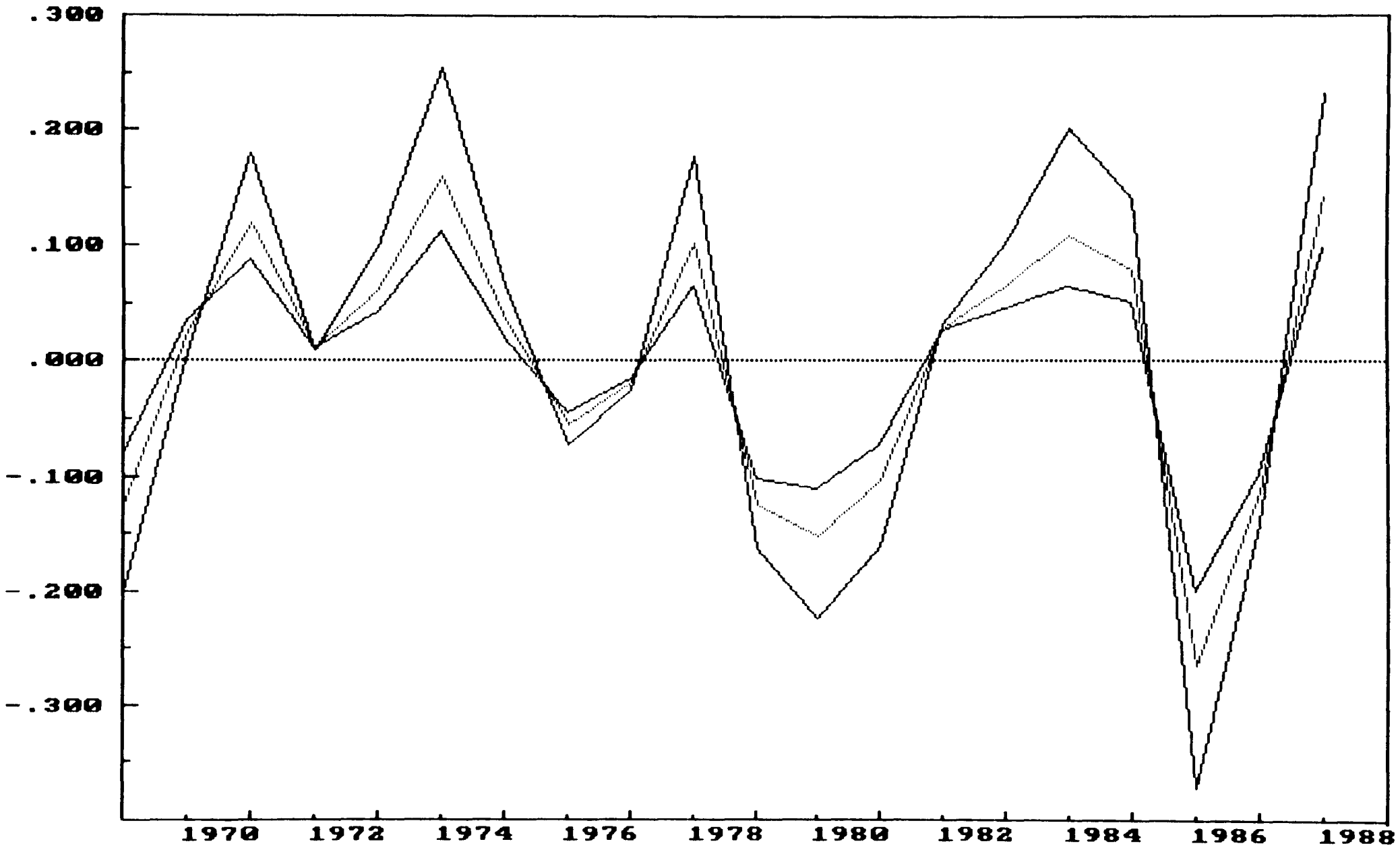


FIGURE 3.4 - Z(T) CENTRAFRIQUE

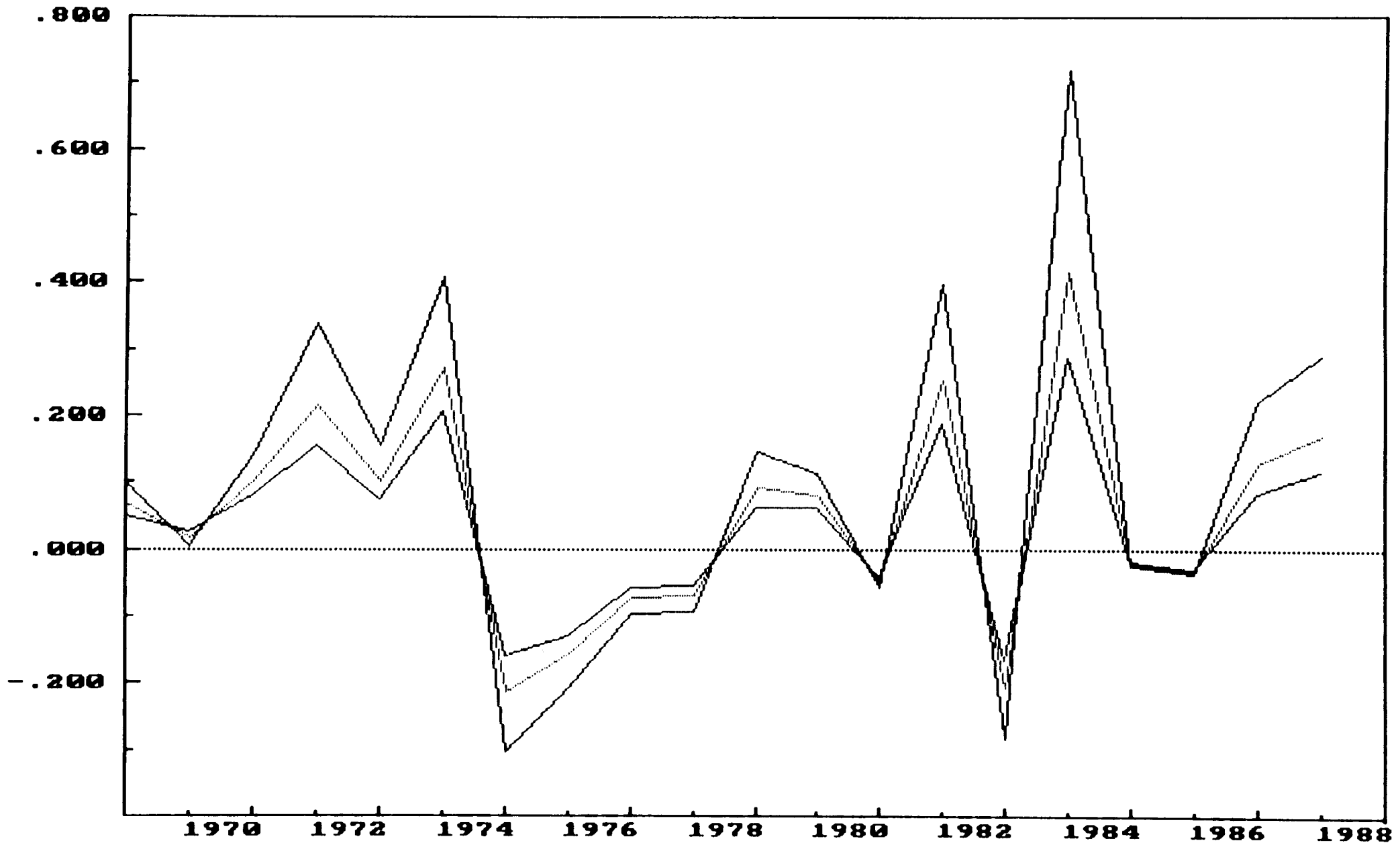


FIGURE 3.5 - Z(T) CONGO

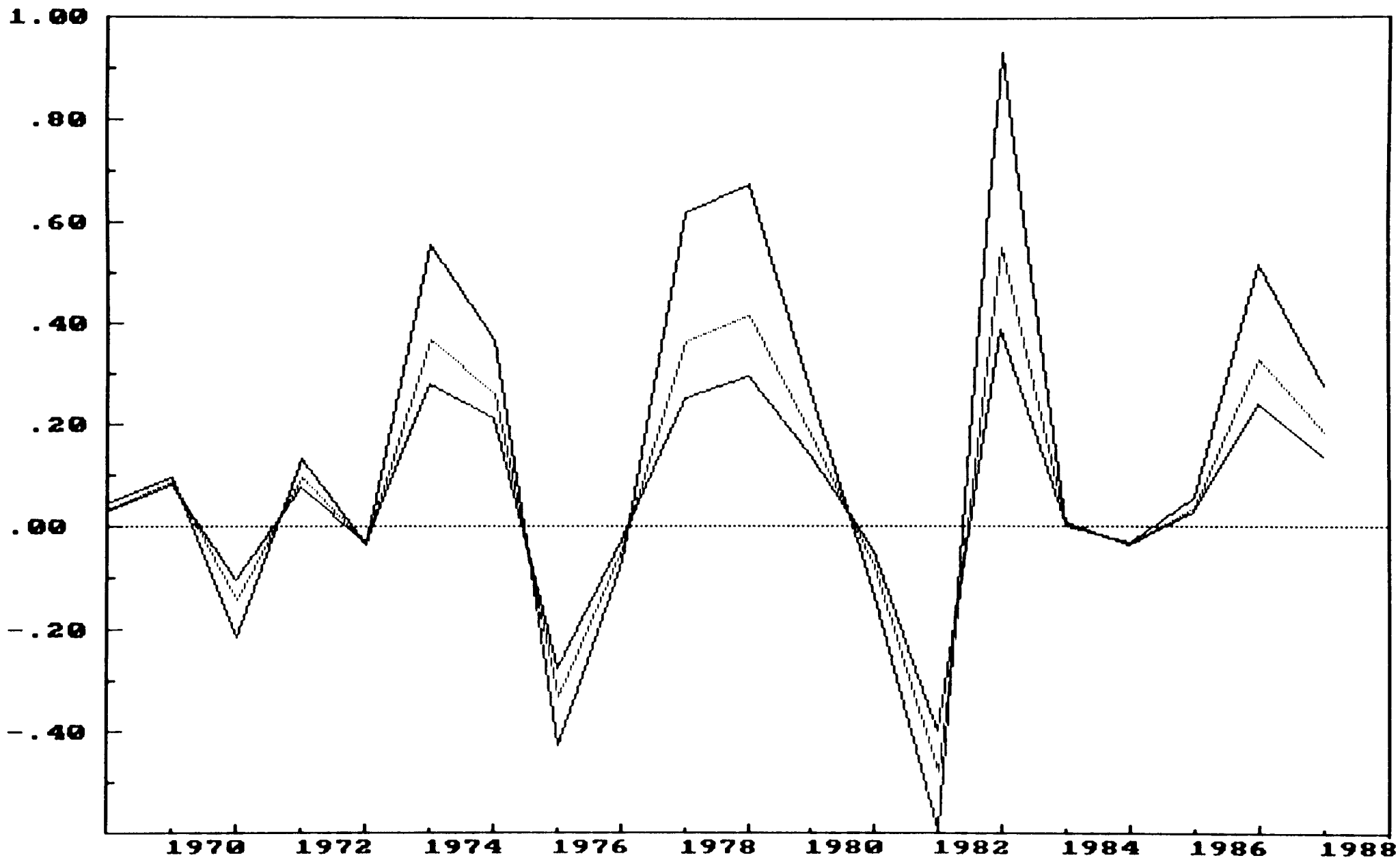


FIGURE 3.6 - Z(T) COTE D'IVOIRE

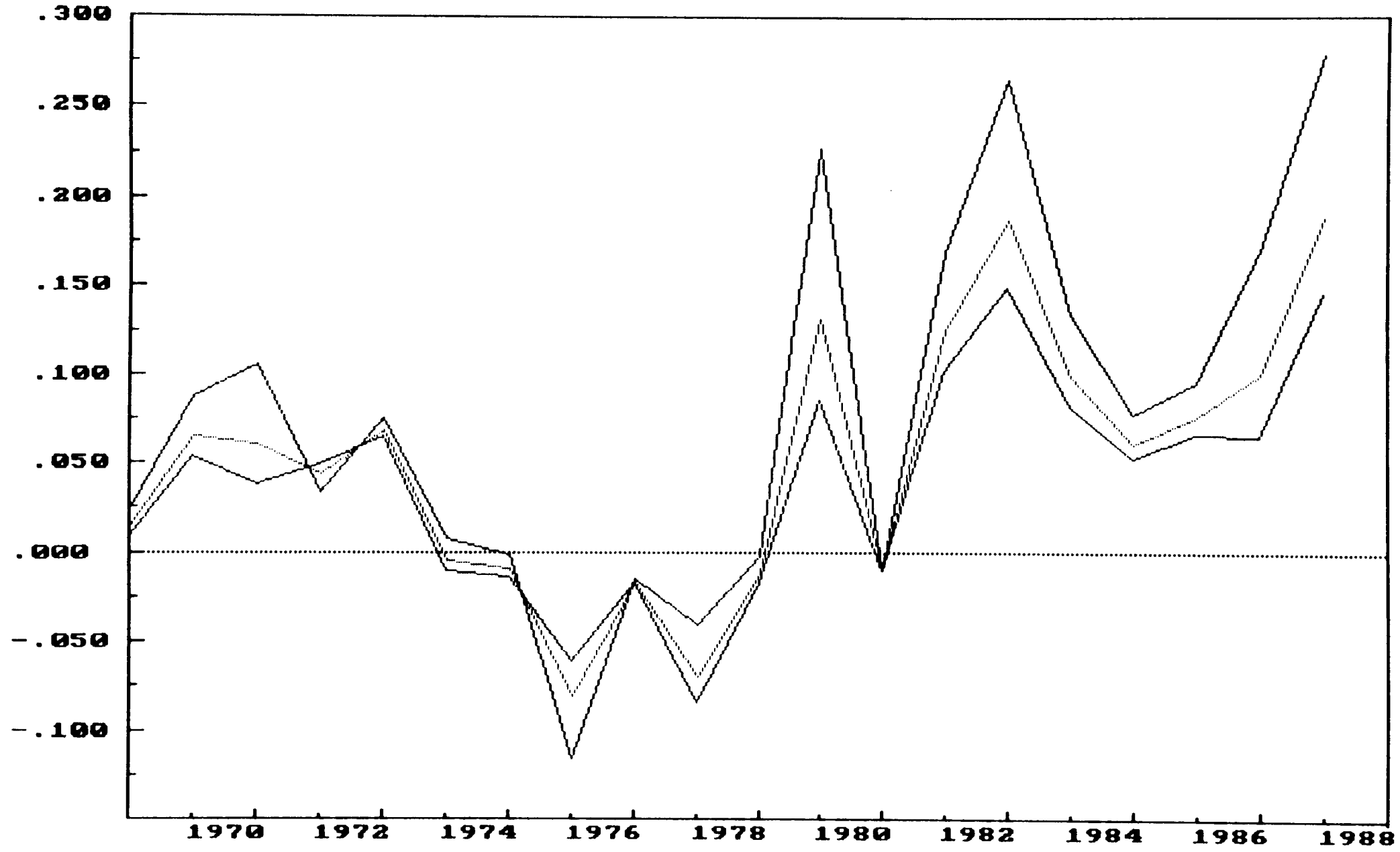


FIGURE 3.7 - Z(I) GABON

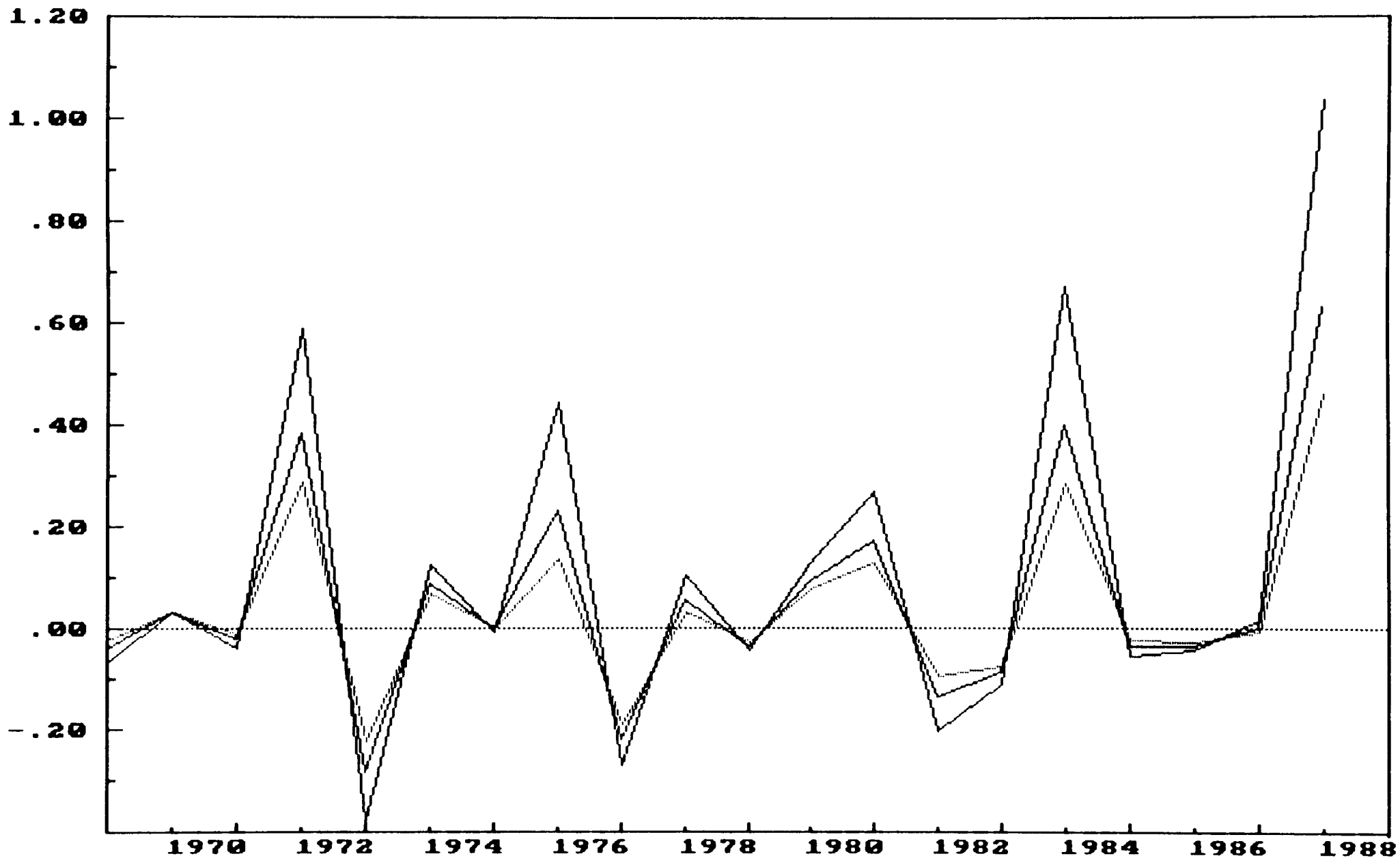


FIGURE 3.8 - Z(T) NIGER

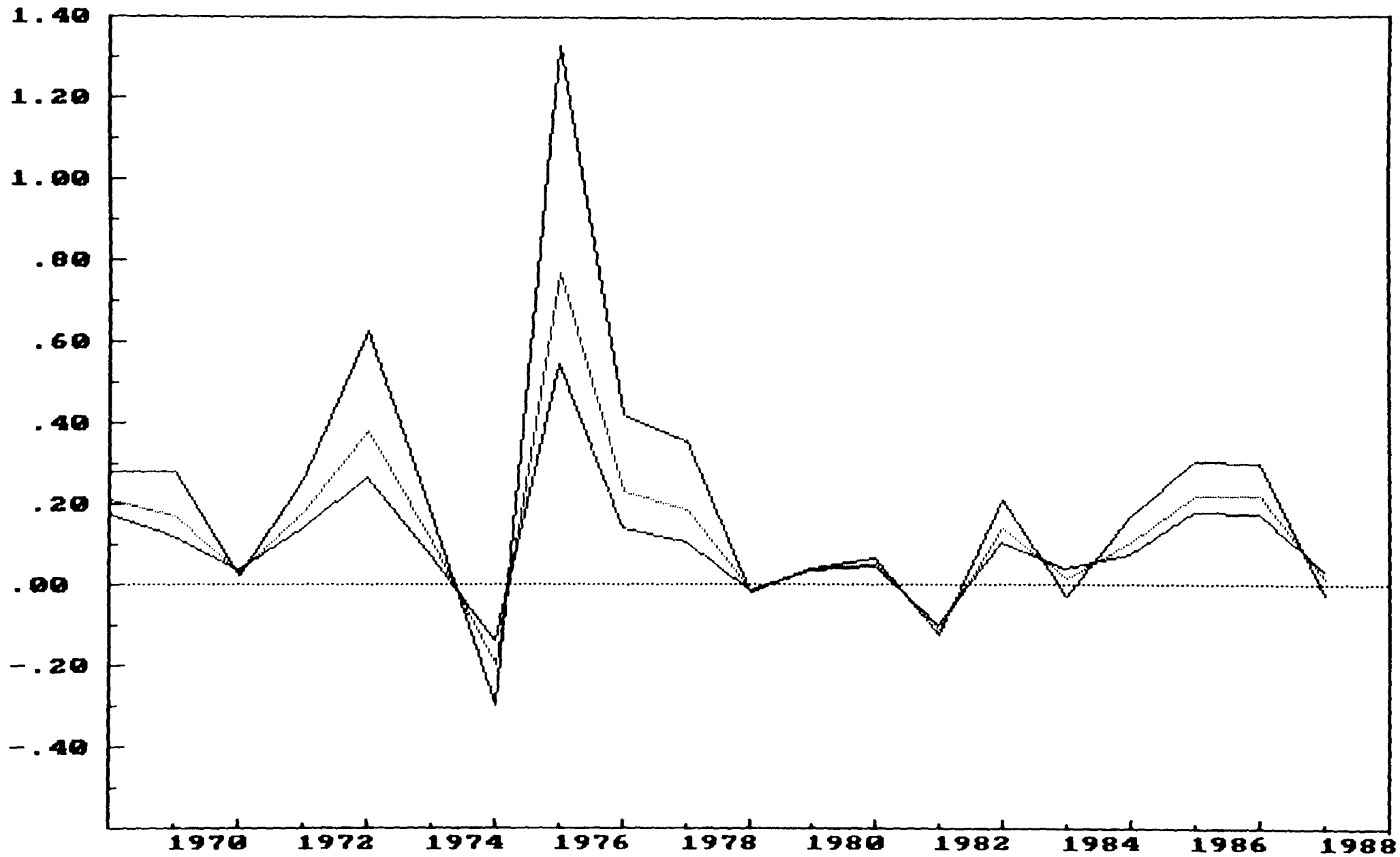


FIGURE 3.9 - Z(T) SENEGAL

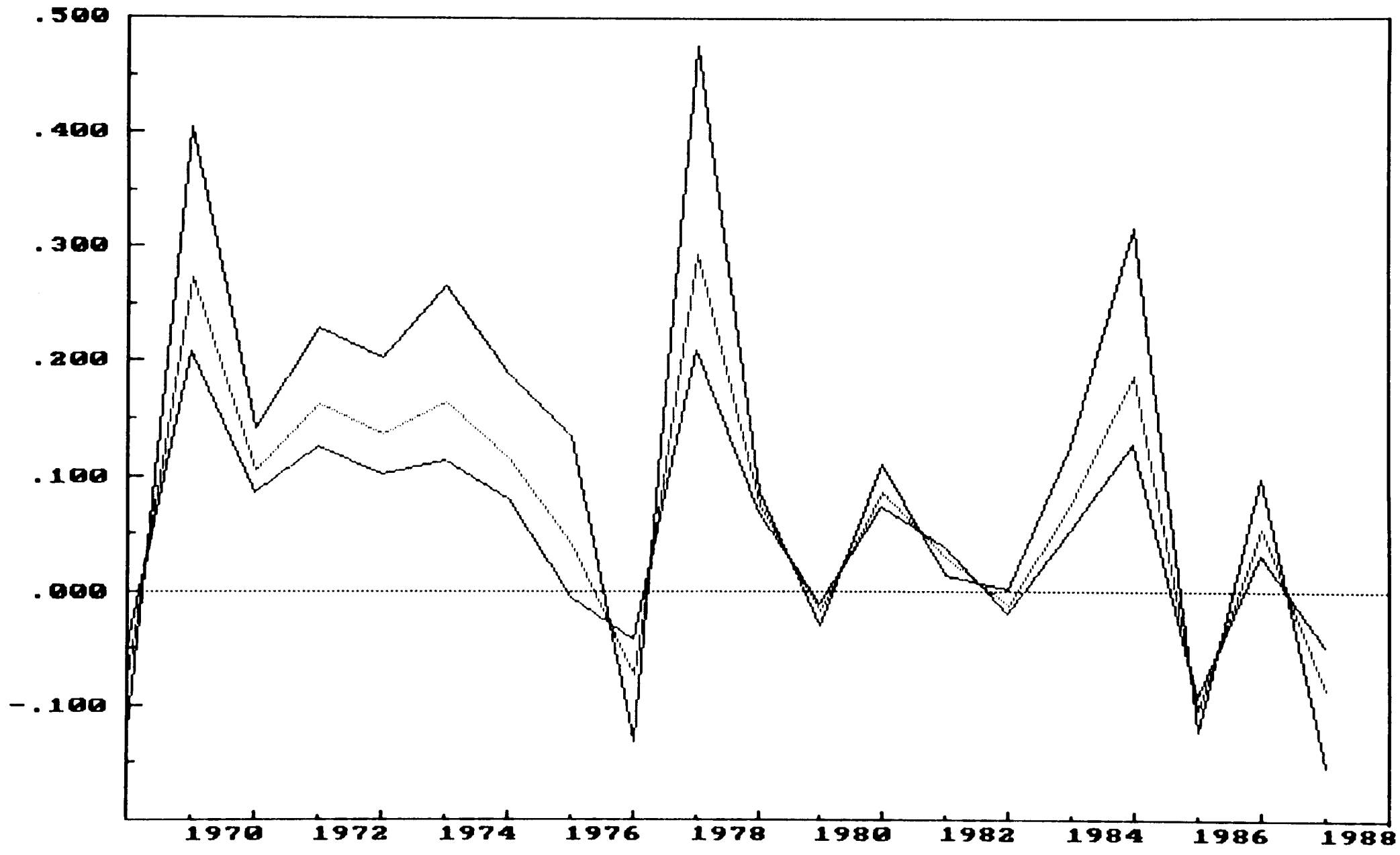


FIGURE 3.10 - Z(T) GHANA

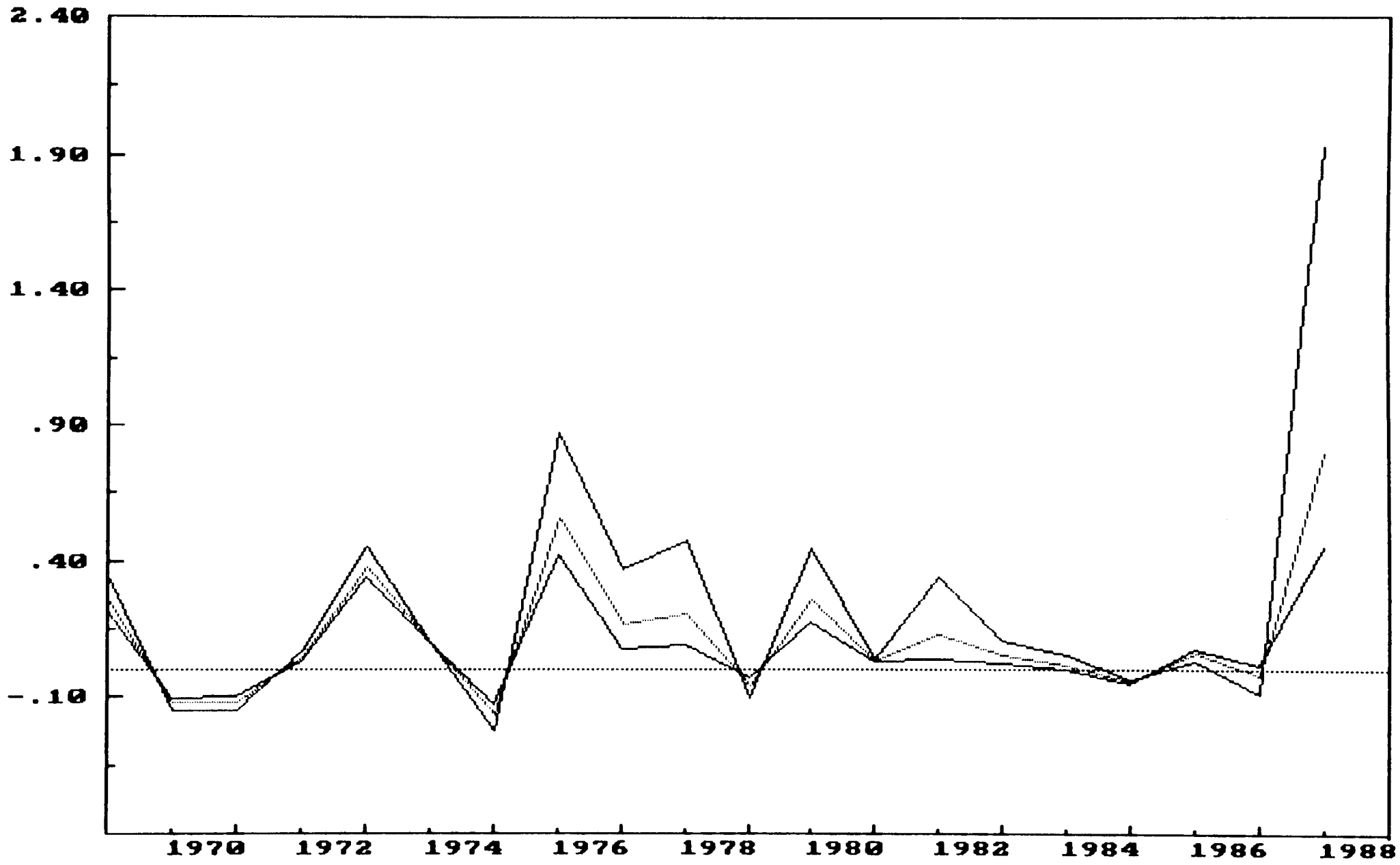
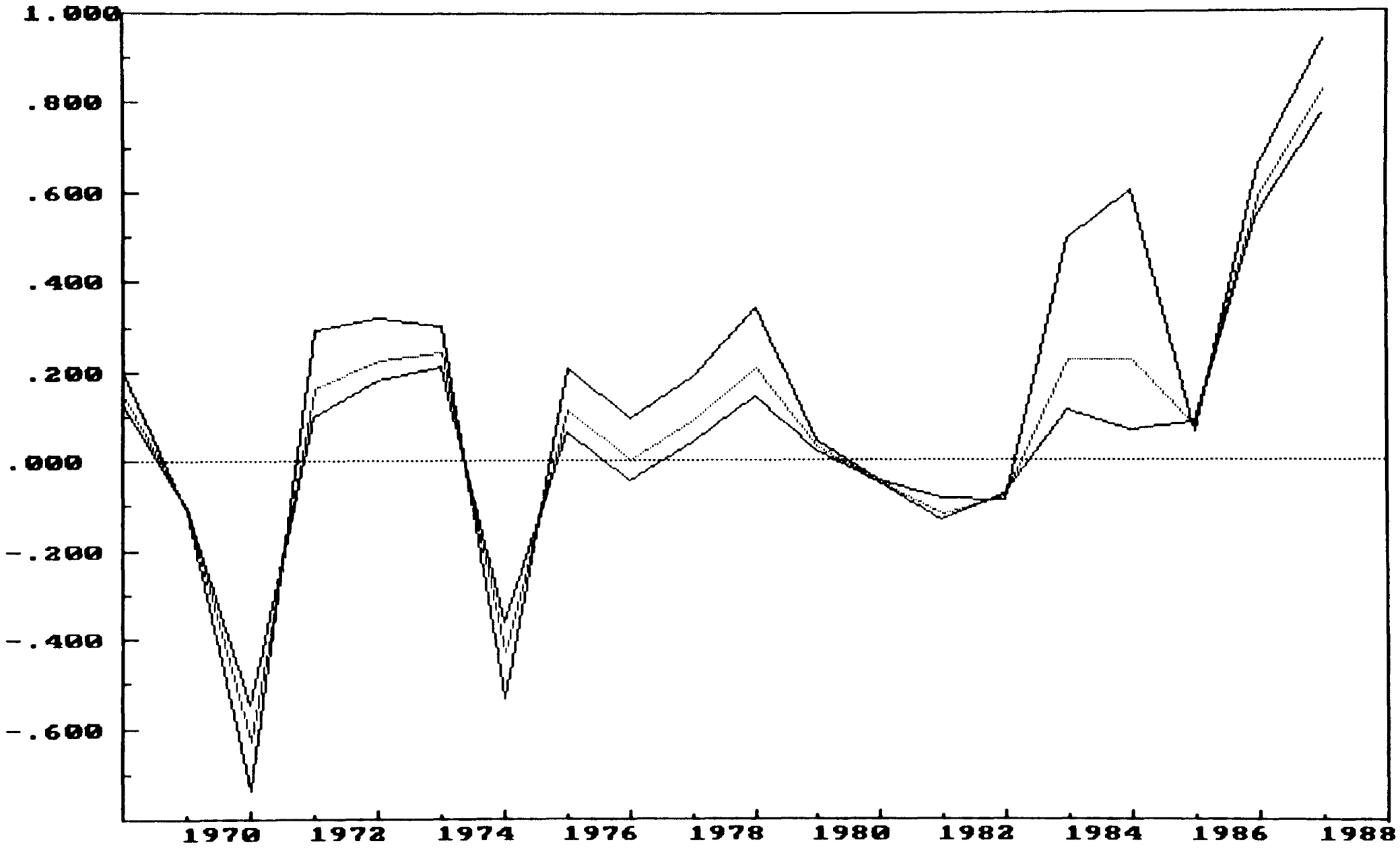


FIGURE 3.11 - Z(T) NIGERIA



CHAPTER 4

MODELLING INVESTMENT IN AFRICA: A THEORETICAL BACKGROUND

MODELLING INVESTMENT IN AFRICA: A THEORETICAL BACKGROUND

In chapter 2, we saw that there is some empirical evidence that investment has been, ceteris paribus, higher amongst the members of the CFA than elsewhere in Africa. However, this evidence does not draw out the mechanisms which might explain these differences, and existing hypothetical explanations remain informal and untested. In chapter 3, we tested one of the hypotheses which has been discussed in the literature, that French and CFA capital markets are fully integrated. This hypothesis was rejected. If Franc Zone members do have easier access to foreign financial capital than their neighbours, the difference is not clear cut.

What is needed is a formal model of investment which can show whether there is to some degree easier access to foreign finance in the Franc Zone, and also show whether other factors are significant. One issue on which it will be important to focus in the investigation of these other factors is the role price fluctuations in determining investment. The model should be testable using the data which exist for at least the better reported Franc Zone members.

In order to construct the empirical model, we need a theoretical framework, based on the investment theory which already exists in the economic literature. This will draw on work on investment in developed countries, where most theoretical economists have concentrated their attention, but must also take into account determinants of investment peculiar to Africa. There are a number of strands in the investment literature which are relevant here:

i) Keynesian and Neoclassical investment theory. These theories focus on the investment decisions of firms, and the prime determinant of investment is the marginal return to capital. Mostly these are MDC-orientated, although a notable exception is the "construction boom" literature, for example Bevan et al. (1990).

ii) LDC "determinants of investment" literature. Three main determinants of investment are highlighted in these papers. First of all, there is an emphasis on the link between savings and investment. In an economy which is completely financially closed,

savings are identical to investment. With partially integrated capital markets, there may still be some correlation between the two. This will be relevant to an analysis of the impact of CFA membership if Franc Zone countries' financial markets are better integrated with foreign markets (i.e., French markets) than those of others in Africa.

Secondly, a small number of papers concentrate on the availability of foreign exchange as a determinant of investment in countries where forex is rationed. If the official exchange rate is fixed above the market clearing exchange rate, so that there is excess demand for foreign currency, then firms will be able to import capital goods only if they can acquire the rationed foreign exchange. Since the Franc Zone is based on a currency which is fully convertible with the French Franc, member states are protected from foreign exchange rationing.

Thirdly, attention is paid to the fact that African investment opportunities are likely to be characterised by high risk. Again, the degree of risk associated with investment/lending in a country may depend on whether it is a member of the CFA. The CFA is characterised by low rates of inflation, ensured by relatively tight monetary policy. The low rate of growth of prices may correspond to lower price variability, and thus a lower volatility of returns. Moreover, even if an anglophone government is currently successful in maintaining stable prices, there may still be a problem with the long run credibility of such a policy. Rodrik (1991) uses a framework similar to Dixit's to show that even a small chance that the government renege on its present low inflation policy can substantially reduce investment. For a CFA government, the costs of reneging are very high, since this would entail secession from the monetary union, and so a low inflation policy is more credible.

iii) Recently, however, there has been some complementary theoretical work on investment decisions under uncertainty. A good example is Dixit (1989a). This provides a theoretical explanation for why investors may be influenced by the variability of returns, even if they are risk-neutral. However, there has been little in the way of empirical research corresponding to this theoretical model.

Thus we have three sources to draw on, and two main issues which need to be drawn out: relative openness of capital markets and risk. It is surprising that these sources appear as self-contained units, and that each draws little from either of the others. An

adequate analysis of investment surely requires a synthesis of elements from all of the strands in the literature. In this chapter, we will present some of the findings of groups (i-iii), and show which might be most relevant to an investigation of the reasons for higher rates of investment in the Franc Zone. In the final section of this chapter, we will present a model which draws together strands from all three groups.

1. Keynesian and Neoclassical theories

The basis of our empirical model ought to be an investment equation with microfoundations, i.e., one consistent with a plausible model of the behaviour of firms. A number of recent books and articles have attempted to synthesise Neoclassical theory of the firm, epitomised by Jorgenson's model of investment (Jorgenson (1963, 1966, 1972)) with Keynesian models of investment and Tobin's "q" theory (Tobin and Brainard (1977)). Good examples are Abel (1981) and Precious (1987). These models assume that investment in the domestic economy is by domestic firms which are not constrained in credit markets - typically, they face an infinitely elastic supply of funds - and which operate in a world of certainty. This strand in the literature is therefore not well adapted to explain the effect on investment of international financial flows and uncertainty about the return to capital. However, they provide an account of some of the mechanisms which will be important in determining investment in the private sector, and are a useful starting point for a comprehensive model of investment.

We note that our model of investment will be somewhat more aggregated than that of some other applications of neoclassical investment theory to LDCs. In particular, it abstracts form the "traded-nontraded" disaggregation of capital goods which is the centrepiece of the construction boom literature. The disaggregated investment data for the countries we are studying do not exist for long enough periods (without gaps) for use in an econometric model. The point of the theory in this chapter is to guide the construction of an econometric model. In general, the results of this model can be explained by a theory where all capital goods are traded goods. The main drawback of the aggregated approach is that the dependant variable used, which is a constant prices measure of aggregate investment, may misrepresent the true value of investment when there are large changes in the relative prices of different capital goods, for example, in the relative prices of traded and non-traded capital goods. This should be borne in mind as a caveat in the interpretation of the final results of the model.

Investment dynamics in the neoclassical economy

The Abel-Precious model can be used to examine the dynamics of investment in

economies unconstrained in the credit market. The basic model considers a firm which faces no quantity constraints in any market. There are, however, capital stock adjustment costs and a "putty-putty" technology. The firm acts to maximise the present value of future net cash flows:

$$\max V(0) = [p(t)Q(t) - w(t)L(t) - P_I C(I(t))]\exp[-rt]dt$$

$$\text{subject to:} \quad (1)\ Q(t) = F(K(t),L(t),t)$$

$$(2)\ \dot{k}(t) = I(t) - hK(t)$$

where p is the price of output, Q, which is a function of capital stock, K and "labour" input, L (which can be thought of as a variable input aggregate). Labour has a price w and investment a price P_I, which is determined by the international price of capital goods and the nominal exchange rate. The firm treats both factor prices as given. The rate of change of the capital stock, $\dot{k}$, is equal to gross investment, I less depreciation, hK. r is a fixed real interest rate: firms are able to borrow as much as they like at this interest rate. This characterisation is appropriate for looking at an individual firm in a perfectly competitive market for domestic funds with a market clearing interest rate, or for a firm/sector which has access to a foreign financial capital market. The former case is unlikely to be the case anywhere in Africa. The latter case is an extreme characterisation of firms in the CFA. C() represents adjustment costs. The corresponding Lagrangian is:

$$M = [pF(K,L) - wL - P_I C(I)] + \mu[I - hK]$$

where μ is the Lagrangian multiplier for the constraint, (2), and (1) has been substituted into the profit function. This yields the first order conditions:

$$\text{(i)}\ \dot{\mu} = \mu[r + h - \dot{P}_I/P_I] - pF'_K$$

$$\text{(ii)}\ w = pF'_L$$

$$\text{(iii)}\ \mu = P_I C'_I$$

where $\dot{\mu}$ is the rate of change of μ. From (i) we see that:

$$\mu(t) = \int [w(s)F'_K(s)/F'_L(s)][\exp[-(r + h - \dot{P}_I/P_I)(s - t)]]ds$$

I.e., μ is the present discounted value of the future profit stream generated by the marginal unit of capital. The discount rate depends on the interest rate, the rate of depreciation of capital, and the rate of change of P_I. (If P_I is growing quickly, then the discount rate is higher, since delaying investment entails the loss of financial capital gains.) μ/P_I is therefore a marginal Tobin's q, showing the ratio of the value of the marginal unit of capital to its replacement cost. (iii) shows that I depends directly on just μ/P_I, so the equation of motion for the capital stock can be written as:

$$(2') \quad \dot{k} = I(q) - hK$$

where $q = \mu/P_I$. Using q, (i) becomes:

$$(3) \quad \dot{q} = q[r + h - \dot{P}_I/P_I] - p[F'_K/P_I]$$

If movements in P_I are discrete and unexpected, the first term will reduce to $q[r + h]$. Once I() and F() are specified, equations (2') and (3) can be solved simultaneously for $\dot{k} = \dot{q} = 0$. Figure 4.1 is a phase diagram depicting a solution to this system. With constant returns to scale, F'_K will be independent of K, so the $(\dot{q} = 0)$ locus will be horizontal. With decreasing returns to scale, F'_K will fall as K rises, so the locus slopes downwards. $\dot{q} > 0$ when $q[r + h] > F'_K/P_I$ (above the $(\dot{q} = 0)$ locus), whilst $\dot{k} > 0$ when $I(q) > hK$ (to the left of the $(\dot{k} = 0)$ locus), so there is a saddlepath locus (SS) defining those points away from equilibrium from which the system will tend towards equilibrium, as shown in the diagram. Only points on the saddlepath are consistent with Rational Expectations (see Precious (op. cit.)). If the parameters of (2') or (3) change, adjustment to the new equilibrium will be along such a saddlepath, as depicted in Figure 4.2 for a shift upwards in the $(\dot{q} = 0)$ locus: with decreasing returns to scale, slow adjustment of the capital stock to its new equilibrium level will entail "overshooting" of the marginal q, as the value of an incremental unit of capital first rises with the positive shock (a → b), and then falls as the capital stock rises (b → c).

Figures 4.3 and 4.4 show how investment and the capital stock will adjust over time: remembering that $I = I(q)$, we know that if q "overshoots" in the short run, then so will optimal I. At the time of the initial shock, investment jumps up from its base level ($\underline{I}$)

(point a in the figure). Thereafter, there is falling investment (b → c). The adjustment path is monotonic, so in an empirical model, we will expect to see a positive relationship between I(t) and I(t-1). It is also worth noting that the ($\dot{q} = 0$) locus will shift outwards for a rise in p, a fall in P_I or a fall in r, so in the long run, I is a positive function of p and a negative function of P_I and r. These results are intuitive: investment will be higher if its marginal revenue rises or its marginal cost falls.

Thus we have a dynamic investment function of the form,

$$(4)\ I(t) = f(I(t-1), w(t), P_I(t), p(t), r(t))$$

which is in principle estimable. In practice, we may wish to add lags of the price terms: even in the extreme case of a world of perfect foresight, decision-making procedures in the firm may entail some lag in the response of an organisation to a change in prices.

However, this function represents an extreme case: no risk and an infinitely elastic supply of loanable funds. It does not take into account credit constraints, which have been the major focus of attention for empirical models of investment in LDCs, which are reviewed in the following section.

2. Determinants of investment in existing models of LDCs

Most of the sizeable empirical literature on the determinants of investment in LDCs approaches the question from a slightly different angle from the neoclassical perspective. Cross country studies typically concentrate on just one factor which is thought to be important in explaining investment. The theoretical background to these papers is often informal. Usually, the focus is on either savings or direct foreign investment. Again, this literature is divided into distinct groups, with little cross-fertilization. In all of the studies, the role of foreign financing is given prominence, but this financing appears in different forms in different models. In our empirical model, we shall want to build in important features highlighted by this literature. In particular, the work on foreign sources of finance may provide a route into the analysis of financial market integration. The literature contains the following categories.

i) There is a literature concerning the extent to which gross domestic investment is correlated with gross domestic savings. This work also includes studies of developed economies. The basic idea is that if the domestic financial capital market is perfectly integrated with that of the rest of the world, then there will be no correlation between savings and investment. Firms will be able to borrow at the international interest rate on an international market, and a fall in domestic savings will not lead to a fall in domestic investment. At the other extreme, if there is no international financial market, then we will be back in an ISLM world, where I = S. In intermediate cases, there will be some correlation between I and S. An assertion which we are interested in is that financial markets in the Franc Zone are better integrated with foreign markets than are financial markets in the rest of Africa. If this assertion is correct, then there should be a weaker link between I and S in the CFA.

A number of studies use time series or cross-country data to test the hypotheses, corr[I,S] = 0 and corr[I,S] = 1. Feldstein and Horioka (1980) regress I/Y on S/Y and Δ(I/Y) on Δ(S/Y) using cross-country data, finding coefficients significantly different from zero, but not significantly different from unity. These results are confirmed by subsequent

papers.[1] However, this methodology is open to a number of criticisms. As Tesar (1988) points out, there are many reasons why savings and investment might be correlated, other than a lack of capital market integration. It may simply be that the propensities to save and invest are correlated because of productivity shocks or a lack of integration of domestic and international goods markets. For example, and increase in labour productivity may stimulate higher investment and, since income increases, higher savings. Using I/Y and S/Y instead of I and S will generally not be enough to solve this problem (for example, when the marginal propensity to save is not constant). Indeed, with any positive income shock, savings and consumption are both likely to rise; if some of the extra consumption is on internationally nontraded goods, then the price of such goods will rise, stimulating higher investment.

Bayoumi (1990) attempts to avoid some of these criticisms by estimating correlations between I/Y and S/Y for different sample periods. He finds that there is no significant correlation for a number of Western economies during the period of the Gold Standard (1880-1913), whilst there is a strong correlation during the postwar period. Since during the Gold Standard period there was an absence of institutional constraints on international financial capital mobility, in contrast to the postwar period, when barriers to mobility have been common, Bayoumi suggests that it is such barriers which have led to a high correlation between I and S. There is however a danger here of committing the fallacy of *post hoc ergo propter hoc*. It has still to be demonstrated that the increasing dependency of investment on savings in the postwar years does not have some other explanation. Such models cannot avoid the basic criticism that the coefficients of $I/Y = \alpha + \delta(S/Y)$ may be biased because of omitted variables. Until these variables are included, estimates of δ tell us nothing.

ii) Other papers concentrate on determinants of direct foreign investment (DFI). There are two approaches. The approach favoured for developing countries is to use a range of "political and economic" variables to explain differences in DFI between countries. In studies of developed countries, a time-series approach is preferred, with a different set of explanatory variables. Since the latter allows for uncertainty in foreign exchange

[1] Examples are: Feldstein (1983), Penati and Dooley (1984), Murphy (1984), Caprio and Howard (1984) and Feldstein and Bacchetta (1989).

markets, we will leave it to the next section.

Amongst the more influential studies using the first approach are Root and Ahmed (1979) and Schneider and Frey (1985). Not surprisingly, real GNP and GNP growth turn out to be important in these papers, as do variables reflecting domestic labour productivity and the Balance of Payments. Amongst the "political" explanatory variables are indicators of political stability (for example, the frequency of changes in government) and government political orientation. There are a number of drawbacks to this approach: the empirical models tend to be rather unstructured, involving simply the regression of DFI on as many variables as the author can think of. Estimation is invariably by OLS or discriminant analysis, with no thought given to the possibility of collinearity. A more convincing model would have more structure, elaborating the interdependence of the explanatory variables and using an appropriate estimator. For Africa, however, models of DFI will not be of much use in explaining overall investment, since the proportion of overall investment made up by DFI is typically 0-5%.

iii) In the light of the debt crises of the 1980s, a literature has arisen to explain the volume of financial flows to LDCs and the likelihood of debt default. The models used to tackle these issues have grown in sophistication, beginning with simple Logit models of the probability of default, for example, Feder and Just (1977)) and evolving into the more complex simultaneous equation models of Kharas (1984) and Savvides (1991). In Savvides, the probability that a country will default in a particular period depends positively on the magnitude of previous capital inflows (since higher inflows mean a greater debt burden), whilst these inflows are reduced by a higher probability of default. Independent variables include the debt-export ratio, per caput GNP and country ICOR. The model is estimated for a range of LDCs, including Cote d'Ivoire, Senegal and Togo.

Whilst creditworthiness is an important factor in determining foreign lending to African economies, this type of model is of limited applicability in explaining investment in Africa. First of all, few African countries have actually defaulted on loans; secondly, foreign loans may be spent on consumption rather than on investment, so a model of financial inflows is not a model of foreign-financed investment. Indeed, when investment appears in such models at all, it appears as an independent variable in the financial flow equation.

iv) In addition to the literature concerning the availability of credit in developing countries, there are a number of studies which focus on the availability of foreign exchange. In order to import capital equipment, firms must acquire forex. This will be unproblematic if the market for foreign exchange clears at the prevalent domestic exchange rate. However, if forex is rationed, then the binding quantity constraint on some domestic firms may not be credit but forex.

A number of papers asses the effect of forex rationing on imports as a whole.[2] However, few studies have concentrated on the impact on capital goods. One paper which does address this issue is Matin and Wasow (1992). In this paper, a rather ad hoc model of private investment in Kenya includes foreign exchange reserves as an explanatory variable, which turns out to be highly significant.

In analyzing the relative importance of alternative sources of finance for investment in Africa, models which elaborate the links between domestic savings and domestic investment are the most obviously relevant. The intuition which prompts the search for a causal link between I and S is basically correct, and our model should take account of this. However, simple correlation coefficients for I/Y and S/Y are not adequate, and the interaction of these two variables needs to be analyzed within the framework of a larger model.

Further, more thought needs to be given to the way we should expect savings and investment to evolve in economies enjoying different degrees of financial market integration. In the case of complete integration, for example, might there not still be a long run constraint that the current and capital accounts are zero? Otherwise, a country could run up an indefinitely large stock of debt. The difference between integrated and unintegrated countries will be in the short run relationship between savings and investment, and in how the economy evolves to long run equilibrium with balanced current and capital accounts. In order to use analysis of the savings-investment relationship to explore the issue of financial market integration, we must explicitly model saving-investment dynamics.

Moreover, an important idea which is implicit in other types of empirical work is

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[2] See for example Hemphill (1974) and Moran (1989).

that the availability of foreign funds will depend on the risk which creditors perceive themselves to face, whether the risk is couched in terms of creditworthiness or in terms of "political and economic instability". In the African context, the riskiness of investment projects is likely to be a crucial factor. In the next section, we will survey some work which brings the problem of risk to the forefront.

In looking at the impact of credit availability on investment, and the possibility of a quantity constraint in the loans market, one should not forget the possibility of a quantity constraint in the foreign exchange market. This is especially important in comparing Franc Zone members with other African countries, since many of the latter have experienced forex rationing in the 1970s and 80s, whilst the CFA enjoys guaranteed convertibility with a hard currency. In constructing a model of investment, it will be important to be clear about how the two quantity constraints are likely to interact.

3. Investment under uncertainty

Many economists have pointed out that there is no a priori reason why firms should exhibit risk averse behaviour. If shareholders can hold a diverse portfolio of assets, there is no reason why they should be worried by the high variance of returns to a particular asset: they will not avoid buying shares in a particular firm just because there is a high variance in its share dividends. However, a number of recent papers have shown that the variability of returns to a project may deter investment even by risk neutral firms. This idea is the burden of Dixit (1989a,b,c), Bentolila and Bertola (1987) and Pindyck (1987). All these papers elaborate the hysteretical effects which may arise when there are entry and exit costs associated with an activity and which may be exacerbated when returns to the activity are variable. Higher risk entails lower investment.

The basic idea is quite straightforward: the price which will trigger entry into an activity is greater than the minimum price necessary to keep an active firm running. In the one case, sunk costs are included in profit calculations, whilst in the other they are discounted. More interesting is the effect of the variability of returns on such trigger prices.

For an intuitive example, suppose that the return to the project in period zero is p_0. Thereafter, p_t follows a random walk, increasing by m with probability 0.5 each period, and decreasing by m with probability 0.5. Once the firm has entered, exit is impossible (exit costs are infinite). The project lasts for T periods, where T is arbitrarily large, so T is approximately equal to (T-1). Expected returns from entering the project now are Tp_0. Suppose that

$$Tp_0 = Tw + K + E$$

where w are project running costs per period and K the cost of entry. E is an arbitrarily small positive number. If p_t were constant at p_0, then this would induce entry. Will it induce entry when p_t follows a random walk? The expected value of starting now is E. If the firm waits until period 1 before deciding whether to enter, then with probability 0.5, $p_1 = (p_0 - m)$, in which case there is no entry, and profits are zero. Also with probability 0.5, $p_1 = (p_0 + m)$, and there is entry with expected profits $(T-1)(p_0 + m - w) - K + E$.

Thus the expected value of waiting for a period instead of entering right away is:

$$0.5[(T-1)(p_0 + m - w) - K + E] > E$$

So the rational firm will delay its entry decision for a period. In order to induce entry in period zero, the return to the project would have to be greater than $Tw + K + E$, so that the loss of one period's profits was not negligible, i.e., the price which triggers entry is greater under uncertainty.

This particular example, of one agent deciding whether to be active or idle, can be extended to a wide range of price behaviour and entry/exit costs. Dixit (1989a) gives a good summary of this type of analysis. The values of trigger prices for entry and exit are derived by treating both activity and idleness as assets whose value is determined by the value of the options they entail, namely the option to become active in the future, if one is idle now, and the option to become idle in the future, if one is active now. At the trigger entry price, the value of being active now equals the value of being idle at this price in this period plus the sunk entry cost. Similarly, at the trigger exit price, the value of being idle now equals the value of being active now plus the exit cost.

However, this model is not quite what we need for analysis of investment decisions in an LDC. Here, the default state is unlikely to be idleness. For a foreign firm contemplating direct foreign investment, the choice is between investing in Africa and investing at home. Similarly, for an African firm, the choice is (perhaps) between buying capital goods and entering into some other activity which may also involve sunk costs. This alternative may be the acquisition of financial assets, for example, stockpiling or buying forex. The sunk costs involved would be in the one case, buying a warehouse, and in the other, the bribery and corruption required in order to acquire the right to import foreign currency. Another alternative is to engage in an activity which does not involve gross capital formation as usually defined, but which nevertheless entails sunk costs in some other way. Possible examples are import retailing, which again may require rent-seeking, and employing a labour-intensive technique of production when there are large hiring-and-firing costs.

Dixit (1989c) provides a better framework for analyzing such a scenario. Dixit's model concerns the allocation of capital goods between two sectors of a centrally planned

economy, but the interpretation of the model can easily be adapted to analyze the choice of any agent between two activities which involve sunk costs. We provide a summary of such an adaptation below; technical details can be found in Dixit (1989c).

Suppose that one of the activities (B) is "safe", i.e., its return is constant. This return can be taken as the numeraire: the activity could be, for example, investing in a US subsidiary instead of in a Ghanaian subsidiary. Activity A is risky: the return varies over time (for example, as the Cedi-$ exchange rate and the state of Ghanaian industry vary with trade shocks and military coups). The analysis is more tractable if the return to A (P) is assumed to follow Brownian motion:

$$(5)\quad dP/P = \mu dt + \sigma dz$$

where $E[dz] = 0$ and $E[dz^2] = dt$. Let P_0 be the initial value of P, in period zero. It follows from the theory of Brownian motion that:

$$(6)\quad \ln P_t \sim N(\ln P_0 + [\mu - \sigma^2/2]t,\ \sigma^2 t)$$

and thus that:

$$(7)\quad E[P_t | P_0] = \exp[\mu t]$$

μ being the trend rate of growth of P_t.

The profit-maximising, risk neutral firm is assumed to have a total of K units to invest. The units are ordered from 1 to K. For simplicity, K is taken to be made up of indefinitely many integer units. Movement of these units between the two activities is costly (for example, if capital is to be run down in the US subsidiary and the extra finances released used to increase the capital stock of the Ghanaian subsidiary). Suppose that there are (M-1) units of K in A. Define the cost of raising this to M units as h(P,M). A transfer in the opposite direction costs l(P,M). A simplifying assumption is that costs arise just because it takes a certain amount of time to move the units between the two activities, during which time they cannot be used. Assuming also that all other factors are sector-specific, we can write the output of A as PF(M) and of B as G(K-M), where F() and G() are production functions. We then have:

$$h(P,M) = h_0[G(K - (M-1)) - G(K-M)]$$

$$l(P,M) = l_0[F(M) - F(M-1)]$$

$$R(P,M) = PF(M) + G(K-M)$$

where h_0 is the time taken shifting a unit of K out of B into A, and l_0 is the time taken shifting it in the other direction. R() is the firm's total revenue.

Consider now an interval of time / range of prices where the number of units of K in activity A, M, is kept unchanged. This generates a revenue, R(P,M). However, evaluation of the returns to this state should also include any "capital gain" in the asset value of the policy of allocating M units to A now and following optimal policies in the future. (This consideration is analogous to thinking of the value of a state of activity as being its revenue plus the value of the option to finish the activity and become idle at some future date, if this becomes optimal.) Denote the asset value of the state as V(P,M). The total expected rate of return is (R + E[dv]/dt). This must equal the required rate of return, rV, where r is the discount rate. It can be shown that:

$$(8)\ E[dv]/dt = V'_P P\mu + V''_{PP}\sigma^2P^2/2$$

and thus that:

$$(9)\ V'_P P\mu + V''_{PP}\sigma^2P^2/2 - rV(P,M) = - R(P,M)$$

This is a differential equation in V. It turns out that:

$$(10)\ V(P,M) = A(M)P^{-\alpha} + B(M)P^{\pi} + Q(P,M)$$

where A() and B() are arbitrary functions, and

$$-\alpha = [1 - m - ((1 - m)^2 + 4n)^{1/2}]/2$$

$$\pi = [1 - m + ((1 - m)^2 + 4n)^{1/2}]/2$$

$$m = 2\mu/\sigma^2,\ n = 2r/\sigma^2$$

$$Q = E[R(P_t,M)\exp[-rt]dt]$$

The first term on the RHS of (10) is the value of being able to move some units of K out of A in the future; the second term is the value of being able to move some units out of B, and the third is present discounted value of the returns to both activities on the assumption that no capital is transferred between them in the future. Defining

$$f(M) = F(M) - F(M-1)$$

$$g(M) = G(K - (M-1)) - G(K-M)$$

$$a(M) = A(M) - A(M-1)$$

$$b(M) = B(M-1) - B(M)$$

(9) can be written:

$$(9')\ V(P,M) = \sum_{j=1}^{M}[a(j)P^{-\alpha} + Pf(j)/(r-\mu)] + \sum_{j=M+1}^{K}[b(j)P^{\pi} + g(j)/r]$$

the total asset value being expressed as the sum of the values of individual units of capital, each with a current marginal product[3] and an option value of being switched to the other sector.

Now let $P_H(M)$ be the value of P at which it becomes optimal to switch from (M-1) to M units in A. From the "value matching" condition, it must be the case that:

$$(11)\ V(P_H(M),M-1) = V(P_H(M),M) - h(P_H(M),M)$$

i.e., that the value of having M units of K in A at $P_H(M)$ must equal the value at M-1 units plus the cost of transfer. (This is analogous to the value of engaging in an activity at the entry trigger price equalling the value of idleness plus the entry cost.) There is also a "high

[3] Since the ordered units of capital are removed from an activity in turn, each unit i corresponds to a certain marginal product, i.e., MPK in A when i is the highest value unit employed in a.

order contact" condition (see Dixit (1988) for an intuition):

$$(12)\ V'_P(P_H(M),M-1) = V'_P(P_H(M),M) - h'_P(P_H(M),M)$$

Similarly, at the price at which it becomes optimal to switch from M to M-1 units in A (P_L), it must be the case that:

$$(13)\ V(P_L(M),M) = V(P_L(M),M-1) - l(P_L(M),M)$$

$$(14)\ V'_P(P_L(M),M) = V'_P(P_L(M),M-1) - l'_P(P_L(M),M)$$

With the linear cost functions above, these four conditions can be solved simultaneously for (P_H,P_L,a,b). To illustrate this solution, consider the function,

$$\Gamma(P) = a(M)P^{-\alpha} + Pf(M)/(r-\mu) - b(M)P^{\pi} - g(M)/r$$

and find values of a(M) and b(M) such that at P_L, $\Gamma = -l_0Pf(M)$ and $\Gamma' = -l_0f$, whilst at P_H, $\Gamma = h_0g(M)$ and $\Gamma' = 0$. Figure 4.5 shows the Γ function: the curve is adjusted so that it fits within the bounds given by $\Gamma = h_0g$ and $\Gamma = -l_0Pf$. P_L and P_H are the prices at the points of contact. The important result for our purposes is that increasing σ elongates the Γ function, raising P_H. I.e., as the variability of returns to the risky activity increases, the actual return which triggers the shifting of an extra unit of capital into that activity increases.

There has as yet been no empirical work on this kind of model. Existing studies which do take the variability of returns into account usually focus on the possible effects of risk aversion, concentrating on direct foreign investment. For example, Aliber (1971) suggests that countries with "weak" (i.e., highly variable) currencies generate income streams with high exchange risk from the point of view of foreign investors from "strong" currency areas. Foreign shareholders are not worried when foreign firms purchase these income streams, since these firms are thought to be well able to diversify their activities in order to minimise risk. However, domestic firms from the weak currency area are not thought to be able to diversify. So foreigners are more willing to lend to foreign firms so that they can purchase the income stream than to domestic firms. This may explain why there is direct foreign investment in areas with weak currencies.

More sophisticated, and closer in spirit to the Dixit model, are Cushman (1985) and Caves (1988). They point out that in a world of certainty, future appreciation of a country's currency may encourage direct foreign investment, since such appreciation implies a capital gain on those resources committed that country by foreign firms. For example, if a US multinational has a choice between siting capital for production of a good sold in the US in a US subsidiary and siting it in Ghana, appreciation of the Cedi will encourage investment in Ghana, since this will entail capital gains. However, this effect may be offset by the fact that using foreign capital entails using foreign labour, which will be more expensive if there is appreciation. The overall effect is ambiguous. Cushman shows that ambiguous effects also arise in more complex market structures, when one considers the possibility of, for example, home and foreign location of the output market and an intermediate good producing factory.

In a world of uncertainty, the relevant figure is not expected future appreciation, but expected appreciation less the cost of insurance against unexpected exchange rate movements, which will depend on the variability of the exchange rate. Increasing variability increases the cost and so reduces this figure. However, since the effect of this figure on DFI is ambiguous, so is the effect of exchange rate variability. This model is used to explain why higher variability of a country's exchange rate seems to lead to higher DFI in empirical studies, including those of Cushman and Caves, which is a counter-intuitive result.

This evidence may seem at first to be bad news for the Dixit model: there is a positive correlation between price variability and investment. However, the evidence is tangential to Dixit's model, since the price in the empirical studies, which is either the nominal exchange rate or the "real" exchange rate (the nominal rate times the ratio of foreign to domestic CPI), is not the same as P. In order to test the predictions of the Dixit model, we need to be careful in choosing a measure which represents P.

First of all, we need to be clear about what kind of investment it is which is reduced by price instability. The instability of returns could affect an African economy in a number of ways:

i) It could lower both DFI and domestic investment.

ii) It could increase the risk of loan default by domestic firms. The "firm" in the Dixit model becomes the financial investor, who can choose from whom she buys shares. Her return is variable, depending on whether there has been loan default in the present period. Thus the Dixit model becomes an explanation for low credit supply which is an alternative to the well known Stiglitz-Weiss model (Stiglitz and Weiss (1981,1983)).

For the foreign direct investor, the relevant choice is between home and African investment. The large political and trade shocks to which African economies are subjected will probably mean that returns to activity in Africa are more variable even in a world of fixed exchange rates. Nominal exchange rate variability will compound this difference, increasing the variability of returns to the African project in the investor's own currency. So the African activity corresponds to activity A above, and the home activity to activity B. The relevant measure of variability here will be an indicator of the variability of the African return relative to the return on the domestic activity. Note that the return to "B" is unlikely to be constant, so it must be included explicitly in the measure. The measure of variability will be based on R/eR*, where R is the return to African activity, R* the return to the home activity and e the price of home currency in units of the African currency. Since prices cannot be assumed to follow Brownian motion, it may not be the case that σ is the best measure of variability, and one should be a priori agnostic about what the best measure is.[4] This measure could be used in a cross-country model, to see if, over a certain time period, African countries with higher variability experience lower investment, or in a time series model, to see if increasing variability over time decreases investment. R/eR* may also be a good measure to choose for African firms, if they have access to foreign investment opportunities.

For explaining the behaviour of a foreign bank choosing whether to lend to African firms or to European or American firms, the variability of R/eR* may also be the appropriate measure to use, since it captures the "riskiness" of African firms relative to that of foreign firms. If either the returns to the African project in African currency or the nominal African exchange rate become more variable, African firms will have more difficulty than foreign firms in repaying loans made in foreign currency. The banks may then decide to concentrate their financial activity on their home market, rather than on Africa, the trigger price for entry into African financial markets having risen.

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[4] In subsequent chapters, a number of different measures are tried out in empirical models.

For the investment decisions of the African firm which has a choice only between different domestic activities, a number of measures of variability suggest themselves. If the firm has a choice between investment in capital and expenditure on other inputs in activities which have a sunk cost component, the appropriate measure to use will be the variability of R_I/R_O, where R_I is the return to the investment and R_O the return to the other activity.[5] Another alternative to investment may be expenditure on consumption by the owners of the firm. In the latter case, the risk involved in consumption being zero, an appropriate measure would be simply deflated R_I.

Given the variety of ways in which uncertainty might affect domestic investment, the selection of a correct measure of variability is essential. We will consider a variety of measures in the next section, which attempts to draw together the different strands of the investment literature to construct a comprehensive model of investment for LDCs.

[5] One might argue that theoretically any sunk cost expenditure should be counted as an investment, even if it does not involve buying physical capital goods. However, this "investment" is not counted as such in the National Accounts on which our empirical models will be based, nor would one wish to include it in a measure of augmentation to capital stock.

4. Constructing a comprehensive model of investment

So far, we have discussed three different approaches to explaining investment. All three highlight important issues, but none provides a comprehensive account of the determinants of investment. The task of this section is to draw these diverse issues together in a single model. The initial problems to be tackled are:

i) The different models above apply to different definitions of investment. In sections (1) and (3), the focus of attention was on the private firm's capital formation. In section (2), the focus was on the link between savings and investment qua national accounts aggregates. Here, investment was inclusive of central government capital formation and additions to stocks.

ii) We need to construct a model which can be tested on existing data. The dependant variable needs to correspond to an existing time series, and, for a dynamic model, this time series needs to be stationary. A model of the level of investment is therefore likely to be inappropriate. We are much more likely to find time series for investment which are stationary in first differences.

Let us begin by taking the definition of investment appropriate to section (2): aggregate gross domestic investment. We will begin by assuming that there are no forex constraints. If there is complete integration of domestic financial markets with foreign markets, then the immediate impact of a change on savings on aggregate investment ought to be zero. Take the case of a temporary trade shock. In response to a positive (negative) shock, savings will rise (fall). With unrestricted access to international financial markets, domestic agents will be able to achieve the change in saving by altering their net foreign asset holdings. Investment ought to be impervious to the change in saving. (Of course, the trade shock will have altered relative prices, and therefore perhaps optimal levels of investment, but this effect is properly modelled by price variables in the investment equation, independently of savings.) With incomplete access to international financial markets, some of the change in domestic saving will have to be accommodated by a change in domestic investment.

Nevertheless, both integrated and unintegrated economies alike are likely to face

a long run capital account constraint. In the long run, net inflow of financial capital will be zero. Even with access to international financial markets, domestic agents will not be able to run up indefinitely large debts, nor will they wish to run up indefinitely large amounts of credit. Our hypothesis is that there is a long run equilibrium stock of net foreign assets held by domestic agents. Even if this stock is non-zero, equilibrium implies a zero flow. So, in the long run, I = S. In this case, one way to bring the short and long run constraints together in a differenced model of investment is with an "error correction" process:[6]

$$(15)\ \Delta \ln I(t) = ß\Delta \ln S(t) - \phi[\ln I(t-1) - \ln S(t-1)] + ...$$

ß quantifies the magnitude of the short run constraint: if ß = 0, then a change in savings now will have no immediate effect on investment. If there is imperfect financial market integration, then ß > 0. Note that in West African economies, which are often characterised by fixed interest rates and an excess demand for domestic loanable funds, ß will capture the dependence of investment on an independent S.[7] ϕ quantifies the speed with which the economy reaches the long run equilibrium, with a balanced capital account. The larger ϕ, the more quickly the long run constraint binds.

Figures 4.6a and 4.6b show two alternative time paths for savings and investment. In both, savings are originally equal to investment, but then savings fall. In Figure 4.6a, ß > 0, so there is some short run capital constraint. As soon as savings fall, investment must fall too. Over the long run, the capital account constraint binds, and investment converges to the new level of savings. In Figure 4.6b, ß = 0, so there is no short run constraint. However, investment will still eventually begin to fall, until I = S again. An alternative path for investment is shown in Figure 4.6c. Here, there is no short run capital constraint, but the news of the fall in savings affects investors' behaviour. Knowing that in the long run investment needs to be lower, firms may increase borrowing and investment in the short run, in order to build up their capital stock. The knowledge of a future constraint imposing a lower ΔK causes present ΔK to be higher, bringing firms closer to their long run optimal capital stock than would otherwise be the case. In this

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[6] Here, it is true ex hypothesi that the error correction term is stationary. In practice, this is something which ought to be checked. Note that in this case, "error correction" (the generic term in the literature for this type of model) is not meant to imply a process by which individual investors correct past errors.

[7] Independent, that is, vis a vis the loans market. Savings may be indirectly dependent on investment, via income. This is discussed later.

instance, ß < 0.

However, our behaviourial models of investment in sections (1) and (3) are applicable only to the private sector. What long run constraint does the private sector face? Denoting private investment by I_P and government investment by I_G, the long run constraint will mean that in the long run, $\ln(I_P + I_G) = \ln S$. This suggests an error correction term of the form:

$$(16)\ \Delta \ln I_P(t) = -\phi[\ln(I_P(t-1) + I_G(t-1)) - \ln S(t-1)] + ...$$

This captures the speed with which the long run constraint binds. If $\phi = 0$, then the constraint never binds; if $\phi = 1$, then the constraint binds fully next period: any aberration from the long run equilibrium in one period will be fully corrected in the next.

The value of ϕ will depend on the length of time private agents in the economy are willing and able to remain away from their long run equilibrium stock of net foreign assets, be it positive or negative. Thus, although it is determined partly by external constraints, for example, the magnitude of indebtedness which foreign creditors will tolerate, it may also depend on private intertemporal preferences. A simplifying assumption which we make below is that ϕ is constant over time, and that it takes the same value for positive values of the error correction term as for negative ones. Note that in the model below, the value of ϕ cannot be assumed to indicate the degree of external constraint which an economy faces. The parameter which indicates a constraint is the short run elasticity of investment with respect to savings, ß.

This model will be altered if the private investors face forex rationing. If all investors are severely rationed in forex, then the credit constraint will no longer bind. If the long run capital account is zero, this will be achieved by the adjustment of S. The important long run determinant of investment will be foreign exchange availability (FEA), and a more appropriate error correction term would be:

$$(17)\ \Delta \ln I_P(t) = -\phi[\ln I_P(t-1) - \ln FEA(t-1)] + ...$$

If only some investors are rationed in forex, then the long run solution to the model will be rather different. Denote the unrationed firms' investment by I_P^U, and the rationed firms'

investment by I_P^C. The long run constraint on unrationed firms is $I_P^U = S - I_G - I_P^C$, and I_P^C will be constrained to equal FEA. However, the long run solution is of the same form as the one appearing in equation 16, since $I_P \equiv I_P^U + I_P^C$.

However, it would be hasty to draw the conclusion that the appropriate error correction term for a country will be either in I and S or in I and FEA. For example, it may be that the long run capital account is affected by forex rationing. If foreign exchange is rationed over long periods, then domestic agents might be quite willing to run up foreign assets for long periods of time. This will be especially true if the rationing regime is not expected to last indefinitely. If forex market clearing is expected in the very long run, then it makes sense to hold onto foreign assets until they can be sold at the market clearing domestic currency price. Thus (I - S) will depend on FEA, and we can expect investment to be co-integrated with both FEA and S. Over the very long run, equation 16 will hold, the very long run may well be much longer than the period available for estimation.

It will therefore first be necessary to estimate the long run relationship between the three variables. The standard procedure[8] is to estimate a dynamic regression in levels on the variables of interest, and to use the coefficients from the static solution as the coefficients in the ECM, which takes the form, $[\ln I_P - \alpha_1 \ln S + \alpha_2 \ln FEA]$. The disadvantage of this procedure is that the estimates of α_1 and α_2 are not unbiased for small samples. However, if forex rationing is a possibility, there is no alternative to the prior estimation of the ECM.

Given that the ECM is initially zero, what factors would lead to a rise in investment, and therefore, to the extent that there is access to foreign financial markets, an inflow of funds? It is here that the variables of sections (1) and (3) are relevant. Changes in the price of industrial output, in the cost of factor inputs, such as capital, labour and oil, and in the interest rate at which firms are borrowing from abroad will change the present marginal return to investment, as described in section (1). Since our model of savings-investment adjustment is log-linear, it will be convenient to express the neoclassical investment function in log-linear form (and, note, in first differences). This will be to impose constant price elasticities of demand for investment goods. If longer time series were available, then an obvious extension of the model would be to estimate a translog function, and if price

[8] See for example Harvey (1990).

terms are not significant in the investment equation, then relaxation of this restriction would be an obvious first step.

Ceteris paribus, investment will adjust in the way described in section (1) in response to a change in prices. However, we must also take into account the effect of the volatility of returns to investment discussed in section (3). This will be an extra factor in firms' investment decisions.

The variability of returns to investment term is still something of a black box. What form is it to take precisely? We need to construct a time series which is statistically manageable. We are dealing with a more complex profit function than in the Dixit papers, so the expression describing returns is a little more complicated than Dixit's P. We know from section 3 that the return to the marginal unit of capital is:

$$\mu(t) = \int [w(s)F'_K(s)/F'_L(s)][\exp[-(r + h - \dot{P}_I/P_I)(s - t)]]ds$$

There is little hope of calculating such an expression, given the absence of data on many of its components. For example, labour market data are very scarce in Francophone Africa, and even nominal wage series running over any length of time are difficult to find, so calculation of the marginal physical product of labour is impossible. Similarly, without information about the way in which capital depreciates, investment data cannot be used to derive the capital stock and so the marginal physical product of capital. A short cut is to argue that μ will be approximately equal to P_I, i.e., the marginal Tobin's q will be approximately unity, and to use P_I as a proxy for μ. This pragmatic approach turns out to work quite well, as we will see in the following chapter; in any case, until it is possible to estimate F'_K, F'_L and h, there is no alternative to using some proxy for μ.

In view of the discussion in section 3, we need either to express P_I as a fraction of the return to some alternative activity, or to deflate the investment price series to give an indicator of the real cost of capital goods with which to construct an index of variability. One possibility is to use the GDP deflator - the price index for aggregate value added of all sectors of the economy. The main drawback of this approach may be that P_I has a positive covariance with other prices in the economy (i.e., there is a positive covariance between price series even when they are statationary), so that to use the GDP deflator will tend to underestimate the magnitude of shocks to P_I. The alternative is to use an

international price deflator multiplied by a trade-weighted nominal exchange rate. However, there may be a similarly positive covariance using this measure, too, as the exchange rate varies with shocks to the economy.

For a measure of relative returns, one possibility is to divide domestic P_I by a measure of foreign P_I. This approach focuses on the choices of foreign direct and financial investors, who have the opportunity to invest in Africa or in Europe and America. Calculating "foreign" P_I is not a trivial matter, however. If foreign direct investors have the choice between investing in Africa and investing anywhere else in the World, the foreign P_I should be the one which reflects the highest available return elsewhere. However, direct foreign investment is so low in Africa (less than 5% of total investment for Ghana and Cote d'Ivoire), so this index of foreign P_I is unlikely to be as important as that corresponding to the choice of domestic firms. Domestic firms are unlikely to have such a wide choice. They may however have the option of investing in a number of Western economies with which their country has traditional links. One indicator of such links is the magnitude of the i^{th} Western economy's non-primary exports to the African country. Given the special financial relationships between the Franc Zone and France, there is also an argument for letting the weighting for France in the measure used for CFA countries be set at unity.

The next choice to make is the form of the transformation of the measure of returns used to create an index of variability. One possibility is to use a transformation of the moving variance of the series, for example, the moving standard deviation. Another is to look at the absolute value of the first difference of some transformation of the series. Given the lack of precise direction from the theoretical model on this issue, it is perhaps best to take a pragmatic approach, and see what results various alternative measures produce.

To summarise the investment equation, we have, restricting ourselves to a one-period lag on RHS variables, a function of the form:

$$(18)\ \Delta \ln I_P(t) = \beta_0 + \beta_1 \Delta \ln S(t) - \phi[\ln(I_P(t-1) + I_G(t-1)) - \ln S(t-1)] + \beta_2 \Delta \ln p(t) + \beta_3 \Delta \ln p(t-1) + \beta_4 \Delta \ln P_I(t) + \beta_5 \Delta \ln P_I(t-1) + \beta_6 \Delta \ln w(t) + \beta_7 \Delta \ln w(t-1) + \beta_8 \Delta \ln(1+r)(t) + \beta_9 \Delta \ln(1+r)(t-1) + \beta_{10} \Delta \ln I(t-1) + \beta_{11} VAR(t) + \beta_{12} VAR(t-1)$$

where VAR is our chosen measure of the variability of returns. Parameters $ß_1$ and ϕ originate in section (2), $ß_2$ to $ß_{10}$ come from section (1), and $ß_{11}$ to $ß_{12}$ come from section (3). Note that w may represent the prices of a number of factor inputs. If forex rationing is a possibility, the error correction term will need to be adjusted, and ΔlnFEA terms added to the model, as discussed above.

A crucial issue will be the independence RHS variables. Both savings and prices may depend on other RHS variables (for example, an increase in investment last period increases income and so savings this period). In the light of possible non-independence, the strategy which will be followed is this: domestic prices will be estimated as functions of foreign prices, and the resulting estimates used on the RHS of equation (17). These estimates will also be used in a model of gross domestic income, which can then be used as an independent explanatory variable in a savings function. The savings equation will produce a time series for savings which can also be used in equation (17). Since the dynamics of savings and investment are crucial to our model, some time ought to be given to a discussion of how the savings function is constructed.

The success of error correction models of consumption in Western economies[9] suggests that a similar model of savings might be applied to the countries to be studied here. The form of such a model is guided by the restriction that in the stationary state, people will be consuming and saving constant fractions of their income, so we have:

$$(19)\quad S = n\text{INC}$$

Note that this is strictly a model of private savings behaviour. For our investment model, we need a model of aggregate savings, since this is the variable which is used to capture the magnitude of financial openness of the domestic economy. Again, there is no model of public savings behaviour in the literature. In the extreme case of complete Ricardian equivalence, the distinction is unnecessary, since private agents perceive any government saving as temporary, and dissave an equal amount in anticipation of future budget deficits, which will increase private disposable income. However, this extreme case relies on the assumption of perfect capital markets and no uncertainty, conditions unlikely to be fulfilled in the countries which we will be looking at. Nevertheless, if private agents do offset some

[9] See for example Hendry (1986) and Bovenberg and Evans (1990).

of the current budget deficit / surplus, perceiving a long run budget balancing constraint, then a model of private savings may work reasonably well as a model of aggregate savings.[10]

One useful relaxation of equation 19 is to allow the marginal propensity to save to vary, so:

$$(20)\ S = nINC^{\sigma}$$

If savings are disturbed from their long run equilibrium level, then adjustment back to equilibrium is described by:

$$(21)\ S(t) = S(t-1)^{\tau}[nINC^{\sigma}]^{(1-\tau)}$$

If $\tau = 0$, then people attain their long run equilibrium immediately; otherwise adjustment takes some time, and savings converge logarithmically to their equilibrium level. If income is away from its long run equilibrium level, then the time path of savings is described by:

$$(22)\ S(t) = nS(t-1)^{\tau}[n[INC(t)^{\mu}INC(t-1)^{(1-\mu)}]^{\sigma}]^{(1-\tau)}$$

This approach endows consumers with some degree of myopia: savings depending on just past and present income, regardless of where long run equilibrium is. One useful extension of the model may therefore be to disaggregate between components of income which are likely to be permanent, and components which are likely to be transitory. This is pursued in the next chapter.

Equation 22 can be transformed into:

$$(23)\ lnS(t) = \tau lnS(t-1) + (1-\tau)\sigma[\mu lnINC(t) + (1-\mu)lnINC(t-1)] + (1-\tau)lnn$$

which, if savings are integrated I(1), can be estimated as:

$$(24)\ \Delta lnS(t) = (1-\tau)\sigma\mu\Delta lnINC(t) - (1-\tau)[lnS(t-1) - \sigma lnINC(t-1) - lnn]$$

---

[10] See Bernheim (1987) for a survey of the inconclusive results on Ricardian equivalence in MDCs.

Another assumption which can be relaxed is that savings do not depend on the real interest rate. It is possible that n will depend on the real rate of return to domestic savings, r_d. If we allow a general functional form,

$$(25)\ n = n_0(1+r_d)^{\delta}$$

then in equilibrium,

$$(26)\ S = n_0(1+r_d)^{\delta}INC^{\sigma}$$

Note that δ may be positive or negative. A negative δ (a backward-bending savings function) may be a symptom of moral hazard in the loans market.[11] Figure 4.7 illustrates such a case. If such considerations are relevant, then we might expect a positive δ in countries with a low real interest rate, and a negative δ in countries with a high real interest rate. With low inflation, members of the CFA are more likely to fall into the latter category.

If equation (22) is then extended to:

$$(27)\ S(t) = S(t-1)^{\tau}[n_0[(1+r_d)(t)^{\Omega}(1+r_d)(t-1)^{(1-\Omega)}]^{\delta}[INC(t)^{\mu}INC(t-1)^{(1-\mu)}]^{\sigma}]^{(1-\tau)}$$

we can estimate the equation:

$$\begin{aligned}(28)\ \Delta\ln S(t) = {} & (1-\tau)\delta\Omega\Delta\ln(1+r_d)(t) + (1-\tau)\sigma\mu\Delta\ln INC(t) - (1-\tau)[\ln S(t-1) \\ & - \delta\ln(1+r_d)(t-1) - \sigma\ln INC(t-1) - \ln n_0]\end{aligned}$$

Again, it is possible that lags of $\Delta\ln(1+r)$ and $\Delta\ln INC$ will be empirically important, if there is some lag in the decision-making process. Note that the error correction term in the savings equation is quite complex. The coefficients in the ECM will have to be estimated, as in the case of the investment equation with forex rationing. Note that although stationarity requires that $\tau < 1$, there is no other restriction which need be placed on the adjustment coefficient. A positive τ, implying monotonic adjustment to equilibrium, is not essential. It may be the case that there is non-monotonic adjustment ($\tau < 0$). For example,

[11] See Stiglitz and Weiss (1981).

if agents discover that savings this period are too high, then they may reduce savings next period below their long run equilibrium level; otherwise, agents will be left with a long run path of the asset *stock* which is higher than without the original error.

Equations 18 and 28 together form an estimable model of savings and investment. In the following chapters, this model will be applied to those members of the Franc Zone in which data are sufficient, i.e., Cote d'Ivoire and Cameroun. Other countries are lacking in sufficient data. Kenya will also be discussed by way of comparison with anglophone Africa. However, it will be possible later to incorporate some of the features of the time series model above into a cross-country model which includes other Franc Zone members. It will be noted that the limitations of annual data require some simplification of the savings equation: for example, we have not investigated the role of uncertainty of returns in savings behaviour. In a later chapter, we will come back to this issue.

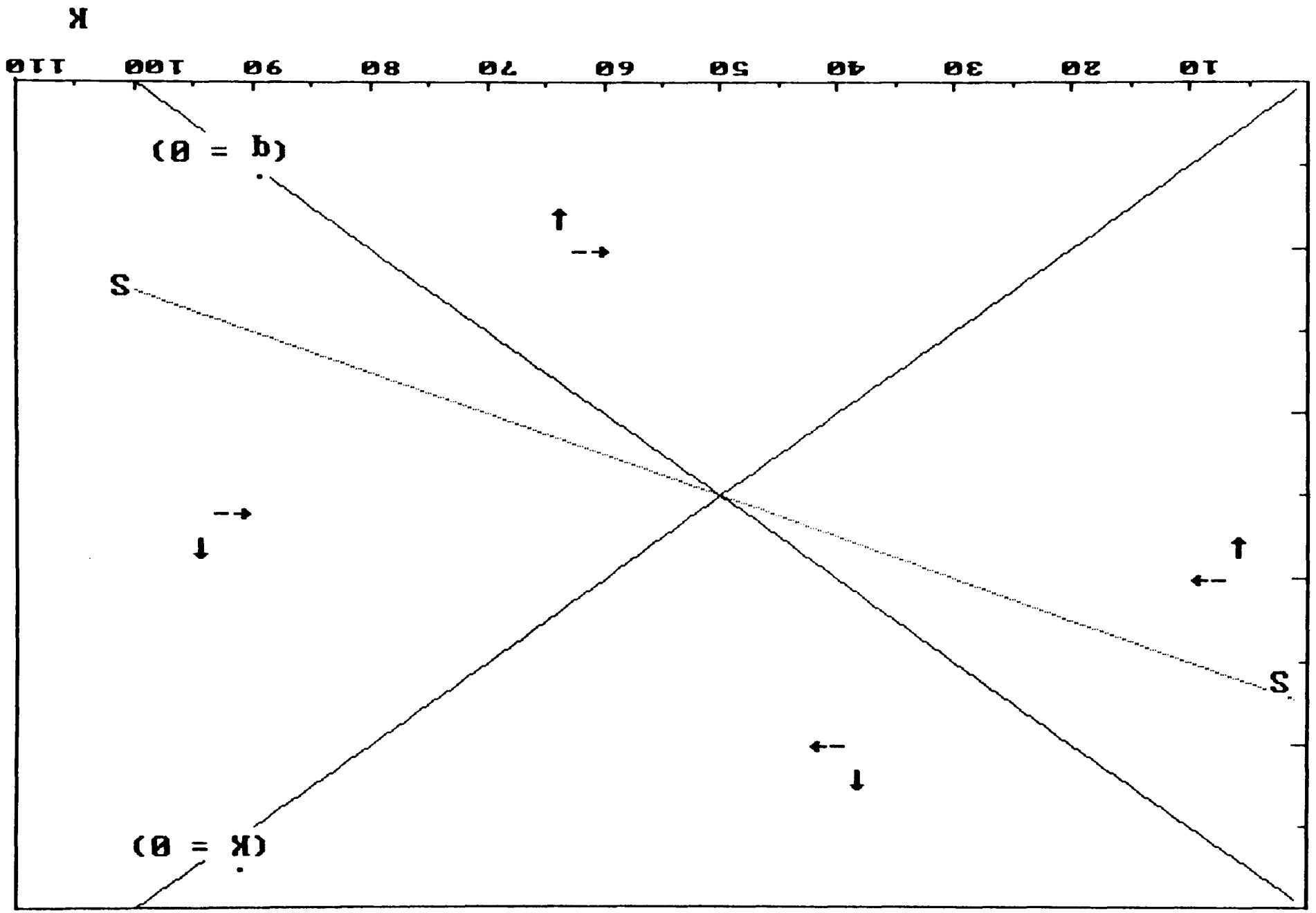


FIGURE 4.1

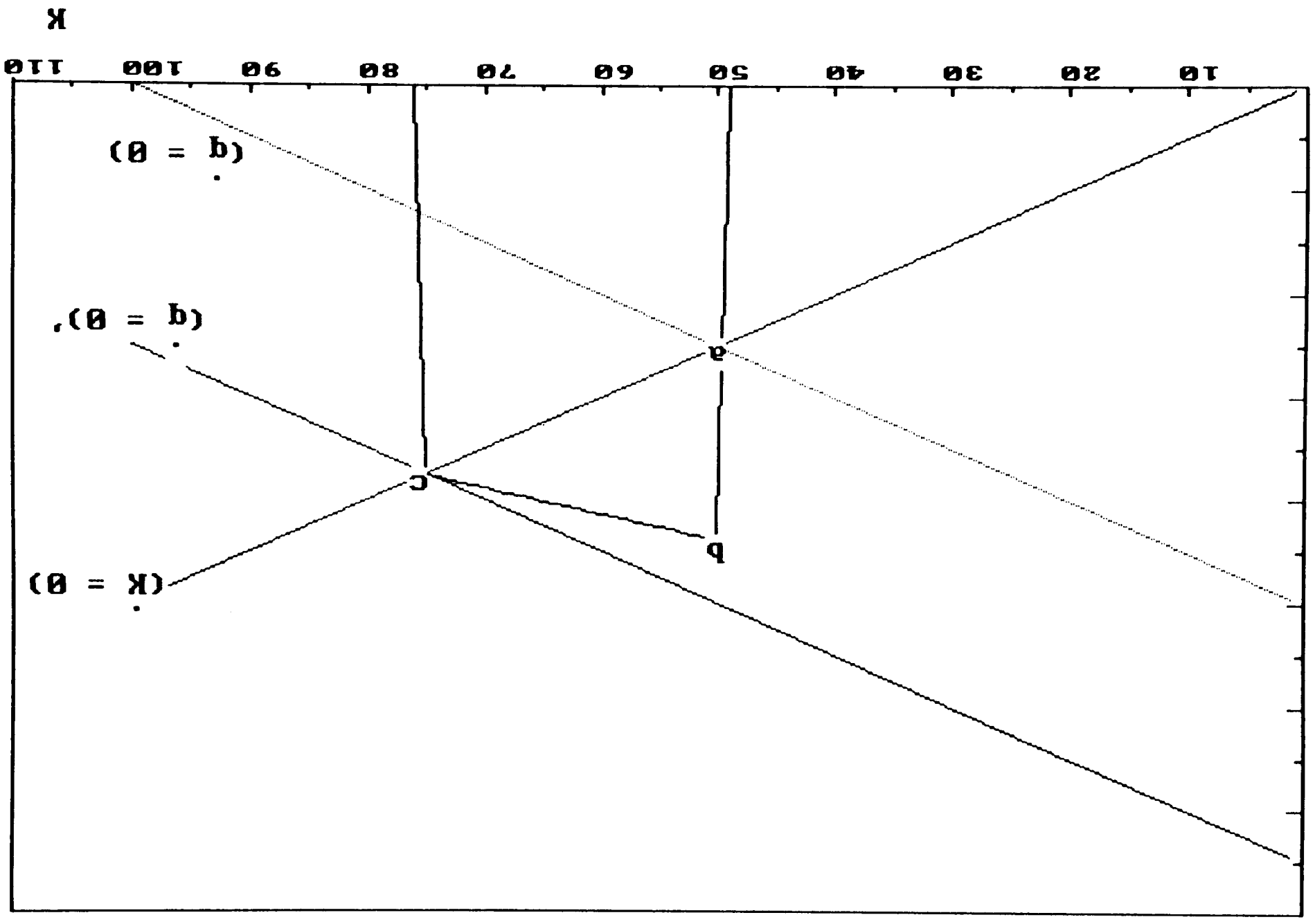


FIGURE 4.2

FIGURE 4.3

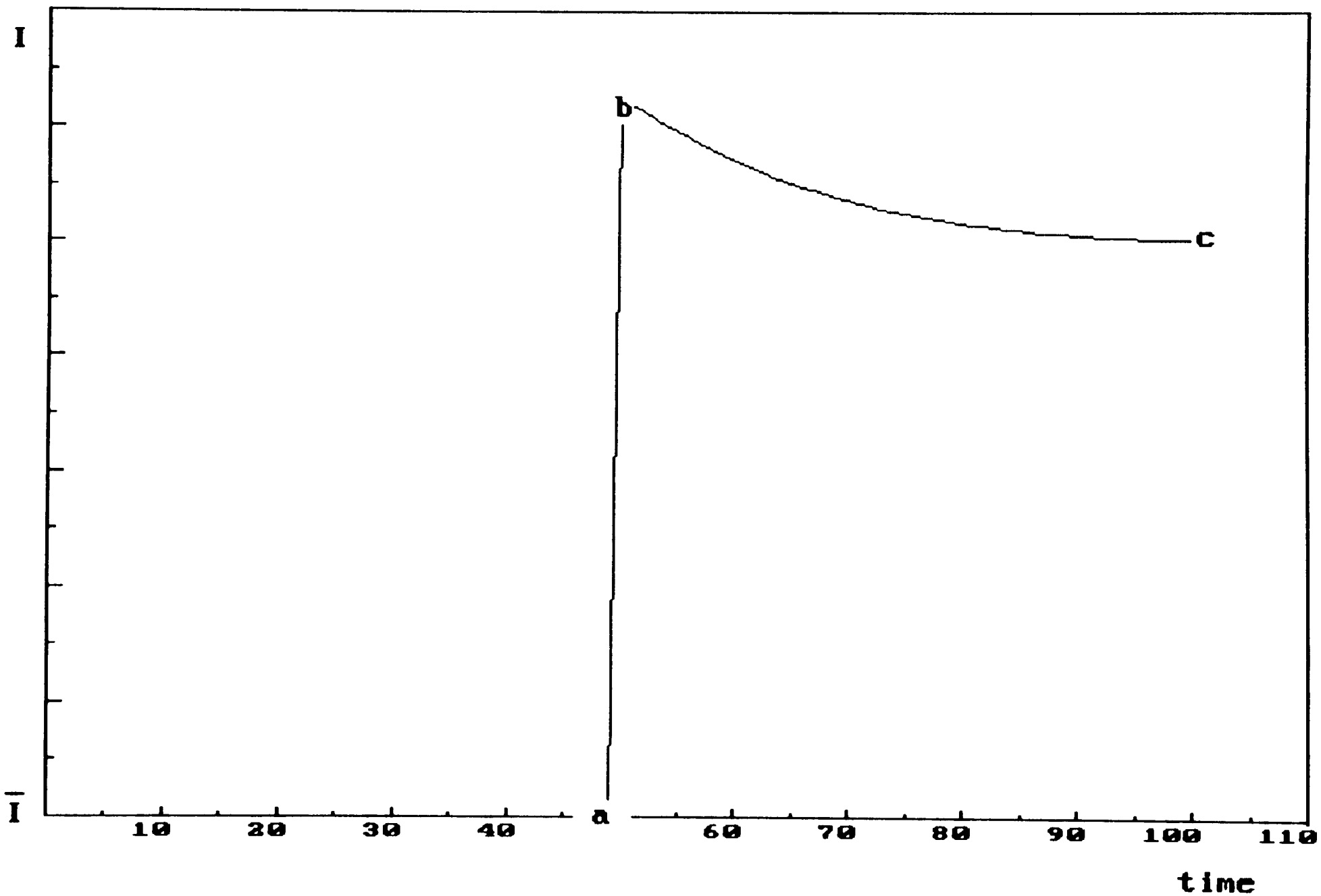


FIGURE 4.4

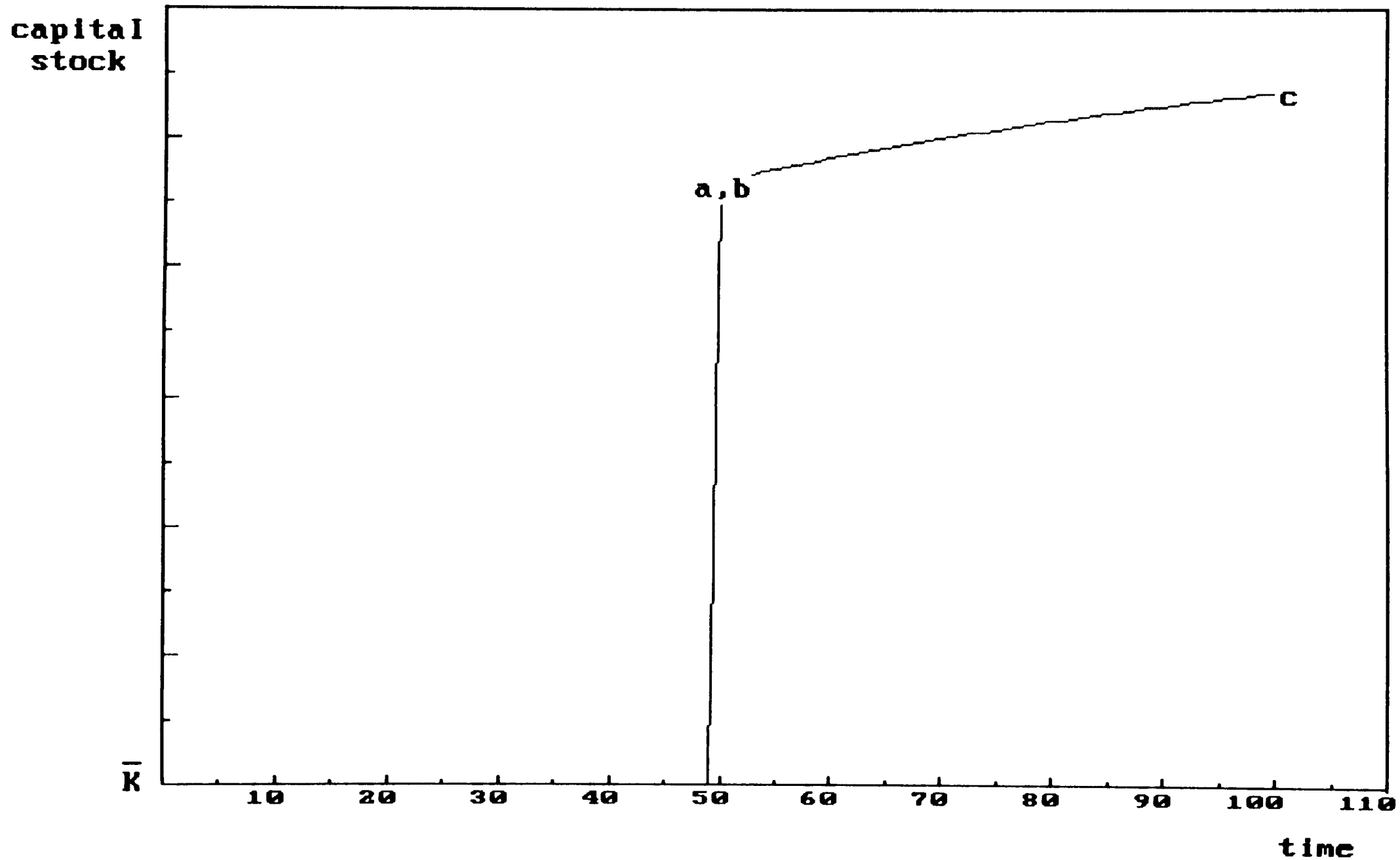


FIGURE 4.5

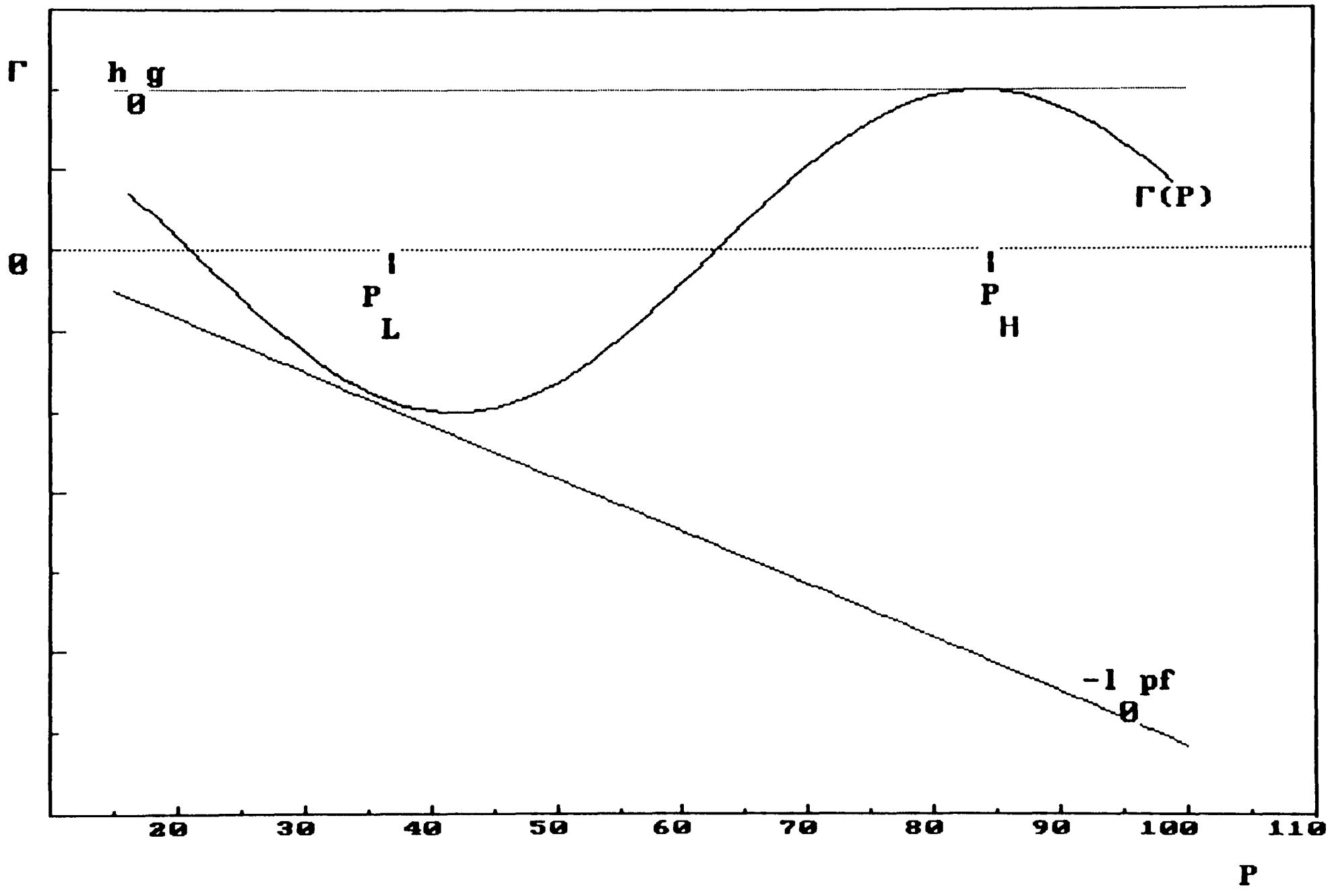


FIGURE 4.6a

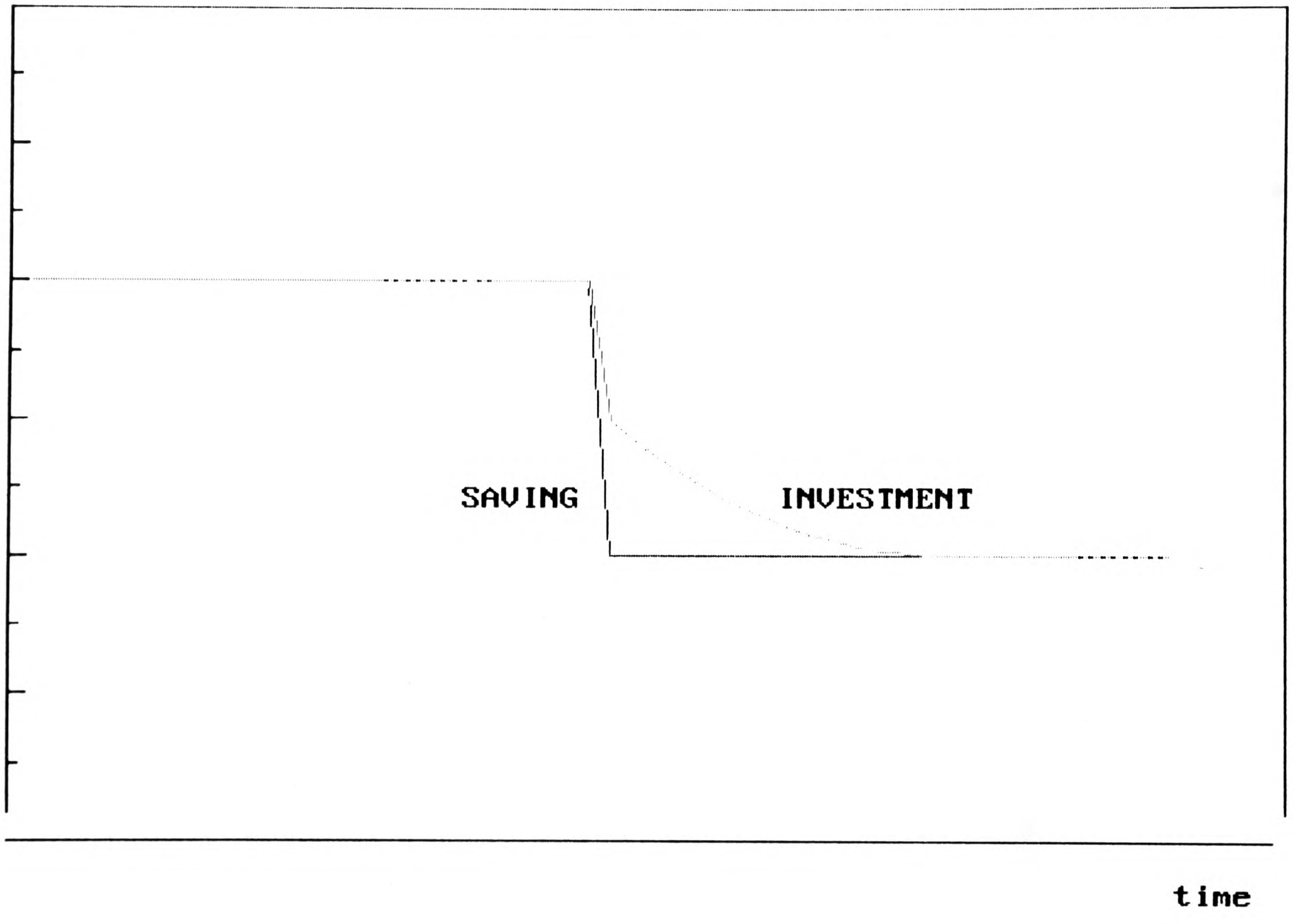


FIGURE 4.6b

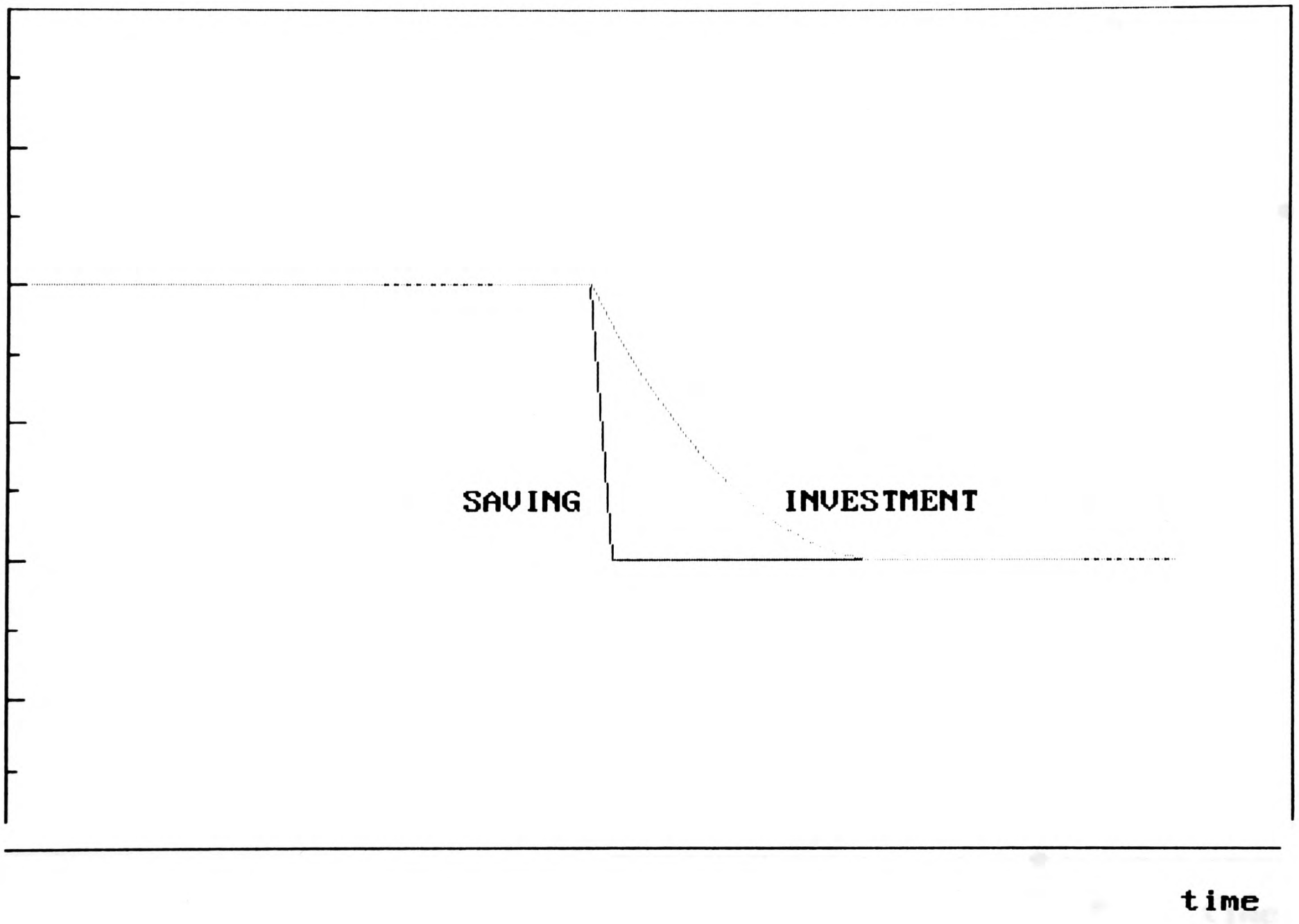


FIGURE 4.6c

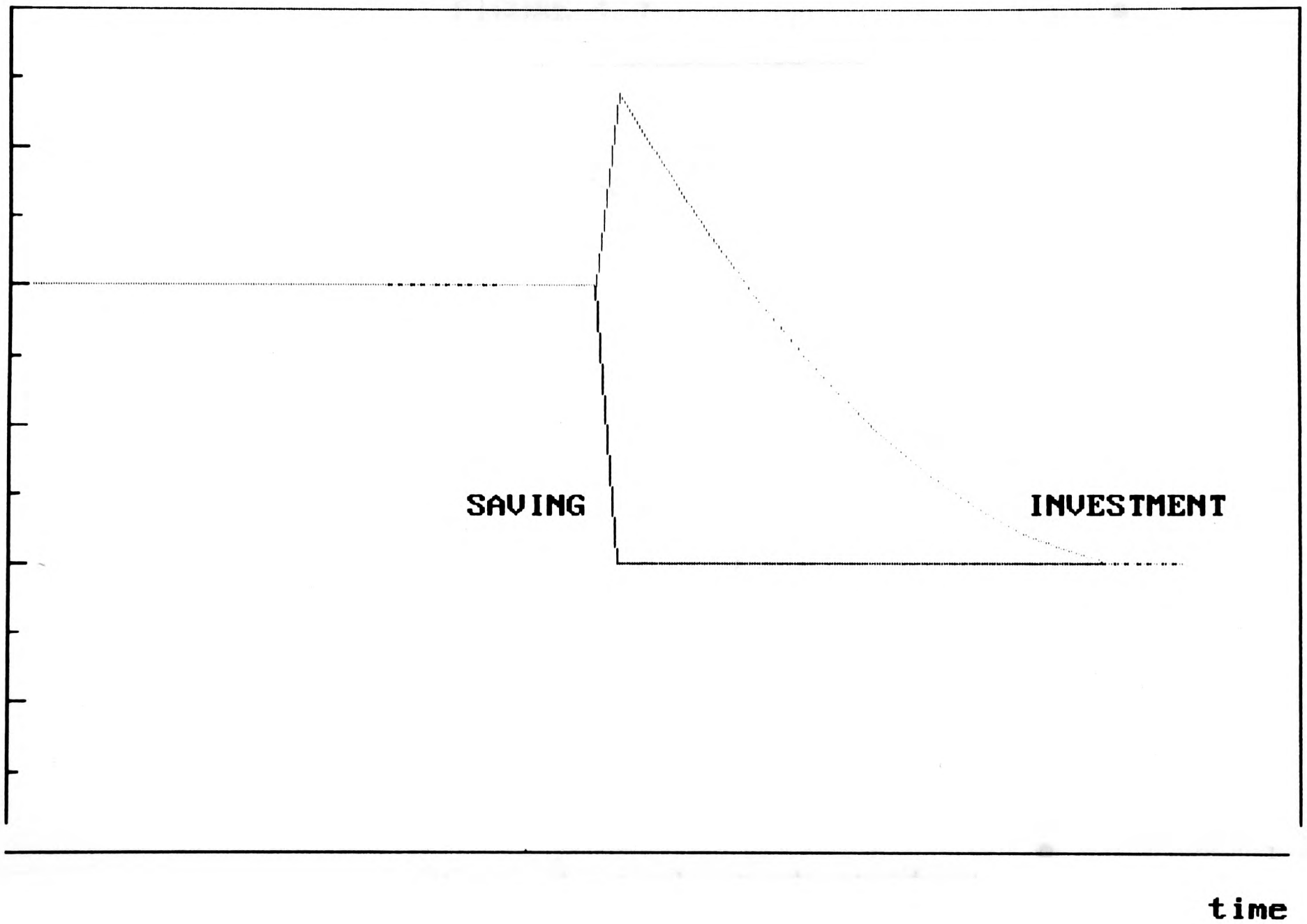
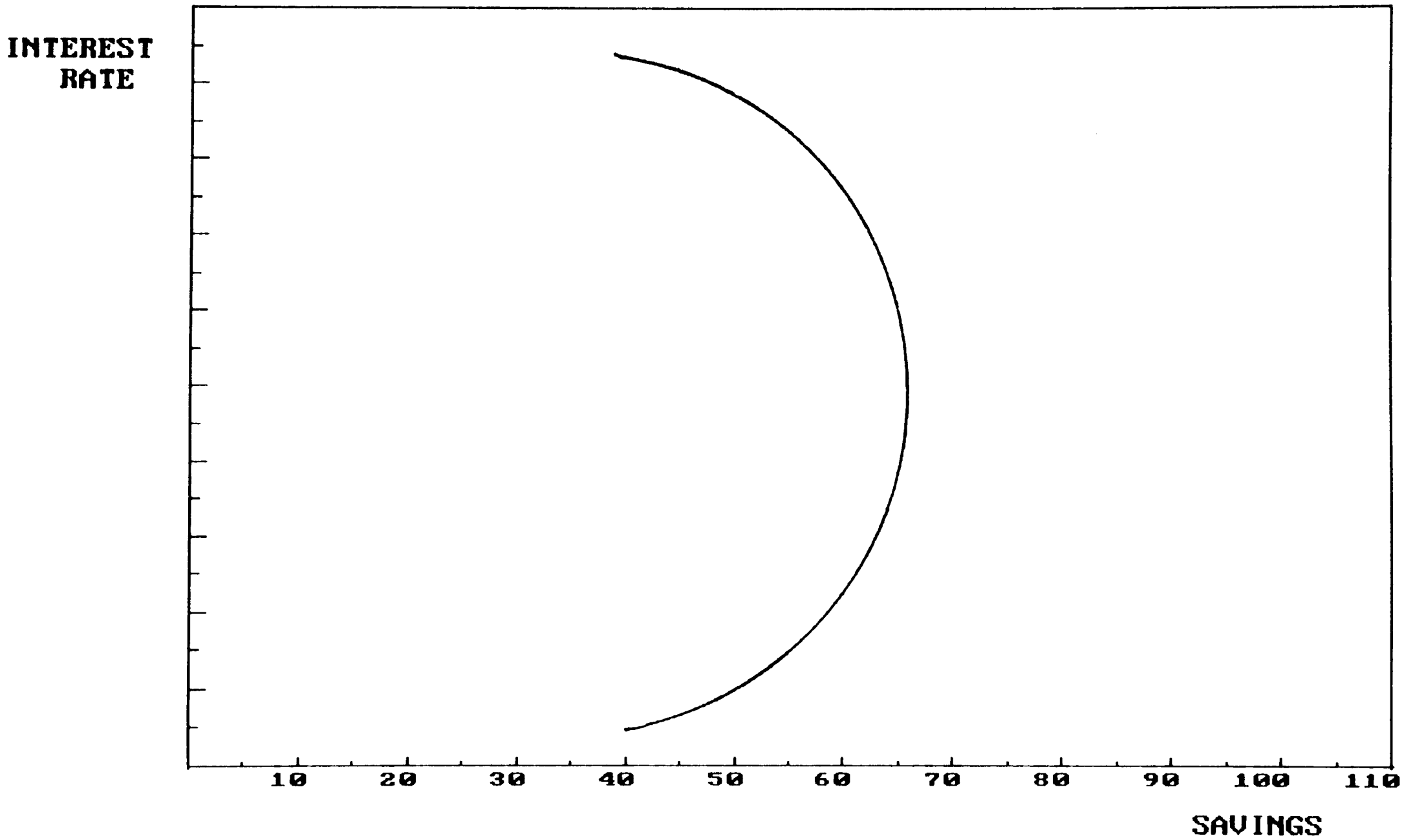


FIGURE 4.7



CHAPTER 5

DETERMINANTS OF INVESTMENT IN KENYA AND COTE D'IVOIRE

DETERMINANTS OF INVESTMENT IN KENYA AND COTE D'IVOIRE

In this chapter, we will apply the model constructed in chapter 4 to two African economies, one in the BCEAO Franc Zone and one with its own currency. The main purpose of this exercise is to shed light on the possible causes of higher investment in the CFA. The three sources of interest are:

(i) The role of gross domestic savings in the determination of gross domestic investment. If Franc Zone members have easier access to foreign finance (or if a larger proportion of domestic firms in these countries have access to international funds), then the relationship between savings and investment should be weaker for the CFA member than for the anglophone country. Of course, in the long run, it is reasonable to suppose that there is a constraint that the capital account equals zero (i.e., in the long run, S = I). However, with a degree of financial openness, present investment can exceed present savings. There are two parameters of interest: the speed with the long run constraint binds (how long before the economy must face the zero capital account constraint?) and the degree to which present investment depends on present savings (to what extent is domestic investment dependant on domestic funding, even in the short run?).

(ii) The role of the variability of returns to investment. Here, the difference will not necessarily to be in the coefficient on the variability term; the hypothesis to be tested is that variability is lower in the CFA than elsewhere, so that if a given level of variability has the same effect on investment in all countries, then investment in the Franc Zone will be higher, ceteris paribus. Nevertheless, there are reasons for suspecting the coefficients to be different. If Franc Zone agents have easier access to a wide range of financial assets (at home and abroad), or if a larger proportion of investment in the CFA country is funded by foreigners with access to foreign assets, then a given level of variability may have more impact on investment than is the case in the anglophone country. Anglophones may have no choice but to consume or to invest in physical assets, so the variability of returns to the latter may not deter them so much.

(iii) The impact of forex rationing. Investment in a non-CFA country may be lower because some potential investors' access to foreign exchange is restricted, since the

domestic exchange rate is set above its market clearing level.

In selecting two countries for comparison, we need to bear in mind two constraints. First, data in many African countries are too limited for the kind of analysis discussed in chapter 4: for example, in many countries capital goods price series are unavailable. Secondly, the model of investment described in chapter 4 is not suitable for all African countries. In a small African economy where the public sector dominates investment and where there are large capital inflows in the form of foreign aid, a model which describes the behaviour of private investors facing financial capital constraints is inappropriate. The model is more appropriate for a more developed economy, where private investment is more important, and where foreign aid does not make up a substantial proportion of capital inflows. For this reason, the two countries selected are Cote d'Ivoire and Kenya, economies similar in many ways, except that Cote d'Ivoire is a Franc Zone member and Kenya is not. This chapter does not, therefore, explain differences between less developed African countries. Nevertheless, if Cote d'Ivoire and Kenya are seen as being at a stage of development through which most African economies must at some time pass, the analysis is of much wider relevance.

1. Historical background

At the time of their independence,[1] Cote d'Ivoire and Kenya had similar economies, although Cote d'Ivoire started from a higher level of income. Both had average size populations: around eight million in Kenya in the mid 1960s, and around five million in Cote d'Ivoire. Per caput GNP in Kenya was $120 in 1965; in Cote d'Ivoire, it was $250. Both economies relied quite heavily on export earnings from cocoa and coffee, although successive governments emphasised the importance of industrialization, and urban populations expanded rapidly in the 1970s and 80s. One major difference between them was that francophone Cote d'Ivoire was a member of the Franc Zone whilst anglophone Kenya was not. From 1971 onwards, Kenya had its own currency and central bank.[2]

The performance of both economies has been heavily influenced by the evolution of international prices. The period of high growth in both economies was in the late 1970s, when fuel prices were still relatively low, and beverage prices were at a peak. GNP per caput peaked at $460 (1965 prices)[3] in Cote d'Ivoire, just before the second oil price shock in 1980; it is now around $210. Kenyan per caput GNP peaked at $150 in 1981, and is now around $100. Between 1970 and 1990, gross domestic investment in both Kenya and Cote d'Ivoire ranged between 20 and 30% of GDP. Kenya and Cote d'Ivoire have performed relatively well amongst oil-importing African countries in maintaining real per caput GNP at approximately its independence level.

Comparing the determinants of investment in Kenya and Cote d'Ivoire is therefore a good way of testing the hypotheses discussed above. If a difference emerges, even between countries with similar economies and similar levels of investment, then the hypothesis that the CFA makes no difference to the determinants of investment can be more firmly rejected.

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[1] Kenya gained independence from Britain in 1963; Cote d'Ivoire became formally independent in 1962, but had been effectively self-governing (i.e., under the rule of Houphouet-Boigny) for some years before this.

[2] Until the collapse of the Bretton Woods system, Kenya was part of the East African Monetary Union, using the East African Shilling. In the wake of the collapse, Kenya instituted its own currency, the Kenyan Shilling, which has been pegged at different times to the Pound Sterling, the US Dollar and the SDR, and has been subject to regular devaluation.

[3] The figures use the IMF world consumer price index and World Bank estimates of nominal $ GNP per caput.

Before continuing, it is necessary to mention a number of caveats in the interpretation of the econometric results. First of all, the countries do differ to some extent in their natural resource bases, as well as in their political history. For example, a severe drought is likely to affect domestic investment. As an exogenous reduction in domestic agricultural output and income, the effects of a drought may be similar to those of a trade shock. With a similar geography, Kenya and Cote d'Ivoire are likely to suffer in the same way from such shocks. However, droughts in West Africa are unlikely to occur simultaneously with droughts in East Africa.

Political and geographical factors are difficult to control for other than by means of dummy variables. In any model there is a trade-off between, on the one hand, missing important factors which cannot be captured in available time series, and on the other, excessive data-mining. In the models below, dummy variables are not used to represent effects which the available time series cannot capture: since the time series are so short, the inclusion of dummy variables is not only open to the criticism of data mining, but also substantially reduces the number of degrees of freedom in the model.

2. Modelling savings and investment - definition of variables

First of all, it is necessary to extract from existing data sources series for the variables included in the model of chapter 4. The World Bank World Tables (1988,1989-90) and IMF International Financial Statistics (various editions) include annual figures for the following variables for Cote d'Ivoire and Kenya:

i) Real and nominal gross domestic investment, and gross fixed capital formation, as reported in World Tables, from which can be extracted a GFCF price series. Using government budget data on expenditure on capital goods, taken from the UN African Statistical Yearbook (1973,1980,1987), the Kenyan Annual Statistical Bulletin (1970-1988) and Secretariat du Comite de la Zone Franc (1985,1990), a private investment series can be constructed. Private capital formation will be used as the dependent variable (I_P) in the investment equation, and the associated price as P_I. Private investment is inclusive of parastatal activity but exclusive of central government expenditure.

We need to see to what extent the investment of publicly owned companies can be treated in the same way as that of private companies (see chapter 4). Close examination of the structure of ownership of the Ivorian industrial sector shows that disaggregation of corporate investment into "public" and "private" components in a model of investment determination is inappropriate. Table 5.1 illustrates this point. Of the 34 largest industrial enterprises in Cote d'Ivoire, only two (the sugar and palm oil processing parastatals) are entirely state-owned. Eleven are owned entirely by private agents, and the rest are owned jointly. Thus, most of the investment counted as "public" is in fact being made by organisations which are owned partly by private agents, who presumably have the same incentives as the owners of entirely private organisations. Moreover, there is no reason to suppose that the two entirely public organisations have preferential access to funds channelled through the government (for example, to foreign loans to central government), compared with the many jointly owned parastatals.[4]

In Kenya, over 90% of industrial organisations are privately owned, although since

[4] Ideally, the investment equation would use GDI less central and local government investment. However, complete series for these figures are unavailable.

many of these are small firms, privately owned firms produce around 80% of industrial output.[5] Kenyan statistics for the 1970s show that most of the firms in which the state participated were owned jointly with private shareholders. In the Kenyan Directory of Industries (1974), there are 23 firms listed as fully state owned, but 37 which are listed as joint owned. Of the 23 largest firms listed (those employing over 500 workers), 12 are privately owned, 5 publicly owned and 6 joint owned. Thus, most of industrial production is carried out under private ownership, and most of the rest under joint ownership. Although a higher proportion of firms than in Cote d'Ivoire are entirely owned by the state, the incidence of joint ownership is still higher than that of public ownership. Again, therefore, it is inappropriate to disagggregate investment into that of private companies and that of parastatals and nationalised companies.

ii) Nominal gross domestic savings, as reported in World Tables. These need to be deflated before they are used as the dependent variable in the savings equation, S. The most intuitive approach is to denominate savings in consumption units, using for example the private consumption deflator in the national accounts. In fact, the national accounts of many francophone countries as reported in international statistical publications use the GDP deflator to deflate private consumption. The model below uses the GDP deflator; if other deflators are used, for example, the domestic absorption deflator, coefficients very similar to the ones below are obtained. There will however be some bias in the measure of real savings which we are using. During positive trade shocks, for example, output prices will be high relative to consumer prices, so using the GDP deflator will underestimate real saving conceived in terms of consumption units.

The model below aggregates public and private savings. This has been discussed in the previous chapter.

iii) A real manufacturing wage (w) is reported in World Tables for Kenya, but complete series do not exist for Cote d'Ivoire. The models for Cote d'Ivoire therefore do not include a wage term. In Cote d'Ivoire, there is wage data for about ten years, from the mid 1970s to the mid 1980s. This data could not be included in the investment equations, even making assumptions about the behaviour of wages in unrecorded years, because ten observations are not enough for a regression of wages on instruments.

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[5] See Kenyan Directory of Industries (1974).

iv) the other variable input which is likely to be most important in determining the return to investment is the price of oil, P_o. The oil price used in the model is the dollar price of Nigerian oil as reported in International Financial Statistics, converted into domestic currency prices at the official exchange rate. Oil will be a complement to mechanical equipment, but may be a substitute for other types of investment: for example, a sharp increase in the price of oil may make oil intensive capital equipment too costly to use - effectively, increasing their rate of depreciation - and so stimulate new investment in non-oil intensive capital. So the coefficient on the oil price could be positive or negative.

v) Two indicators from World Tables are used to capture the price of industrial output: first of all, there is the deflator on industrial value added in national accounts statistics, p (i.e., the price of output net of intermediate inputs, whose prices are suppressed in the estimated equations). Secondly, since the national accounts deflators may not capture the activity of the entire industrial sector, there is the inverse of the terms of trade, TOT. Since in our countries imports are largely manufactured goods, whilst exports are largely agricultural commodities, a rise in TOT corresponds to a fall in the relative price of relatively capital intensive goods; variable inputs will be shifted into the agricultural sector, and the marginal return to investment will fall.

vi) The interest rate (r) used in the investment equation captures the cost of borrowing from abroad. For Cote d'Ivoire, this is the French annual average money market rate (loan and deposit rates are not given for every year back to the 1960s). For Kenya, the rate used is the US money market rate adjusted for exchange rate depreciation.

vii) It is necessary to construct a variability of returns term (VAR). The approach taken here was pragmatic. A number of different specifications were tried out; one problem with many measures is that their distribution is far from normal, and so they are unusable. It turns out that variability series which used a variance-based measure (for example, the standard deviation of the domestic capital goods price series as a fraction of foreign capital goods prices) all suffered from this problem.[6] Using the absolute value of the first difference of relative prices (with lags) produces more satisfactory results. This measures the magnitude of recent changes in relative prices, whether they have been rises

[6] The reason for this is that when variance is used, the distribution of the variability term is highly skewed, with a number of extreme outliers at the top of the range.

or falls. Linear and logarithmic versions of this measure (using P_I and $\ln P_I$) produce similar results, but the standard errors on the logarithmic versions tend to be lower.

In chapter 4, we saw two measures of the return to investment on which a sensible variability term might be based: P_I/eP_I^*, the domestic capital goods price relative to foreign prices, and P_I/P, the domestic capital goods price relative to the GDP deflator. We will consider both. Note however that the latter may not perform well in a relatively industrialised economy, in which there is some domestic capital good production. In this case, P_I/P is also proxying for the relative price of the output of two sectors of the domestic economy (consumer goods and capital goods), in both of which will there be some investment, and of which it is not obvious which is the more risky. Indeed, in the wake of a large jump in relative prices, the marginal return to investment is high relative to the aggregate marginal return to sunk capital (the former can be allocated to the most profitable sector ex post, the latter cannot), which may actually stimulate investment.

The variability of returns to investment is therefore proxied in two ways: by $|\Delta \ln P_I/P|$ ("VAR") or by $|\Delta \ln(P_I/eP_I^*)|$ ("VAR'"), where eP_I^* is constructed from foreign GDI deflators. For Kenya,

$$eP_I^* = e^{USA}P_I^{USA}$$

For Cote d'Ivoire,

$$eP_I^* = e^{FRA}P_I^{FRA}$$

in the light of the importance of French financial institutions in the CFA (see chapter 2).

viii) In Kenya, foreign exchange availability needs to be measured. The ideal variable would be the quantity of foreign exchange which firms can acquire for investment. Such figures are not available. However, the total quantity of forex available in the economy in a particular year is available, since foreign exchange holdings at the end of the previous year are recorded in central bank publications, quoted in IFS. The nominal value in Shillings of this foreign exchange is deflated by the GDP deflator, and appears in the models below as FOREX. This will be a good proxy for forex availability if the foreign exchange available to firms for investment is proportional to total foreign exchange holdings.

ix) In the savings equation, the income term used (INC) is terms of trade adjusted GDP at constant prices, as reported in World Tables. This measure does not allow for any disaggregation into permanent and transient components of income. In some cases, it will be useful to disaggregate the series: following a large trade shock, for example, the marginal propensity to save may be quite high, since the windfall income is not expected to last. When the income series is disaggregated below, the distinction made is between income from changes in terms of trade (transient, therefore presumably associated with a high savings ratio) and income from GDP (with a larger permanent component, and therefore presumably a lower savings ratio).

x) The real interest rate for consumers will be the nominal rate of return to savings (i) less the rate of change of the CPI (π). The latter is adequately reported in International Financial Statistics, but the former is not: even bank deposit rates are not reported for the whole of the sample period we will be looking at. The only complete interest rate series is for the central bank discount rate, so this is the rate used in the equations below. Since this is only a proxy for the true return to savings, the nominal interest rate and the rate of inflation are included as separate variables. Since the CB discount rate changes seldom, and is anyway only a proxy, we might expect the rate of inflation to be significant, even if the interest rate is not.

The wage and price series above need to be expressed in terms of a numeraire. Again, the GDP deflator is chosen, so that each price is calculated as a fraction of a general price index. These fractions are defined so that 1980 = 1. This is also used as the base year for the terms of trade. Note the comments in (ii) above on the use of the GDP deflator. Quantity variables are expressed in billions of domestic currency units at 1980 prices.

One problem which dogs empirical research on Africa is the poor quality of the data. Often, figures are miscalculated or misreported. How reliable will our results be? Two points are relevant here. First, the model makes as much use of price data as possible, and minimises recourse to quantity data in the set of explanatory variables. Whilst reported price data are not necessarily more reliable than quantity data, prices are often easier to observe in the marketplace than quantities. Secondly, the approach taken below produces statistically significant results. The most parsimonious interpretation of these results is that they reflect actual economic relationships.

3. Estimated equations

The procedure used in the model estimation is as follows. Price and income series are regressed on instruments, using international prices, in order to ensure independence of the explanatory variables in the savings and investment equations. Then savings in each country are estimated as a function of income, the nominal domestic interest rate and inflation. The resulting estimate of savings is included in a model of investment, along with the appropriate price and variability series.

The main problem with estimation of the savings and investment functions is the very small size of the data sets. It will be necessary to restrict ourselves to very simple model specifications. First of all, we need to know about the order of integration of the series of interest. Since the samples are so small, it is unlikely that formal tests for the order of integration of the time series will produce significant results. An augmented Dickey-Fuller test[7] for stationarity was applied to all the variables of interest. This tests for stationarity against the null hypothesis of non-stationarity. The test statistics generated were all well within the central 90% of the sampling distribution: the hypothesis of non-stationarity could not be rejected on the basis of these results. Durbin Watson[8] statistics for the series were also computed. Table 5.2 reports these tests of stationarity, first of all for the variables of interest - the explanatory variables of Tables 5.3 to 5.6 - then for their first differences. These test for non-stationarity against the null hypothesis of stationarity. With a sample size of 20, few series produced DWs small enough to reject the null for the variables of interest.

Nevertheless, the Durbin Watson statistic can be used as a descriptive statistic about the time series, to guide the decision of whether to treat them as stationary. The differenced series all have Durbin Watsons close to 2, but the corresponding DWs for the

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[7] See Engle and Granger (1987) for a description of this test. The procedure used is to estimate $\Delta x(t) = \alpha x(t-1) + \Sigma \beta_i \Delta x(t-i) + u(t)$, where u(t) is a white noise process. (In the case of Kenya and Cote d'Ivoire, 4 lags were used.) If x(t) is stationary, then α should be significant (i.e., x(t) should not be a random walk). The appropriate sampling distribution for α is slightly different from the Student's t.

[9] The DW statistic is $\Sigma_2^T(x_t - x_{t-1})^2/\Sigma_1^T(x_t - \bar{x})^2$. If x_t is a random walk, then DW will be close to zero; if x_t is white noise, then DW will be close to 2.

variables in levels are much smaller in all cases except for VAR and VAR'.[9] This is typical of variables which are I(1). The statistics suggest that, except for VAR and VAR', the variables of interest are I(1) series, stationary in first differences but not in levels. The price variability terms are taken to be stationary. With a larger data set, a more formal test of stationarity would be likely to produce significant results, and so the decision here could be made on a more rigorous basis.

Given that the series are I(1), our first task is to search for co-integration between lnS and {ln(1 + π), ln(1 + i), lnINC}. If there is such co-integration, it can form the basis of error correction terms of the form discussed in chapter 4. The procedure used is that discussed by Harvey (1990): to estimate a long run relationship between the variables of interest by calculating the static solution to a dynamic regression (in levels) of the dependant variable on explanatory variables, for example, lnS = a + blnINC + cln(1 + r) - d ln(1 + π), and to construct an error correction term form this: [lnI - a - blnINC - cln(1 + r) + dln(1 + π)]. If lnS and {lnINC, ln(1 + r), ln(1 + π)} are indeed co-integrated, then the error correction term ought to be stationary, and the long run coefficients in the levels regression highly significant. If the ECM is stationary, then it is appropriate to use it as an explanatory variable in a model of ΔlnS(t).

The co-integrating equations are reported in Tables 5.3 and 5.5. Individual country equations are discussed in detail below. For the moment, we note that the static solution coefficients of the reported equations are highly significant, and tests of stationarity on the error correction terms suggest that they are I(0). The DW statistics are close to 2, and the augmented Dickey-Fuller tests reject non-stationarity at the 5% level. The sample is 1968-87 for Cote d'Ivoire and 1968-88 for Kenya.

The savings and investment equations are then estimated with ΔlnS and ΔlnI as the dependant variables. The equations estimated are based on those in chapter 4 (equations 18 and 28), as amended above. At least four degrees of freedom are preserved at all times; this means that in the investment equations, some lags of some variables must be omitted. This is discussed in each individual country study below. The results of the estimations are reported in Tables 5.3 to 5.6, along with diagnostic statistics which are

[9] The DW for lnI_p in Cote d'Ivoire is quite high (1.44); however, this result is very sensitive to the sample size. In particular, it seems to be caused by the abnormally low level of private investment for a single observation (1984). The DW for a sub-sample ending in 1983 is 0.30.

described in Appendix 5.1. For each country, and for each dependant variable, there are three equations: first of all, a general AD(1,1) + ECM model, then a model with insignificant explanatory variables omitted (along with tests of the validity of such a reduction), and then the same model estimated over a shorter time period, leaving the last for observations for a parameter constancy test. The results for each country are discussed below.

(i) Kenya

The error correction term for savings is estimated from the model reported in Table 5.3. Savings are co-integrated with income and the interest rate. (Substitution of GDP and terms of trade adjustment terms for income did not improve the model: no terms of trade adjustment term was significant.) The long run coefficient on lnINC (1.084) is not significantly different from unity, implying that, ceteris paribus, savings are proportional to income. The constant estimated is 2.203, which means that savings are ceteris paribus around 45% of income. There is also a significant coefficient on the interest rate (0.199).

The equations for ΔlnS are reported in Table 5.3. The short run coefficient on income is smaller than the long run coefficient, but the difference is not significant (the short run coefficient is within two standard errors of unity). Note that the coefficient on Δln(1 + r)(t-1) is negative, and the coefficient on the error correction term is less than -1, implying non-monotonic convergence to equilibrium. If we solve out the final equation for lnS(t) as a function of ln(1 + r)(t-1) and (1 + r)(t-2), the negative interest rate coefficient becomes less puzzling. There are positive coefficients on both lags, but the coefficient on ln(1 + r)(t-1) is the smaller. That is, the full response of savings to a change in the interest rate is delayed over a number of years. Initially, there is no response (there is no significant coefficient on ln(1 + r)(t)). This may be because of learning effects, or because people do not immediately perceive a change in the interest rate to be permanent.

The savings equations pass the diagnostic tests reported, and the final equation for ΔlnS shows that the model performs well as a forecaster of future savings.

The investment equations for Kenya are reported in Table 5.4. The coefficients of the error correction term are estimated in the first equation, using the static solution

shown. Over the long run, investment depends both on savings and on the quantity of foreign exchange available. Since investment is approximately equal both to savings and to foreign exchange stocks over the sample period, the elasticities estimated (0.24 and 0.30 respectively) are also approximately the marginal change in private investment for a change in savings/forex.

We can arrive at a measure of the cost of the forex constraint by comparing the actual equilibrium level of investment in Kenya (based on the reported equation) with the hypothetical equilibrium level, based on a long run solution with $I_P = S - I_G$. Since S, FOREX and I_G are evolving over time, the actual and hypothetical equilibrium levels of investment are evolving over time, too. The ratio of actual to hypothetical equilibrium investment is:

1972	82%
1976	71%
1980	79%
1984	55%
1988	53%

That is, the costs in terms of total private investment are substantial, and have increased in the 1980s.

The first equation for $\Delta \ln I_P$ omits the wage and interest rate terms, in order to preserve degrees of freedom. Alternative versions of the model were estimated using these variables instead of other explanatory variables which turn out to be insignificant, and no significant coefficients appeared on these variables. The measure of price variability reported is VAR' rather than VAR. Using VAR instead did not produce significant coefficients.

The second equation shows the result of omitting insignificant variables from the first. Significant explanatory variables are savings, the oil price, terms of trade and price variability. All coefficients have the expected signs. The price variability term (VAR') is significant.[10] The estimated coefficient on VAR' is -1.31. The maximum value of VAR' over the sample period is 0.179; the minimum is 0.020. This means that the largest observation of VAR' led to a level of $I_P(t)/I_P(t-1)$ which was 79% of the level it would have been if agents were insensitive to price variability, whilst the smallest observation of VAR' led to a ratio of 97%. The average value of VAR is 0.076, implying a ratio of 91%. The other variable of interest is savings. The major impact of savings on investment is through $\Delta \ln S(t)$ and $\Delta \ln S(t-1)$. Present investment is highly dependant on recent savings, and the hypothesis of capital market integration can be firmly rejected.

The final equation for $\Delta \ln I_P$ shows the forecasting model. There is no significant misprediction over the forecast period, so the hypothesis of parameter constancy cannot be rejected.

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[10] Note that the heteroskedasticity-consistent standard error for VAR'(t) is much lower than the non-adjusted standard error. VAR'(t) is significant at 5%.

The model of investment in Kenya shows that both forex constraints and savings constraints affect investment. Moreover, investment is sensitive to the variability of capital goods prices. It remains to be seen whether the model for Cote d'Ivoire provides any grounds for the assertion that Franc Zone membership confers advantages with respect to these three variables.

(ii) Cote d'Ivoire

Table 5.5 shows the savings model for Cote d'Ivoire. The first equation shows the levels regression used as the basis of the error correction term. The model disaggregates income into GDP and terms of trade, as discussed above. Both are significant in the long run solution. The elasticity on the main component of income, GDP, is approximately 0.7,[11] and significantly different from unity: savings are not proportional to permanent income. Surprisingly, the coefficient on inflation is positive. This may reflect Stiglitz-Weiss effects in the savings market (see chapter 4). If it is the case that savings are lower for a higher real interest rate, because this increases the perceived risk of a failure to honour credit contracts, this represents a failure of the Ivorian banking system which puts it at a disadvantage with respect to Kenya.

The subsequent equations show the model of $\Delta \ln S$. In the final model, the short run coefficients on explanatory variables are not significantly different from the long run ones, except in the case of GDP. The short run savings elasticity is much higher (estimated to be 1.75). Since savings do not include consumer durables, this effect is understandable: a rise in income will lead to immediate saving in the form of financial assets, but not consumer durables, which are highly illiquid. But if the rise is permanent, then in the long run consumers will purchase consumer durables as well as holding financial assets, and the observed propensity to save will fall. The coefficient on the ECM is not significantly different from unity. This implies very rapid adjustment to the long run equilibrium.

Table 5.6 shows the investment model. Note that the error correction term is [lnI - lnS], and is not the result of an estimation procedure, since the convertibility of the CFA

[11] With an average propensity to save over the sample period of around 0.25, this implies a marginal propensity to save of around 0.44.

Franc means that no distinction between forex and domestic currency is necessary. The French interest rate is omitted from the first equation; substituting this variable for insignificant variables in the equation did not produce significant interest rate coefficients. The equation shows VAR' rather than VAR, the inclusion of which did nor produce significant coefficients.

The second equation omits insignificant variables. Significant explanatory variables are: the capital goods price, the price of industrial output, the price of oil, the terms of trade and price variability. All these variables take the expected signs.

Note that, as anticipated, the coefficient on VAR' is very large compared with Kenya: -5.23. This means that, although price variability is lower in Cote d'Ivoire than in Kenya (an average value of VAR of 0.053), the impact of price variability is greater than in Kenya. The ratio of actual $I_p(t)/I_p(t-1)$ to the hypothetical value for investors insensitive to price variability is 76% for the mean value of VAR. The maximum value (0.186) implies a ratio of 38%, and the minimum (0.002) a ratio of 99%.

The coefficient on $\Delta \ln S(t)$ is negative, so the model for Cote d'Ivoire corresponds to Figure 4.6c in chapter 4. When savings fall, the immediate response is an increase in borrowing from abroad to finance investment, in anticipation of a long run capital account constraint. Since the coefficient on the ECM (-1.10) is not significantly different from unity, it appears that the long run constraint binds very quickly. It is true to say that there is not a short run I = S constraint in Cote d'Ivoire, but the short run in this case is very short - about 12 months. Typically, investment is very close to savings, but there are periodic shocks which push the two apart. The stock of Ivorian foreign debt will not trend continuously downwards, but there will be discrete increases in debt in the wake of negative savings shocks.[12]

The benefits of the absence of a short run savings constraint are therefore likely to be minimal: when savings fall, firms have very little time in which to increase investment, and short run adjustment costs prohibit very much capital accumulation.

The final equation for Cote d'Ivoire shows the forecasting model. There is no

[12] The consequences of this will be investigated in chapter 10.

significant misprediction of investment, and the hypothesis of parameter constancy cannot be rejected.

4. Conclusion

We have seen that all three hypothesised differences between Franc Zone members and other African countries in terms of investment determination are relevant to a comparison of Kenya with Cote d'Ivoire. In one case, that of forex rationing, the costs of not adhering to the Franc Zone appear to be substantial. To the extent that non-CFA countries' governments are tempted to ration foreign exchange, being a CFA member entails higher investment.

In the two other cases, it is not obvious that CFA membership is advantageous. It is true that in the very short run, investment in Cote d'Ivoire is not constrained by savings; however, this period is so short that it is unlikely to make a substantial difference to the long run capital stock. Moreover, although capital price variability does inhibit investment in both countries, and variability is lower in the Franc Zone member, it is Cote d'Ivoire which is more severely affected by variability, since Ivorian investors are much more sensitive to this variable.

There are then two outstanding issues. First of all, is it generally true that price variability is lower in the CFA than elsewhere in Africa, and if so, are the benefits of lower variability cancelled out by higher sensitivity? Data in most African countries are not of a high enough quality for the kind of time series analysis presented in this chapter. However, it is possible to use a cross country model to investigate the impact of price variability on investment across a wider range of African countries. This will be the subject of chapter 7. Secondly, the results of this chapter and of chapter 3 suggest that domestic savings will be an important determinant of investment, even in CFA countries. We might therefore ask whether CFA membership has any effect on savings. Annual National Accounts savings data provide too few observations for a sophisticated model of savings, and the model used in this chapter is very basic. However, a more sophisticated model can be constructed using quarterly financial data on monetary aggregates. This will be the subject of chapter 8.

However, there is one data-rich Franc Zone country which we have not yet looked at: Cameroun. Cameroun is a member of the BEAC, whose recent economic history has been somewhat different from that of Cote d'Ivoire. Cameroun is an oil exporter, and did

not suffer the large falls in per caput GNP which beset West Africa in the early 1980s. Cameroun has been praised as a model of good economic management by the World Bank, and it will be interesting to see to what extent the management of the Camerounian economy is influenced by Franc Zone membership.

TABLE 5.1: OWNERSHIP OF LARGEST 34 FIRMS IN COTE D'IVOIRE[13]

Turnover	Sector	*Ownership* % state	% private Ivorian	% foreign
> FCFA 30bn.				
SIR	refining	47.5	----	52.5
EECI	electricity	81.0	----	14.0
UNICAFE	agro-ind	----	----	100.0
Blohorn	soap	----	20.0	80.0
UTPA	agro-ind	----	----	100.0
> FCFA 20bn.				
SODESUC	agro-ind	100.0	----	----
Palmind	agro-ind	100.0	----	----
CIDT	agro-ind	55.0	----	45.0
> FCFA 10bn.				
SITAB	tobacco	19.0	21.0	60.0
Gonville	textiles	33.0	22.0	45.0
SOLIBRA	beer	----	20.0	80.0
SACO	agro-ind	35.0	----	65.0
BRACODI	beer	----	22.0	78.0
SODECI	water	52.4	15.0	2.6
GMA	agro-ind	----	25.0	75.0
CAPRAL	agro-ind	24.0	9.0	67.0
Decorticaf	agro-ind	----	----	100.0
COGEXIM	agro-ind	n/a	n/a	n/a
> FCFA 5bn.				
SCA	cement	40.0	----	60.0
SMB	petrochem	93.0	----	7.0
SICM	cement	----	----	100.0

[13] Source: Mytelka, 1984

ICODI	textiles	16.0	16.0	68.0
API	agro-ind	77.0	----	23.0
COTIVO	textiles	29.0	----	71.0
SOTEXI	textiles	20.0	15.0	65.0
SAFAR	automobiles	----	----	100.0
UTEXI	textiles	20.0	----	80.0
SALCI	agro-ind	24.0	----	76.0
SIEM	metal boxes	12.0	----	88.0
SONACO	paper	90.0	----	10.0
PROCACI	agro-ind	60.0	----	40.0
Toles Ivoire	steel	----	24.0	76.0
SIFAL	lubricants	----	----	100.0
Trituraf	agro-ind	79.0	----	21.0

TABLE 5.2 DURBIN WATSON TESTS OF STATIONARITY

	Cote d'Ivoire	Kenya
$\ln I_P$	1.439	1.138
$\Delta \ln I_P$	2.764	2.215
lnS	0.441	0.273
ΔlnS	1.518	2.073
lnGDP	0.089	
ΔlnGDP	2.185	
lnINC		0.077
ΔlnINC		1.798
$\ln(1+\pi)$	1.586	1.616
$\Delta \ln(1+\pi)$	2.717	2.908
ln(1 + i)	0.177	0.078
Δln(1 + i)	2.385	0.905
lnp	0.467	0.194
Δlnp	2.240	1.668
$\ln P_I$	1.064	0.140
$\Delta \ln P_I$	2.388	2.082
$\ln P_O$	0.261	0.239
$\Delta \ln P_O$	1.905	2.076
lnTOT	0.991	1.356
ΔlnTOT	1.886	2.771
VAR	1.378	2.021
ΔVAR	2.188	2.841
VAR′	1.367	1.996
ΔVAR′	2.121	2.581
lnFOREX		1.361
ΔlnFOREX		1.997

TABLE 5.3 - KENYA

Modelling LS by OLS

The Sample is 1968 to 1988

VARIABLE		COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
LS	1	-.29485	.11817	.13189	-2.49510	.3416
LS	2	-.68891	.11638	.10105	-5.91955	.7449
LINC		.70293	.27217	.23444	2.58269	.3573
LINC	1	1.53665	.42575	.35054	3.60925	.5205
LINC	2	-.08852	.34310	.33785	-.25801	.0055
L(1+r)		.09549	.18318	.19432	.52127	.0221
L(1+r)	1	-.29945	.27439	.29831	-1.09135	.0903
L(1+r)	2	.59893	.16714	.15908	3.58337	.5169
CONSTANT		-4.36953	.48129	.48741	-9.07870	.8729

R^2 = .9866756 σ = .0552609 F(8, 12) = 111.08 [.0000] DW = 2.435

RSS = .0366451391 for 9 Variables and 21 Observations

Information Criteria: SC = -5.046202; HQ = -5.396702; FPE = .004363

R^2 Relative to DIFFERENCE+SEASONALS = .95444

Solved STATIC LONG RUN Equation

LS = 1.084 LINC + .199 L(1+r) - 2.203

(.05869) (.03769) (.15166)

WALD Test Chi^2(3) = 42562.882

Tests on the Significance of each Variable

Variable	F[NUM,DENOM] =	Value	Probability	Unit Root t-test
LS	F[2, 14]	21.357	.000	-12.245
LINC	F[3, 14]	46.481	.000	9.717
L(1+r)	F[3, 14]	14.095	.000	5.152
CONSTANT	F[1, 14]	82.423	.000	-9.079

DW on ECM = 2.01 ADF (1 lag) = 7.56

Modelling DLS by OLS

The Sample is 1969 to 1988

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLS 1	1.01527	.37147	.34196	2.73315	.4276
DLS 2	.18404	.24175	.22752	.76128	.0548
DLINC	.86934	.29439	.21961	2.95302	.4658
DLINC 1	-.44189	.66119	.62544	-.66833	.0428
DLINC 2	.36993	.31867	.31043	1.16084	.1188
DL(1+r)	.02411	.20226	.22803	.11920	.0014
DL(1+r)1	-.56073	.21059	.19583	-2.66268	.4149
DL(1+r)2	-.25482	.30659	.27674	-.83114	.0646
ecms 1	-2.60773	.64577	.62094	-4.03818	.6199
CONSTANT	-.01628	.03478	.03395	-.46801	.0214

R^2 = .9634503 σ = .0542197 F(9, 10) = 29.29 [.0000] DW = 2.149

RSS = .0293977445 for 10 Variables and 20 Observations

Information Criteria: SC = -5.024703; HQ = -5.425381; FPE = .004410

R^2 Relative to DIFFERENCE+SEASONALS = .98238

Testing for Serial Correlation

CHI^2(1) = 1.615 and F(1,9) = .79 [.3971]

ARCH TEST

CHI^2(1) = .300 with F(1,8) = .13 [.7296]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .519

Modelling DLS by OLS

The Sample is 1969 to 1988

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLS 1	.70764	.08024	.07309	8.81895	.8383
DLINC	.67508	.22934	.20863	2.94355	.3661
DL(1+r)1	-.55873	.10826	.13804	-5.16079	.6397
ecms 1	-1.98291	.13846	.17323	-14.32119	.9318
CONSTANT	.00784	.01618	.01886	.48458	.0154

R^2 = .9536767 σ = .0498390 F(4, 15) = 77.20 [.0000] DW = 2.498

RSS = .0372589504 for 5 Variables and 20 Observations

Information Criteria: SC = -5.536662; HQ = -5.737001; FPE = .003105

R^2 Relative to DIFFERENCE+SEASONALS = .97766

Testing for Serial Correlation

CHI^2(1) = 2.086 and F(1,14) = 1.63 [.2225]

ARCH TEST

CHI^2(1) = .850 with F(1,13) = .61 [.4492]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .597

Modelling DLS by OLS

The Sample is 1969 to 1988 less 4 Forecasts

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLS 1	.71413	.09244	.07926	7.72549	.8444
DLINC	.67025	.26053	.21598	2.57259	.3756
DL(1+r)1	-.50046	.13622	.13733	-3.67401	.5510
ecms 1	-1.98538	.16180	.19528	-12.27057	.9319
CONSTANT	-.00110	.02090	.02515	-.05259	.0003

R^2 = .9547886 σ = .0555381 F(4, 11) = 58.08 [.0000] DW = 2.052

RSS = .0339292800 for 5 Variables and 16 Observations

Information Criteria: SC = -5.289632; HQ = -5.518702; FPE = .004048

R^2 Relative to DIFFERENCE+SEASONALS = .97814

Tests of Parameter CONSTANCY over: 1985 - 1988

Forecast $Chi^2(4)/ 4$ = .40

CHOW TEST F(4,11) = .27 [.8913]

Testing for Serial Correlation

$CHI^2(1)$ = .894 and F(1,10) = .59 [.4596]

ARCH TEST

$CHI^2(1)$ = 1.173 with F(1,9) = .76 [.4048]

CHI-SQUARED Test for NORMALITY : $CHI^2(2)$ = .342

TABLE 5.4 - KENYA

Modelling LIp by OLS

The Sample is 1967 to 1988

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
LIp 1	.15136	.15891	.15313	.95248	.0537
LS	.42440	.16841	.23489	2.52006	.2841
LS 1	-.22382	.20212	.25085	-1.10737	.0712
LFOREX	-.17983	.11104	.07041	-1.61951	.1408
LFOREX 1	.43542	.10379	.08459	4.19535	.5238
CONSTANT	1.21003	.26247	.27519	4.61012	.5705

R^2 = .8077228 σ = .1249290 F(5, 16) = 13.44 [.0000] DW = 1.700

RSS = .2497161224 for 6 Variables and 22 Observations

Information Criteria: SC = -3.635461; HQ = -3.862923; FPE = .019864

R^2 Relative to DIFFERENCE+SEASONALS = .77079

Solved STATIC LONG RUN Equation

LIp = .236 LS + .301 LFOREX + 1.426

(.10432) (.11899) (.19828)

WALD Test Chi^2(3) = 4601.391

Tests on the Significance of each Variable

Variable	F[NUM,DENOM] =	Value	Probability	Unit Root t-test
LIp	F[1, 17]	.907	.354	-5.340
LS	F[2, 17]	5.188	.017	1.905
LFOREX	F[2, 17]	9.335	.002	2.609
CONSTANT	F[1, 17]	21.253	.000	4.610

DW on ECM = 1.56 ADF (1 lag) = 3.67

Modelling DLIp by OLS

The Sample is 1968 to 1988

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLIp 1	-.24602	.22322	.18449	-1.10213	.1955
DLS	.29893	.24938	.20792	1.19870	.2232
DLS 1	.88678	.31692	.23330	2.79815	.6103
DLFOREX	-.13598	.12228	.10918	-1.11203	.1983
DLFOREX1	-.03528	.16231	.20032	-.21733	.0094
DLPI	-.18028	.40640	.38062	-.44361	.0379
DLp	-.23752	.63883	.60000	-.37180	.0269
DLp 1	-.34197	.76006	.47240	-.44993	.0389
DLTOT	-.81199	.49607	.41073	-1.63684	.3489
DLTOT 1	-1.25688	.53926	.38964	-2.33076	.5207
DLPO	.17160	.08593	.08626	1.99702	.4437
DLPO 1	.02922	.10570	.11713	.27642	.0151
VAR'	-1.38214	.90625	.74565	-1.52512	.3175
VAR' 1	-.11566	1.04478	.89261	-.11071	.0024
ecm* 1	-1.00652	.46779	.52844	-2.15166	.4808
CONSTANT	.05935	.12085	.11092	.49109	.0460

R^2 = .9577102 σ = .0959921 F(15, 5) = 7.55 [.0176] DW = 2.265

RSS = .0460724424 for 16 Variables and 21 Observations

Information Criteria: SC = -3.802427; HQ = -4.425538; FPE = .016235

R^2 Relative to DIFFERENCE+SEASONALS = .98087

CHI-SQUARED Test for NORMALITY : $CHI^2(2)$ = .304

Modelling DLIp by OLS

The Sample is 1968 to 1988

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLIp 1	-.24020	.12135	.08382	-1.97941	.2626
DLS	.34682	.12199	.09282	2.84295	.4236
DLS 1	.87525	.16298	.09007	5.37027	.7239
DLFOREX	-.13716	.06579	.04899	-2.08475	.2832
DLTOT	-.68427	.19797	.15378	-3.45647	.5206
DLTOT 1	-1.11731	.23693	.18595	-4.71589	.6691
DLPO	.16144	.05217	.04157	3.09460	.4654
VAR'	-1.30567	.62519	.51041	-2.08844	.2839
ecm* 1	-.94831	.11656	.11254	-8.13549	.8575
CONSTANT	.04934	.04635	.03280	1.06450	.0934

R^2 = .9497327 σ = .0705585 F(9, 11) = 23.09 [.0000] DW = 1.812

RSS = .0547635365 for 10 Variables and 21 Observations

Information Criteria: SC = -4.499481; HQ = -4.888925; FPE = .007349

R^2 Relative to DIFFERENCE+SEASONALS = .97726

Testing for Serial Correlation

CHI^2(1) = .000 and F(1,10) = .00 [.9886]

ARCH TEST

CHI^2(1) = .037 with F(1,9) = .02 [.9001]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = 1.613

Modelling DLIp by OLS

The Sample is 1968 to 1988 less 4 Forecasts

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLIp 1	-.26466	.12797	.09203	-2.06815	.3793
DLS	.40471	.15357	.12584	2.63536	.4980
DLS 1	.79401	.19167	.11381	4.14267	.7103
DLFOREX	-.06567	.08000	.05599	-.82084	.0878
DLTOT	-.90810	.29349	.33651	-3.09411	.5776
DLTOT 1	-.84428	.32210	.18611	-2.62117	.4953
DLPO	.21974	.07632	.06119	2.87901	.5421
VAR'	-.91949	.77734	.66378	-1.18287	.1666
ecm* 1	-.92248	.12706	.14549	-7.26010	.8828
CONSTANT	.01161	.05477	.03179	.21193	.0064

R^2 = .9638598 σ = .0736814 F(9, 7) = 20.74 [.0003] DW = 1.771

RSS = .0380026923 for 10 Variables and 17 Observations

Information Criteria: SC = -4.436716; HQ = -4.878122; FPE = .008622

R^2 Relative to DIFFERENCE+SEASONALS = .98342

Tests of Parameter CONSTANCY over: 1985 - 1988

Forecast $Chi^2(4)/ 4$ = 3.49

CHOW TEST F(4,7) = .77 [.5766]

CHI-SQUARED Test for NORMALITY : $CHI^2(2)$ = .749

TABLE 5.5 - COTE D'IVOIRE

Modelling LS by OLS

The Sample is 1968 to 1987

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
LS 1	.09697	.12052	.24280	.80459	.0512
LTOT	.78838	.13387	.16773	5.88902	.7429
LTOT 1	-.17228	.15931	.20063	-1.08147	.0888
LGDP	1.60904	.30761	.43508	5.23082	.6951
LGDP 1	-.98214	.28428	.35461	-3.45480	.4987
CONSTANT	-1.98971	.81707	1.17272	-2.43516	.3307
L(1+π)	.67500	.21200	.23700	3.18531	.4581
L(1+π) 1	.02100	.18500	.22300	.11181	.0010

R^2 = .9648127 σ = .0502454 F(7, 12) = 47.00 [.0000] DW = 2.114

RSS = .0302951556 for 8 Variables and 20 Observations

Information Criteria: SC = -5.294207; HQ = -5.614749; FPE = .003534

R^2 Relative to DIFFERENCE+SEASONALS = .91892

Solved STATIC LONG RUN Equation

LS = .682 LTOT + .694 LGDP - 2.203

(.12432) (.06042) (.79303)

+ .800 L(1+π)

(.00198)

WALD Test Chi^2(4) = 120447.867

Tests on the Significance of each Variable

Variable	F[NUM,DENOM] =	Value	Probability	Unit Root t-test
LS	F[1, 14]	.647	.435	-7.493
LTOT	F[2, 14]	19.569	.000	4.137
LGDP	F[2, 14]	21.787	.000	5.722
CONSTANT	F[1, 14]	5.930	.029	-2.435
L(1+π)	F[2, 14]	8.698	.004	4.008

DW on ECM = 1.99 ADF (1 lag) = 3.13

Modelling DLS by OLS

The Sample is 1969 to 1987

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLS 1	.02368	.19020	.16156	.12448	.0015
ecm 1	-1.03728	.32511	.27904	-3.19056	.5045
CONSTANT	.00331	.02679	.02859	.12356	.0015
DLTOT	.76452	.16204	.12151	4.71806	.6900
DLTOT 1	.06918	.22818	.22426	.30319	.0091
DLGDP	1.79997	.27846	.27638	6.46406	.8069
DLGDP 1	-.08353	.67655	.68077	-.12347	.0015
DL(1+π)	.80000	.22700	.20700	3.52133	.5536
DL(1+π)1	-.10700	.19700	.18400	-.54394	.0287

R^2 = .9312885 σ = .0506691 F(8, 10) = 16.94 [.0001] DW = 1.902

RSS = .0256735908 for 9 Variables and 19 Observations

Information Criteria: SC = -5.211997; HQ = -5.583651; FPE = .003783

R^2 Relative to DIFFERENCE+SEASONALS = .96168

Testing for Serial Correlation

CHI^2(1) = .001 and F(1,9) = .00 [.9838]

ARCH TEST

CHI^2(1) = .576 with F(1,8) = .26 [.6210]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .011

Modelling DLS by OLS

The Sample is 1969 to 1987

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
ecms 1	-1.02195	.13407	.14016	-7.62268	.8058
CONSTANT	.00133	.01415	.01933	.09362	.0006
DLTOT	.80655	.10013	.12980	8.05474	.8225
DLGDP	1.76798	.22712	.35139	7.78428	.8123
DL(1+π)	.75100	.14200	.14800	5.29926	.6673

R^2 = .9276183 σ = .0439520 F(4, 14) = 44.85 [.0000] DW = 1.850

RSS = .0270449396 for 5 Variables and 19 Observations

Information Criteria: SC = -5.779842; HQ = -5.986316; FPE = .002440

R^2 Relative to DIFFERENCE+SEASONALS = .95963

Testing for Serial Correlation

CHI^2(1) = .012 and F(1,13) = .01 [.9290]

ARCH TEST

CHI^2(1) = .754 with F(1,12) = .52 [.4828]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .195

Modelling DLS by OLS

The Sample is 1968 to 1987 less 4 Forecasts

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
ecms 1	-.84261	.11098	.21456	-7.59234	.8398
CONSTANT	-.02010	.01778	.02775	-1.13034	.1041
DLTOT	.80070	.10898	.09956	7.34703	.8307
DLGDP	1.75798	.23212	.41118	7.57349	.8391
DL(1+π)	.74900	.12700	.17800	5.89754	.7597

R^2 = .9580593 σ = .0410385 F(4, 11) = 62.82 [.0000] DW = 2.131

RSS = .0185257553 for 5 Variables and 16 Observations

Information Criteria: SC = -5.894748; HQ = -6.123819; FPE = .002210

R^2 Relative to DIFFERENCE+SEASONALS = .97291

Tests of Parameter CONSTANCY over: 1984 - 1987

Forecast Chi^2(4)/4 = 2.40

CHOW TEST F(4,11) = 1.75 [.2097]

Testing for Serial Correlation

CHI^2(1) = 2.278 and F(1,10) = 1.66 [.2266]

ARCH TEST

CHI^2(1) = .007 with F(1,9) = .00 [.9490]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .458

TABLE 5.6 - COTE D'IVOIRE

Modelling DLIp by OLS

The Sample is 1968 to 1987

VARIABLE		COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLIp	1	-.23756	.14391	.13145	-1.65070	.3527
DLS		-.33229	1.21082	1.04757	-.27443	.0148
DLS	1	-.97199	1.21846	.94626	-.79772	.1129
DLp		3.31228	.59369	.58516	5.57913	.8616
DLp	1	1.08044	1.32997	1.14260	.81238	.1166
DLPI		-5.25330	1.23853	.90943	-4.24157	.7825
DLPI	1	-4.87363	1.35505	1.14444	-3.59663	.7212
DLPO		.41128	.12711	.07813	3.23554	.6768
DLPO	1	.20826	.20701	.14121	1.00605	.1683
DLTOT		-1.08895	1.23921	1.14148	-.87875	.1338
DLTOT	1	-2.12730	.52802	.57749	-4.02885	.7645
VAR'		-2.51195	2.52895	2.21405	-.99328	.1648
VAR'	1	-4.09401	1.56938	1.28939	-2.60868	.5765
ecm*	1	-1.32310	.26059	.19010	-5.07728	.8376
CONSTANT		-.22221	.13794	.12932	-1.61087	.3417

R^2 = .9771849 σ = .1761183 F(14, 5) = 15.30 [.0036] DW = 2.835

RSS = .1550882387 for 15 Variables and 20 Observations

Information Criteria: SC = -2.612694; HQ = -3.213710; FPE = .054281

R^2 Relative to DIFFERENCE+SEASONALS = .99173

CHI-SQUARED Test for NORMALITY : $CHI^2(2)$ = .028

Modelling DLIp by OLS
The Sample is 1968 to 1987

VARIABLE		COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLIp	1	-.19647	.08036	.07794	-2.44485	.3741
DLS		-1.35575	.30901	.22157	-4.38740	.6581
DLp		3.42978	.41393	.39674	8.28585	.8729
DLPI		-4.14573	.47351	.46303	-8.75527	.8846
DLPI	1	-4.02872	.54421	.48576	-7.40281	.8457
DLPO		.36301	.08443	.05843	4.29945	.6489
DLTOT	1	-2.23081	.34864	.37013	-6.39865	.8037
VAR'	1	-5.22778	.78207	.69876	-6.68453	.8171
ecm*	1	-1.10265	.10701	.06463	-10.30450	.9139
CONSTANT		-.15550	.08369	.07071	-1.85793	.2566

R^2 = .9715927 σ = .1389612 F(9, 10) = 38.00 [.0000] DW = 2.296
RSS = .1931021809 for 10 Variables and 20 Observations
Information Criteria: SC = -3.142402; HQ = -3.543079; FPE = .028965
R^2 Relative to DIFFERENCE+SEASONALS = .98970

Testing for Serial Correlation
CHI^2(1) = .565 and F(1,9) = .26 [.6212]
ARCH TEST
CHI^2(1) = .224 with F(1,8) = .10 [.7653]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = .790

Modelling DLIp by OLS

The Sample is 1968 to 1987 less 4 Forecasts

VARIABLE		COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLIp	1	-.25735	.12526	.10719	-2.05454	.4130
DLS		-1.19819	.51308	.36538	-2.33530	.4761
DLp		2.83847	.89410	.79894	3.17468	.6268
DLPI		-3.57281	1.05966	.84847	-3.37165	.6545
DLPI	1	-3.06445	.98638	.82493	-3.10677	.6167
DLPO		.29463	.12121	.08764	2.43067	.4961
DLTOT	1	-1.78124	.53642	.44548	-3.32059	.6476
VAR'	1	-3.41484	1.53759	1.61300	-2.22091	.4512
ecm*	1	-1.07879	.16793	.09104	-6.42387	.8731
CONSTANT		-.18717	.11581	.12621	-1.61620	.3033

R^2 = .9187281 σ = .1506617 F(9, 6) = 7.54 [0116] DW = 2.874

RSS = .1361936501 for 10 Variables and 16 Observations

Information Criteria: SC = -3.033398; HQ = -3.491539; FPE = .036886

R^2 Relative to DIFFERENCE+SEASONALS = .94011

Tests of Parameter CONSTANCY over: 1984 - 1987

Forecast $Chi^2(4)/4$ = 2.81

CHOW TEST F(4,6) = .63 [.6610]

CHI-SQUARED Test for NORMALITY : $CHI^2(2)$ = .216

APPENDIX 5.1

In addition to the well known diagnostic statistics (R_2 and RSS for goodness-of-fit; the regressor standard error, t and joint F-statistics for regressor significance; the Durbin-Watson statistic for error autocorrelation; the Chow test for parameter constancy and the regression standard error, σ), the results reported in chapter 5 include the following statistics:

i) For the static solution to a dynamic equation of the form, $b(L)y(t) = \Sigma b_i(L)x_i(t)$, where y is the dependant variable, x_i the i^{th} explanatory variable and L a lag operator of order r, an F-test of the hypothesis, H_0: $(b_{i1},\ldots,b_{ir}) = (0,\ldots,0)$, is reported for each variable, as a test of its significance. This statistic is discussed in Hendry (1989). It is accompanied by a "unit root" t-test of the hypothesis, H_0: $b_i(1) = 0$.

ii) Each regression includes the Schwartz Criterion (SC), the Hannon-Quinn Criterion (HQ) and the Final Prediction Error (FPE), discussed in Hendry (op. cit.) and Judge et al. (1985). The purpose of these alternative statistics is to indicate the validity or otherwise of a model reduction (i.e., the imposition of a restriction that the coefficient on a variable is equal to zero). A large change in the statistic (which does not occur in the reported equations!) indicates invalidity. All three statistics are transformations of σ, the sample size, T, and the number of regressors, k.

iii) There are three tests indicating whether the regression residual, u(t), possesses the desired properties for a least squares regression. First of all, there is a test of the null hypothesis of residual normality:

$$X^2_2 = (T-k)(SK^2 + EK^2/4)/6$$

where SK is the skewness of the residual distribution and EK is its excess kurtosis.

See Jarque and Bera (1980).

Secondly, there is a Lagrange Multiplier test for error autocorrelation. The null hypothesis is that u(t) is white noise. u(t) is regressed on a one-period lag plus the variables of the initial regression for a first order autocorrelation test which is calculated as TR^2 and distributed as a X^2; an F-form of this statistic is also reported. See Harvey (1990).

Thirdly, there is a test for first order autoregressive conditional heteroskedasticity (ARCH), i.e., a test of the null hypothesis that ß = 0 in:

$$E[u(t)^2 | u(t-1)^2] = \alpha + ßu(t-1)^2$$

$u(t)^2$ is regressed on $u(t-1)^2$, and the X^2 test statistic is again calculated as TR^2. See Harvey (1990).

CHAPTER 6

INVESTMENT IN CAMEROUN: 1978-1987

INVESTMENT IN CAMEROUN: 1978-1987

The Camerounian economy in the 1980s followed a somewhat different path from those of the more industrialised countries of the BCEAO region such as Cote d'Ivoire. From the late 1970s onwards, Cameroun became an oil exporter, and experienced rates of growth far higher than its neighbours to the west. Government policy was praised by analysts from the World Bank, who contrasted it with that of other CFA members, and foreign commercial banks were encouraged to enter Camerounian financial markets. However, by the end of the decade, Cameroun's image had become tarnished, as foreign debt rose inexorably and structural adjustment programmes were introduced. In this chapter, we will use the model developed in chapters 4-5 to investigate some of the possible causes of this fall from grace.

1. Institutional background

Devarajan and de Melo (1987b) analyse the response of three Franc Zone members to trade shocks in the 1970s and 80s: Senegal, Cote d'Ivoire and Cameroun. Much emphasis is placed on the detrimental effects which result from too lax a fiscal policy in response to a positive trade shock. If the public sector is allowed to spend too much, it is argued, the increase in demand for imports will result in serious trade imbalances in the future, with the accompanying problems of debt service. An added problem for countries with a fixed exchange rate is that a spending boom will tend to cause "real exchange rate appreciation", that is, the price of internationally nontraded goods, which is determined by domestic demand and supply, will rise relative to the domestic price of traded goods, which is determined by world markets and the fixed exchange rate. Imports become relatively cheap, and the balance of payments plunges further into deficit.

Cote d'Ivoire is hypothesised to have suffered particularly badly from these effects, whilst Cameroun is praised for its fiscal restraint, which is argued to be a major factor contributing towards the health of the Camerounian economy in the 1980s. In practice, this restraint took the form of public saving of the revenue from the oil boom.[1] The oil revenue was saved in American banks, instead of adding to the stock of credit in the Camerounian banking system, which might have caused a spending boom. The magnitude of these savings is difficult to estimate, since the government was evading the BEAC regulations requiring member states to hold a fraction of their assets within the BEAC system (see chapter 2).[2] In fact, it is likely that only a small number of government ministers close to the President were aware of the unofficial accounts recording the flow of assets overseas. However, World Bank estimates put Camerounian assets in the USA at around 75% of total oil revenue, i.e., the government has been secreting in American banks three times as much as is declared in official accounts.

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[1] See Benjamin et al. (1989) and Devarajan (1991).

[2] Creative accounting is now a fine art in Camerounian civil service. Under the Ahidjo administration, the creation of parallel "official" and "unofficial" accounts facilitated policies which favoured the president's tribal homeland in the North. When the Biya government came to power, these techniques were adapted for the avoidance of BEAC rules. In the case of oil revenue, the government has secured the connivance of the main petroleum companies operating in the country. Approximately half of the profits of these companies goes unrecorded. See Vallee (1988).

Not all commentators share this rosy picture, however. As Cameroun has succumbed to the IMF and accepted a structural adjustment programme, some economists have wondered whether this fate could have been avoided by better management of the windfall gain from the oil, and a less Draconian monetary and fiscal policy. It has been argued that investment and output might now be higher, if the government and the central bank had not been so parsimonious.

What would an optimal policy with respect to foreign asset holding and the money stock be like? Two relevant sources worthy of attention are (i) the recent theoretical literature on the optimal response to a temporary trade shock and (ii) the views expressed by Camerounian economic commentators.

In the theoretical literature,[3] emphasis is placed on the change in a country's net foreign assets over the period of the boom. With temporary windfall income, the optimal path of assets over time is likely to be non-monotonic. When the windfall is discovered, there is an incentive to invest immediately, since anticipated permanent income increases. However, the windfall income flow is just about to begin, so any investment now must be financed by a running down of net foreign assets. Later on, with the end of the windfall in sight, there will be an incentive to increase asset holding, in order to finance investment after the boom has finished. The precise path of investment and asset holding will be determined by the paths of output and capital goods prices, which will depend on whether investment is reversible, and on whether some capital goods are nontradables. In one extreme (but empirically plausible) case, that of irreversible investment with some nontradable capital goods when international interest rates are higher for borrowers than for lenders, optimal asset holding in the early part of the boom is constant; later on, there should be a rise and then fall in net foreign assets.

Given that most of the country's foreign assets are held in secret, it is impossible to produce a precise time series for Camerounian net foreign assets. However, the appreciable current account surplus since 1978 (the year when Cameroun became a net oil exporter), suggests that the Biya administration has been accumulating assets since the very beginning of the boom period, a strategy which theory suggests is *not* optimal. An optimal policy would involve the financing of more initial investment via the running down

[3] See for example Bevan et al. (1990).

of foreign assets, or at least holding them at a constant level.

Although unaware both of the niceties of the construction boom literature and (in many cases) of the government's secret offshore accounts, Camerounian commentators in the late 1980s did express dissatisfaction with policy enforced by the BEAC. However, there is an ambiguity in official reports and statements, suggesting some complexity (and lack of coherence?) in the formulation of macroeconomic policy. On the one hand, the government draws attention to its fiscal restraint, emphasising the need for careful budgeting. In a statement to Parliament in 1984 on the 1984/5 budget, President Biya proclaimed:

"Never have the costs of State services been so carefully calculated (services budget: FCFA 400bn., compared with FCFA 326bn. in 1983/4); never has so much thought been put into the calculation of the costs and benefits of investment activities, and never have they been so judiciously budgeted (investment budget: FCFA 220bn., compared with FCFA 194bn. in 1983/4)".[4]

On the other hand, many high-ranking officials complain about the constraints placed on them by the regulations of the BEAC. Two ministers in the Biya administration, Georges Ngango and Jean Nkuete, have made it clear that they think that Cameroun would be better off outside the Franc Zone. Nkuete (1980) claims that

"The monetary accords [of the BEAC] are today the main cause of our [economic] dependence".

Other authors spell out the reasons for this point of view:

"As far as credit is concerned, monetary policy [in the Franc Zone] boils down to the application of a number of the essential principles of Quantity Theory, notably the causal link between M and P, and the neutrality of money. Credit policy here is such that money supply is strictly limited to the minimum required for transactions purposes. Thus credit is composed mostly of short term liabilities linked to the agricultural cycle.....For example, medium term loans represent barely 20-30% of BEAC credit, and long term credit

[4] My translation; see Vallee (op. cit.)

is virtually non-existent."[5]

The tight monetary policy of the central bank is seen as inhibiting growth; advocates of monetary autonomy proposing a more liberal regime. Even the National Credit Committee in Cameroun, an organ of the BEAC, has called for a more liberal monetary system. Behind these statements is the idea, never explicitly articulated, that other members of the BEAC, and France, are free riding on the Franc Zone financial system. Doubtless, had it not been for its creative accounting, Cameroun would have been a large creditor of the Paris operations account. There is underlying resentment of the perceived fact that Cameroun puts more into the BEAC than it gets out. This resentment is well expressed by M. Mapeta, head of the Camerounian research division of the BEAC, in a recent report, who suggested that

"It will be necessary to break the bonds of 'friendship' which link Cameroun to certain other countries, or group of countries, and replace them with fairer links".

An economically coherent interpretation of the Camerounian position is that the country is unable to benefit from the fruits of fiscal prudence under a tight monetary regime. Governments of many African economies outside the Franc Zone finance fiscal deficits by excessive monetary expansion, leading to hyperinflation (and if exchange rates are not flexible, an increase in the relative price of nontradables). With a balanced budget, Cameroun could make a higher level of medium term credit available for private use (and particularly investment) whilst maintaining moderate money supply growth and low inflation. Instead of funding government consumption, the extra money would fund private investment. The BEAC rules governing credit expansion prevent such a policy, enforcing an artificially low level of medium and long term domestic assets. To this case one might add the observation that the theoretical trade shocks literature suggests that an increase in investment, via substitution of domestic assets for foreign ones, is an optimal response at the beginning of an oil boom. The domestic asset constraint would prevent an optimal investment path.

The Camerounian case could be put like this: of all the rules of the Franc Zone, it

[5] Bekolo-Ebe (1986); my translation

is the ones governing medium term credit that bind in Cameroun. The rules aimed at fiscal prudence and slow money supply growth (for example, the rule constraining government monetary creation to be 20% of last year's fiscal receipts) are unnecessary, since the Camerounian government is inclined to prudence anyway.[6] The rules which make a difference are the ones which limit the formation of less liquid domestic assets, rules for which there is no reason in Cameroun.

However, the issue of controls on the growth of domestic assets seems to have become linked in policy-makers' minds with foreign control over Cameroun's windfall assets via BEAC regulations. In order to retain national control over monetary assets, the government held large savings in America, outside Franc Zone institutions and beyond the control of the BEAC. This policy may also have been prompted by the fear of yet more French Franc devaluations, an issue about which President Biya has frequently complained (apparently, the institutional safeguards against French devaluations for Franc Zone members (see chapter 1) are perceived to be inadequate)[7]. Whatever its motivation, the holding of large quantities of offshore assets has exacerbated rather than eased the liquidity constraints in Cameroun: revenue from the oil boom has been used to finance investment by firms in America, rather than investment by firms in Cameroun.

This scenario prompts two questions: first, is the Camerounian case, as outlined above, justified, and secondly, given the existence of BEAC institutions, is the optimal response for Cameroun to cheat on them?

First of all, there is some justification for the claim by Bekolo-Ebe that, if they have had any impact at all, the BEAC regulations have affected long term rather than short term assets. Whereas the annual average of short term credit (i.e., credit with a maturity period of less than three months) allocated to Cameroun rose from FCFA 1820bn in 1980 to FCFA 6802bn in 1986, that of medium and long term credit only rose from FCFA 1214bn to FCFA 2271bn[8] In real terms, there is a marked fall in the availability of medium and

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[6] We will see in chapter 10 whether this is in fact the case.

[7] In the case of a FF devaluation, the compensation to BEAC members would take the form of a reduction of the debit in the Paris operations account, so Cameroun would never see any of the money. The effects of an increase in the FCFA value of international debt would be all too apparent, however.

[8] Source: Notes Annuelles de Statistique du Cameroun, Yaounde (various editions)

long term credit after 1983, whilst short term credit has continued to rise (see Figure 6.1).[9] This corresponds to a slowdown in investment in the mid 1980s (see Figure 6.2).

To what extent is this slowdown a result of BEAC constraints? The relevant BEAC policy instrument here is the plafond d'avances au Cameroun (long/moyen terme). This is the level of long and medium term advances by the central bank to local Camerounian banks. If this is a binding constraint, then the ratio of these banks' long and medium term lending to the advances they receive will be constant (i.e., this is a binding reserve assets ratio, banks not being willing to lend any more, given the current level of advances). Figure 6.3 shows that there is some evidence that there was indeed a binding constraint over the period in which the real level of advances fell. Between 1980 and 1987, the ratio of bank credit to advances was constant at around 6.5%. As the fall in advances began to bite, in 1983, there was a small rise in the ratio, to around 7%. However, this lasted for only a year, and was offset by a fall in the ratio to around 6% in 1986.

However, it can be argued that the cause of the downward trend in medium and long term credit had its origins in the 1970s, before the oil boom. Vallee (op. cit.) notes that there was a shortage of deposits in the banking system even in 1979. Banks were having difficulty obtaining repayments of loans both to parastatals and to private businessmen from North Province, who had received preferential treatment under the Ahidjo regime. In the early 1980s, the government made up for this shortage by transferring revenues from a number of the healthier parastatals -among them the ONCPB (primary commodity marketing), the SNI (National Investment Corporation) and the SNH (National Hydrocarbons Corporation) - into the private banking system. This was topped up by borrowing from abroad, at a time when foreign creditors were only to happy to lend to oil exporters. However, this meant that both foreign borrowing and public saving were being directed towards maintaining short term liquidity in the banking system, instead of being used in long term investment projects. The fact that most of public sector savings were being held abroad exacerbated this problem.

Low BEAC-maintained interest rates (see chapter 1) were also a probable cause of the low level of credit to firms in this period. Many local financial institutions transferred their assets abroad, in search of a higher return at World interest rates, lowering further

[9] The diagram shows nominal credit deflated by the GDP deflator

the level of deposits available for distribution as credit to industry. With interest rates so low, there was anyway little incentive for banks to lend. In 1984, private banks provided only 7% of the resources used for investment by Camerounian industry. Firms ploughed back profits, and drew on foreign credit when this was available. Parastatals relied on increased borrowing from central government. The declining health of Camerounian industry in the 1980s suggests that this state of affairs not only reduced the total level of investment, but also impaired the efficiency with which the resources for this investment were allocated. Companies with some state participation were least constrained by the shortage of credit, but there is little evidence that they used this credit efficiently. Of the 63 corporations in which the SNI participates, only 25 had positive balance sheets in the 1980s. Amongst the 76 firms with mixed public and private ownership, whose output makes up over 50% of value added in GDP, only 43% of borrowing from the public sector was repaid in the 1980s.

In the early 1980s, there was the potential for the entry of foreign private banks into the Camerounian financial system. Indeed, the government gave much encouragement to American banks seeking to participate in the economy during the oil boom. In part, this was an attempt to release Cameroun from its "bonds of 'friendship'" with the Francophone world, giving Camerounian firms access to American savings (as American firms had to Camerounian savings!). Even with the backing of parent companies in America, however, these banks did not survive in the African financial system for long. Of the large US banks which had set up operations in 1981-2: First National Boston, Bank of America, Chase Manhattan,.....only Chase was left by 1987, and even that has now left the country.

The financial system managed to muddle through until the collapse of oil prices in 1986. That year, the government attempted to reduce its current and capital expenditure. However, the oil-dependent public sector still needed to withdraw almost FCFA 100bn. from private banks in order to meet "emergency needs", such as the wage bill of the well-salaried public sector. Arrears to banks had reached almost FCFA 250bn. by 1988. The banks reacted by repatriating foreign assets and drawing on foreign credit lines. This led to an increase in foreign debt of around $500mn. In 1987, Parliament authorised the President to borrow $900mn. from abroad. An agreement with the IMF became necessary, and in September 1988 the President signed an accord which made provision for the rescheduling of Camerounian debt. In an attempt to restrict the outflow of private funds from the economy, quantity restrictions were placed on currency exports: the upper limit

is FCFA 20th.

Clearly, the financial crisis in Cameroun cannot be ascribed solely to the government's handling of the oil revenue. However, repatriation of public savings held in the USA may well have mitigated the problems which the country now faces. In particular, it would be useful to analyse the impact of credit constraints on economic growth in the 1980s, and especially on investment. One possibility is that if government assets held secretly in the USA had been repatriated (or if the funds had never been exported in the first place), then more credit would have been available to fund private investment.

This brings us to the second question above, concerning the optimal policy response of the Camerounian government. The theoretical macroeconomic analysis points to the optimality of higher investment in Cameroun in the early 1980s, and a lower level of net foreign assets. If the revenue from the oil boom were to be channelled into the domestic economy, then it would have to be used for government investment or left to the private sector and the vagaries of the Camerounian financial system. Both these strategies are likely to have drawbacks.

There is an example of an African oil exporter which has financed government investment with windfall revenue: Nigeria. However, Nigeria's handling of its resources has also been disastrous. The national ICOR for Nigeria between 1980 and 1987 is estimated to have been -7.7[10]. This compares poorly with other countries in the region: in the same period, the Ivorian ICOR was 9.4, and the Camerounian ICOR 3.3. Evidently, it would have done Cameroun no good at all to follow the Nigerian path.

The question then is, would more credit in the banking system have led to higher investment, given the imperfections abounding there? One way to investigate this question is to examine in more detail the links between domestic investment and the volume of credit in the banking system. In subsequent sections, we will explore these links, in order to compare the likely return to channelling the oil windfall into the domestic economy with the actual return to increasing net foreign assets.

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[10] World Bank Trends in Developing Economies (1989)

2. Modelling investment and credit in Cameroun

As noted in the previous section, the contraction of medium and long term credit (CRE)[11] coincided with the fall in investment growth. In assessing the possibility of a causal connection between banks' credit supply and the level of real gross domestic investment, a number of points need to be remembered, and taken into account in constructing a model of investment.

i) The fall in credit supply could a priori be a result of a fall in demand. For example, in a multiplier-accelerator model of the business cycle, we would expect investment and therefore corporate demand for credit to decline as industrial output *growth* fell, leading in a fall in the ratio of credit to the *level* of output. In order to assess the impact of credit policy on investment, and the direction of the causal link, it will be necessary to specify an econometric model of I similar to those used for Cote d'Ivoire, Senegal and Ghana in chapter 5.

ii) Bank credit is not, of course, the only source of funds for investment. Besides savings channelled through the banking system, there are retained profits (i.e., corporate savings) for the healthier enterprises, public funds (i.e., government savings) for parastatals and firms with mixed ownership, and foreign borrowing for firms with access to international capital markets or aid agencies. Total domestic investment is likely to be determined by the interaction of these different sources of funds.

iii) However, it is not possible to make clear disaggregations between different types of corporations, for example, between the public and private sector, and say that a particular type of corporation relies on a particular type of funding. Parastatals have relied on all of the kinds of funding mentioned above, as have many large firms with mixed or private ownership. Thus, policy with respect to bank credit could affect all types of firm.

With these issues in mind, we can construct a model similar to that of the models

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[11] In the following analysis, medium term credit (with a maturity of between three months and two years) and long term credit are aggregated. In fact, the results are being driven by changes in medium term credit, which makes up 20-30% of total credit, rather than by long term credit, which makes up less than 1%.

for investment in Cote d'Ivoire and Kenya in chapter 5. The dependent variable is private (i.e, not central government) capital formation at constant prices, for 1968-88, constructed from central government capital expenditure and gross domestic capital formation series in the World Bank World Tables and UNECA Yearbooks. This sample size leaves enough observations for a general model of investment, but with the period of declining credit (1981-88) still a large fraction of the sample period, so the effects of credit constraints are not likely to be swamped by other explanatory variables. An aggregate measure of investment is chosen, including public sector investment. The impossibility of separating public and private corporate activity in other CFA members, even at the level of the individual firm, has already been noted in chapter 5. In the case of Cameroun, noting that here too there are many large firms with mixed ownership, we choose to leave investment disaggregated because:

i) the disaggregated data for investment in the Notes Annuelles de Statistique are unreliable. Addition to capital stock ("augmentation de capital") is recorded by sector, apparently on the basis of notaries' audits. However, the total addition to capital stock based on these figures is around 10% of gross domestic investment!

ii) as noted above, the differences between the various sectors with respect to sources of funding is one of degree, not of kind. No sector, even amongst entirely state owned firms, can be assumed a priori to be free of credit constraints. If data were available, it would be useful to compare the coefficients on the determinants of investment for different sectors. Nevertheless, the aggregate estimates of the model below will be a good indication of the factors influencing a typical firm.

The econometric model is based on the theory discussed in chapter 4. Some firms have access to international funds, and are unconstrained by domestic credit markets. Others may have to rely on domestic funds for investment, whether these are in the form of deposits on the basis of which banks lend to firms, retained profits or credits from central government. The distinguishing feature of the model which follows is that attention is focused on one particular type of saving, the saving which is channelled through the domestic banking system. Fortunately, there exist in Cameroun enough data to make banking credit an explicit part of the empirical model.

The structure of the model of Cameroun is similar to that of Cote d'Ivoire in chapter

5. In the long run, there will be a capital account constraint which entails $I_P + I_G = S$. The problem we have with Cameroun is that S is difficult to measure, since much of the oil revenue saved by the government is unrecorded. However, since private investors do not have access to the unrecorded public saving, which officially does not exist, it is still sensible to look for a long run relationship between I_P and S, although the a priori imposition of coefficients equal to unity is no longer appropriate.

Having estimated a long run relationship between these two variables, it will be possible to estimate an equation for $\Delta \ln I_P$. This equation will indicate the determinants of investment away from long run capital account equilibrium. If there is imperfect access to international financial markets, then there will be a significant coefficient on $\Delta \ln S$, as in the previous chapter. In addition to measuring the impact of total gross domestic savings on investment, we also need to measure the health of the domestic banking sector. The hypothesis to be tested is that a fall in the volume of credit to firms for a given level of domestic saving will have a negative impact on domestic investment. If this is the case, then there are grounds for criticising BEAC policy in Cameroun. The imposition of credit ceilings means that savings are not being channelled into investment activities. Bank credit is measured as medium and long term credit (CRE). In the investment equation, the explanatory variable used is $\Delta \ln CRE$.

Thus, investment is modelled as a function of savings and credit growth (capturing the extent to which domestic firms are constrained by domestic funds), and of international interest rates and input and output prices (capturing the behaviour of firms with access to international capital markets). Prices and savings are expressed as fractions of the GDP deflator (see chapter 5 for a discussion of alternatives). The savings series is instrumented on income, inflation and nominal interest rates, as described below. Income and price terms are instrumented on international prices.

Again, an error correction process is used to model savings in Cameroun. The model is reported in Table 6.1. The theoretical basis for this model is discussed in chapter 4. Savings are co-integrated with income (real terms of trade adjusted GDP) and with the rate of inflation (the rate of change of the CPI), and the nominal interest rate (the central bank discount rate). The possible reasons for this seemingly perverse relationship between savings and the real interest rate have been discussed in chapters 4 and 5. Note again that the coefficient on lnINC is quite large (around 2.5). Since the average savings ratio is

around 0.2 during the oil boom period, this implies a marginal propensity to save of around 0.5 during the boom.

The resulting error correction term is a significant explanatory variable in a model of $\Delta \ln S(t)$, which performs well according to the standard diagnostic tests (see Table 6.1).

Now investment can be modelled as a function of savings. The investment equations are reported in Table 6.2. As in chapter 5, the dependant variable is $\Delta \ln I(t)$. In accordance with the discussion above, a levels regression of $\ln I_p$ on $\ln S$ is estimated as a basis for the ECM. This is reported in Table 6.2. In the static long run solution, the coefficient on $\ln S$ (0.97) is not significantly different from unity, and there is no significant constant term. That is, in the long run, private investment tends towards reported gross domestic saving. This is consistent with the hypothesis that there is an extra component of government saving which is unrecorded, and which can be used to finance government activity. The error correction term used is $[\ln I_p - \ln S]$.

The error correction term appears in the model for $\Delta \ln I_p$ along with the credit availability term, $\Delta \ln CRE$. As in chapter 5, the other possible explanatory variables are $\Delta \ln p$, $\Delta \ln P_I$, $\Delta \ln P_O$, $\Delta \ln TOT$, $\Delta \ln(1+r)$ and VAR (see chapter 5 for definitions). There are not enough degrees of freedom for an AD(1) model of $\Delta \ln I(t)$, so some variables must be omitted from the first equation. $\Delta \ln(1+r)$ is omitted, not being significant when substituted for one of the explanatory variables used below. The second equation shows the result of omitting insignificant variables.

The estimated coefficients hold few surprises. Investment depends positively on credit availability, with an elasticity of 1.76, positively on gross domestic savings, with an elasticity of 0.49, and negatively on the price of oil, with an elasticity of -0.19. (Higher oil prices lead to lower gross domestic investment: the level of investment in the oil industry is unlikely to be sensitive to short run movements in the oil price, whilst manufacturing investment is likely to be sensitive.) Again, there is a significant coefficient on the VAR term, reflecting the effect of higher capital good price instability on investment. The coefficient is -0.99, which is lower than in Cote d'Ivoire.

The results suggest that there is imperfect integration of the Camerounian financial market with international markets, so present investment depends on present savings.

Moreover, investment depends not only on the quantity of funds, but also on the capacity of the domestic banking sector to manage those funds. A higher rate of growth of medium and long term credit in the banking system leads to a higher level of investment. If the rate of growth of credit were higher, then we should expect more investment. In the next section, we will use the model of section 2 to elaborate on the relationship between investment and the availability of domestic finance, and assess its implications for the magnitude of the loss resulting from the purchase of foreign assets by the government.

3. What would have happened if the oil revenue had been managed differently?

We have seen that Camerounian investment depends on domestic savings, even in the short run. Although the government's policy of saving the oil revenue in the form of foreign assets was not the only factor affecting the quantity of funds in the economy, this policy was surely a major factor. By 1984, the estimated annual oil revenue was over FCFA 400bn[12], whilst the reported level of gross domestic savings was FCFA 800bn[12]. If oil revenue had been directed into the domestic financial system over a number of years, the level of funds available for investment would have been very different. In this section, we will ask the question, What would have happened if the oil revenue transformed into foreign assets had been used to provide credit for domestic firms instead?

The opportunity cost to the economy of this alternative policy would be the loss of the returns to the foreign assets. There is reason for thinking that these returns were not substantial. Approximately 3/4 of the estimated oil revenue was banked in America. Table 6.3 shows the dollar value of this 3/4 each year, from 1982 to 1987. At the US interest rates shown, the total value of Camerounian assets in America in 1987 would have been $6953mn.

The relevant measure for the real value of the return is its dollar value deflated by the dollar import price index. Taking this approach, the value of the $6953mn in 1980 prices is $5723mn. Since the real dollar value of the outflow altogether was $5217mn, this means that $506mn was earned on the assets: a real interest rate of 9.7% for the whole period.

The benefit to the economy of the alternative policy is the increased domestic investment which results from the increased savings. For a conservative estimate, we will assume that the increased availability of funds has no impact on investment through the medium and long term credit term. The extra investment comes through extra funds measured by S. We can use the model in section 3 to simulate what this difference would have been.

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[12] At 1980 prices

Table 6.4 shows the simulation results. (Hypothetical - actual) ΔlnI is calculated for each year, on the basis of the (hypothetical - actual) ΔlnS. The latter is based on the addition of 3/4 of the oil revenue to actual S between 1982 and 1987. It can be seen that the impact of the policy difference after 1987 is negligible. For the purposes of calculation, we note that the difference between hypothetical and actual ΔlnI, is given by:[13]

$$\Delta \ln I_p\#(t) = -0.80\Delta \ln I_p\#(t-1) + 0.49\Delta \ln S\#(t) - 0.61[\ln I_p\#(t) - \ln S\#(t)]$$

where X# is the difference between hypothetical and actual X. Thus we can see what the impact on the economy would have been of retaining all or part of the exported capital from the oil revenue. From these results, hypothetical private investment is calculated.

The simulations show that the alternative policy would, over the six years, have generated additional investment in excess of FCFA 606bn at 1980 prices. Converting the nominal investment generated into dollars and deflating by the import price index, the real value of the investment is $2744mn, an implicit real return of 52.6%, to be compared with the 9.7% of exporting the funds. (The disadvantage of the former scenario is that the return is locked in investment, whereas the former can be spent on anything. However, the cost implied is unlikely to outweigh the overall benefit of a real return some four times higher than the alternative.)

These results suggest that directing the oil revenue towards domestic investment would have been a much better policy than using it to buy foreign assets. The impact on the economy of the hypothetical policy would also depend on Camerounian ICOR, which as noted above, is likely to be in the range 3-4[14].

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[13]See Table 6.4.

[14] There are detailed estimates of CFA ICORs in S. Guillaumont (1988).

5. Discussion

There is good evidence for supposing that the Camerounian government's management of the oil revenue in the 1980s was suboptimal. The real returns to holding foreign assets were probably minimal, and a much better policy would have been to redirect the money towards the domestic economy. Our criticism of the Devarajan and de Melo paper is that they do not consider the whole range of policy options open to the government: it may well be the case that buying foreign assets is better than importing consumer goods, but buying capital goods may be better than either of these alternatives.

An additional problem concerns the functioning of the domestic banking system. The severe shortage of bank credit in the late 1980s has been shown to have had a detrimental effect on investment. For a given level of domestic savings, investment in the short run is lower, the lower the volume of bank credit. To the extent that the accumulation of foreign assets starved the domestic financial system of liquidity, and led to a deterioration of the banking system, the calculations of the previous section underestimate the costs entailed by government policy.

Another issue which ought to be addressed is the allocation of credit between the different sectors of the economy. Unfortunately, there are not enough observations of allocation of CRE by sector to construct a full model of the impact of this variable on investment in each sector. A Granger-causality test, adding sectoral CRE to an A(2) model of sectoral "augmentation de capital" as reported in the Notes Annuelles for 1978-87 produced the following F statistics:

Manufacturing - $F(1,4) = 6.69$
Extraction - $F(1,4) = 0.65$
Agriculture - $F(1,4) = 2.67$

Adding capital accumulation to CRE produced the following results:

Manufacturing - $F(1,4) = 1.36$
Extraction - $F(1,4) = 0.20$
Agriculture - $F(1,4) = 0.22$

R^2 is not significantly reduced[15] in any case, although the F statistics are higher for the first group of tests, especially in manufacturing, suggesting that it would be worthwhile, if one had the data (and especially if one had data on investment better than "augmentation de capital"!), to pursue the argument that in some sectors (more than others) firms are constrained by restrictions on the supply of credit.

Apart from these purely economic issues, it is also important to ask the question, Why did the Camerounian government act in the way it did? There is obviously a great deal of resentment amongst Camerounian administrators for the BEAC regulations which constrain their policy choices. There is a great deal of political complexity within the BEAC administration itself, with regional Camerounian officials criticising the policy of the central administration. A desire to exercise financial autonomy has led to the government worsening one of the perceived ills of the Franc Zone system: excessive limitation of credit facilities. That the central bank is perceived by a member state to be an enemy rather than a friend reveals political weaknesses in the Franc Zone, which have prevented it from achieving its avowed aim of facilitating the economic growth of its members.

[15] I.e., none of the F statistics are significant at 5%

TABLE 6.1

Modelling LS by OLS

The Sample is 1968 to 1988

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
LS 1	.07998	.23184	.40463	.34496	.0091
LINC	3.02531	.72959	1.31923	4.14657	.5695
LINC 1	-.55584	.67719	.94081	-.82081	.0493
L(1+π)	.03754	.00912	.01241	4.11537	.5657
L(1+π) 1	.00113	.00755	.01894	.14918	.0017
L(1+r)	-.06172	.05196	.05030	-1.18792	.0979
L(1+r) 1	-.07779	.08887	.13207	-.87532	.0557
CONSTANT	-12.48302	4.20384	6.84460	-2.96943	.4041

R^2 = .9718184 σ = .1444251 F(7, 13) = 64.04 [.0000] DW = 2.491

RSS = .2711617681 for 8 Variables and 21 Observations

Information Criteria: SC = -3.189744; HQ = -3.501300; FPE = .028805

R^2 Relative to DIFFERENCE+SEASONALS = .80882

Solved STATIC LONG RUN Equation

LS = 2.684 LINC + .042 L(1+π) - .152 L(1+r)

(.41213) (.01000) (.07949)

- 13.568

(2.55052)

WALD Test Chi^2(4) = 16521.084

Tests on the Significance of each Variable

Variable	F[NUM,DENOM] =	Value	Probability	Unit Root t-test
LS	F[1, 15]	.119	.735	-3.968
LINC	F[2, 15]	9.002	.003	3.192
L(1+π)	F[2, 15]	8.738	.003	2.972
L(1+r)	F[2, 15]	1.781	.202	-1.675
CONSTANT	F[1, 15]	8.818	.010	

DW on ECM = 2.25

Modelling DLS by OLS

The Sample is 1969 to 1988

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLS 1	.07200	.20591	.23099	.34968	.0110
DLINC	3.48106	.52062	.39999	6.68633	.8025
DLINC 1	-.77230	.70776	.73805	-1.09119	.0977
DL(1+π)	.03525	.00618	.00518	5.69972	.7470
DL(1+π)1	.00573	.00630	.00552	.90902	.0699
DL(1+r)	-.10427	.05584	.03358	-1.86731	.2407
DL(1+r)1	.03110	.07072	.05404	.43976	.0173
CONSTANT	.04526	.04482	.03990	1.00976	.0848
ecm 1	-1.25933	.30680	.26547	-4.10469	.6050

R^2 = .8852994 σ = .1216135 F(8, 11) = 10.61 [.0003] DW = 2.326

RSS = .1626883100 for 9 Variables and 20 Observations

Information Criteria: SC = -3.463572; HQ = -3.824182; FPE = .021445

R^2 Relative to DIFFERENCE+SEASONALS = .93630

Testing for Serial Correlation

CHI^2(1) = 3.253 and F(1,10) = 1.94 [.1936]

ARCH TEST

CHI^2(1) = .397 with F(1,9) = .19 [.6715]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .415

Modelling DLS by OLS
The Sample is 1969 to 1988

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLINC	3.35624	.43167	.30702	7.77508	.8012
DL(1+π)	.03499	.00587	.00475	5.96536	.7035
DL(1+r)	-.06562	.04141	.03521	-1.58471	.1434
CONSTANT	.00635	.03223	.03049	.19718	.0026
ecm 1	-1.25184	.24000	.24238	-5.21591	.6446

R^2 = .8513989 σ = .1185388 F(4, 15) = 21.49 [.0000] DW = 2.163
RSS = .2107718356 for 5 Variables and 20 Observations
Information Criteria: SC = -3.803778; HQ = -4.004117; FPE = .017564
R^2 Relative to DIFFERENCE+SEASONALS = .91747

Testing for Serial Correlation
CHI^2(1) = 2.040 and F(1,14) = 1.59 [.2279]
ARCH TEST
CHI^2(1) = .842 with F(1,13) = .60 [.4515]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = .396

Modelling DLS by OLS
The Sample is 1969 to 1988 less 4 Forecasts

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLINC	3.50888	.62641	.36082	5.60159	.7404
DL(1+π)	.03642	.00936	.00950	3.89026	.5791
DL(1+r)	-.04925	.06480	.11235	-.76010	.0499
CONSTANT	.00139	.04568	.04816	.03043	.0001
ecm 1	-1.19661	.28605	.28353	-4.18323	.6140

R^2 = .8192766 σ = .1241689 F(4, 11) = 12.47 [.0005] DW = 1.766
RSS = .1695969504 for 5 Variables and 16 Observations
Information Criteria: SC = -3.680485; HQ = -3.909556; FPE = .020236
R^2 Relative to DIFFERENCE+SEASONALS = .92542

Tests of Parameter CONSTANCY over: 1985 - 1988
Forecast Chi^2(4)/ 4 = .83
CHOW TEST F(4,11) = .67 [.6277]

Testing for Serial Correlation
CHI^2(1) = .096 and F(1,10) = .06 [.8107]
ARCH TEST
CHI^2(1) = .262 with F(1,9) = .16 [.6984]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = .472

TABLE 6.2

Modelling LIp by OLS

The Sample is 1967 to 1988

VARIABLE		COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
LIp	1	.86525	.17805	.10121	4.85961	.5542
LS		.47125	.16177	.16744	2.91310	.3087
LS	1	-.34089	.16760	.16322	-2.03393	.1788

R^2 = .9990522 σ = .1700136 F(3, 19) = 6675.99 [.0000] DW = 1.776

RSS = .5491878029 for 3 Variables and 22 Observations

Information Criteria: SC = -3.268851; HQ = -3.382582; FPE = .032846

R^2 Relative to DIFFERENCE+SEASONALS = .30107

Solved STATIC LONG RUN Equation

LIp = .967 LS

(.05769)

WALD Test Chi^2(1) = 281.266

Modelling DLIp by OLS

The Sample is 1969 to 1988

VARIABLE		COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLIp	1	1.45900	.86180	.87041	1.69296	.3644
DLp		.39883	.45253	.38021	.88133	.1345
DLp	1	-.49764	.79644	.77298	-.62483	.0724
DLPI		-2.47583	1.35676	.92875	-1.82481	.3998
DLPI	1	1.26586	1.00005	1.00687	1.26579	.2427
DLPO		-.20081	.11204	.08771	-1.79222	.3911
DLPO	1	.21361	.17950	.17476	1.19003	.2207
VAR		.22600	.16000	.13200	1.41732	.2866
VAR	1	-.34100	.18400	.14700	-1.85252	.4070
DLCRE		2.58458	.76254	.77862	3.38941	.6968
DLCRE	1	-.65742	.77255	.98031	-.85097	.1265
ecm*	1	-1.36658	.67011	.67326	-2.03934	.4541
CONSTANT		-.60874	.25936	.26495	-2.34709	.5242
DLS		1.12029	.44766	.47596	2.50255	.5561
DLS	1	-.64242	.53407	.50304	-1.20288	.2244

R^2 = .9312194 σ = .1039398 F(14, 5) = 4.84 [.0459] DW = 1.739

RSS = .0540174145 for 15 Variables and 20 Observations

Information Criteria: SC = -3.667382; HQ = -4.268398; FPE = .018906

R^2 Relative to DIFFERENCE+SEASONALS = .96244

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .215

Modelling DLIp by OLS
The Sample is 1969 to 1988

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLPI	-.79977	.27285	.34654	-2.93115	.3979
DLPO	-.18752	.06908	.06033	-2.71459	.3618
VAR 1	-.99000	.40000	.37000	-2.46645	.3188
DLCRE	1.76483	.30965	.30286	5.69946	.7142
ecm* 1	-.61284	.14606	.14722	-4.19566	.5752
CONSTANT	-.32002	.07287	.07129	-4.39168	.5974
DLS	.48882	.09428	.08619	5.18494	.6741

R^2 = .8555057 σ = .0934302 F(6, 13) = 12.83 [.0001] DW = 1.410
RSS = .1134796913 for 7 Variables and 20 Observations
Information Criteria: SC = -4.123357; HQ = -4.403832; FPE = .011784
R^2 Relative to DIFFERENCE+SEASONALS = .92110

Testing for Serial Correlation
CHI^2(1) = .238 and F(1,12) = .14 [.7106]
ARCH TEST
CHI^2(1) = .625 with F(1,11) = .37 [.5533]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = 1.681

Modelling DLIp by OLS
The Sample is 1969 to 1988 less 4 Forecasts

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLPI	-.78766	.35615	.44208	-2.21162	.3521
DLPO	-.17898	.09069	.09105	-1.97350	.3020
VAR 1	-1.11000	.53000	.56000	-2.07821	.3243
DLCRE	1.86874	.40507	.37581	4.61338	.7028
ecm* 1	-.60545	.19058	.19448	-3.17689	.5286
CONSTANT	-.32623	.09220	.08075	-3.53819	.5818
DLS	.44825	.12380	.12394	3.62093	.5930

R^2 = .8127329 σ = .1055616 F(6, 9) = 6.51 [.0068] DW = 1.363
RSS = .1002893485 for 7 Variables and 16 Observations
Information Criteria: SC = -3.859277; HQ = -4.179976; FPE = .016018
R^2 Relative to DIFFERENCE+SEASONALS = .91670

Tests of Parameter CONSTANCY over: 1985 - 1988
Forecast Chi^2(4)/ 4 = .39
CHOW TEST F(4,9) = .30 [.8734]

ARCH TEST
CHI^2(1) = 1.237 with F(1,7) = .63 [.4537]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = 1.092

TABLE 6.3: ESTIMATED RETURNS TO US ASSETS

	(1)	(2)	(3)
1982	788.3	12.35	788.3
1983	887.5	9.09	1773.2
1984	1007.1	10.87	2941.4
1985	1116.9	8.05	4378.0
1986	812.3	6.52	5542.8
1987	602.3	6.86	6506.4
1988			6952.8

1: estimated flow of oil revenue to USA, in $mn (3/4 of total oil revenue)

2: nominal US certificate od deposit interest rate (%)

3: resulting estimate of the total value of Camerounian assets, in $mn

TABLE 6.4: HYPOTHETICAL RETURN TO ASSET REPATRIATION

	Fbn 1980			
	Actual	Hypothetical	Difference	Difference ($mn 1980)
Saving	420	605	185	
	564	785	221	
	679	785	221	
	693	996	303	
	505	691	186	
	332	448	116	
Inv	338	404	66	289
	353	465	112	493
	305	414	109	455
	334	481	147	564
	299	415	116	508
	207	283	76	435

FIGURE 6.1 - (1) TOTAL LONG / MEDIUM TERM AND (2) SHORT TERM CREDIT
(FCFABN, 1980 PRICES)

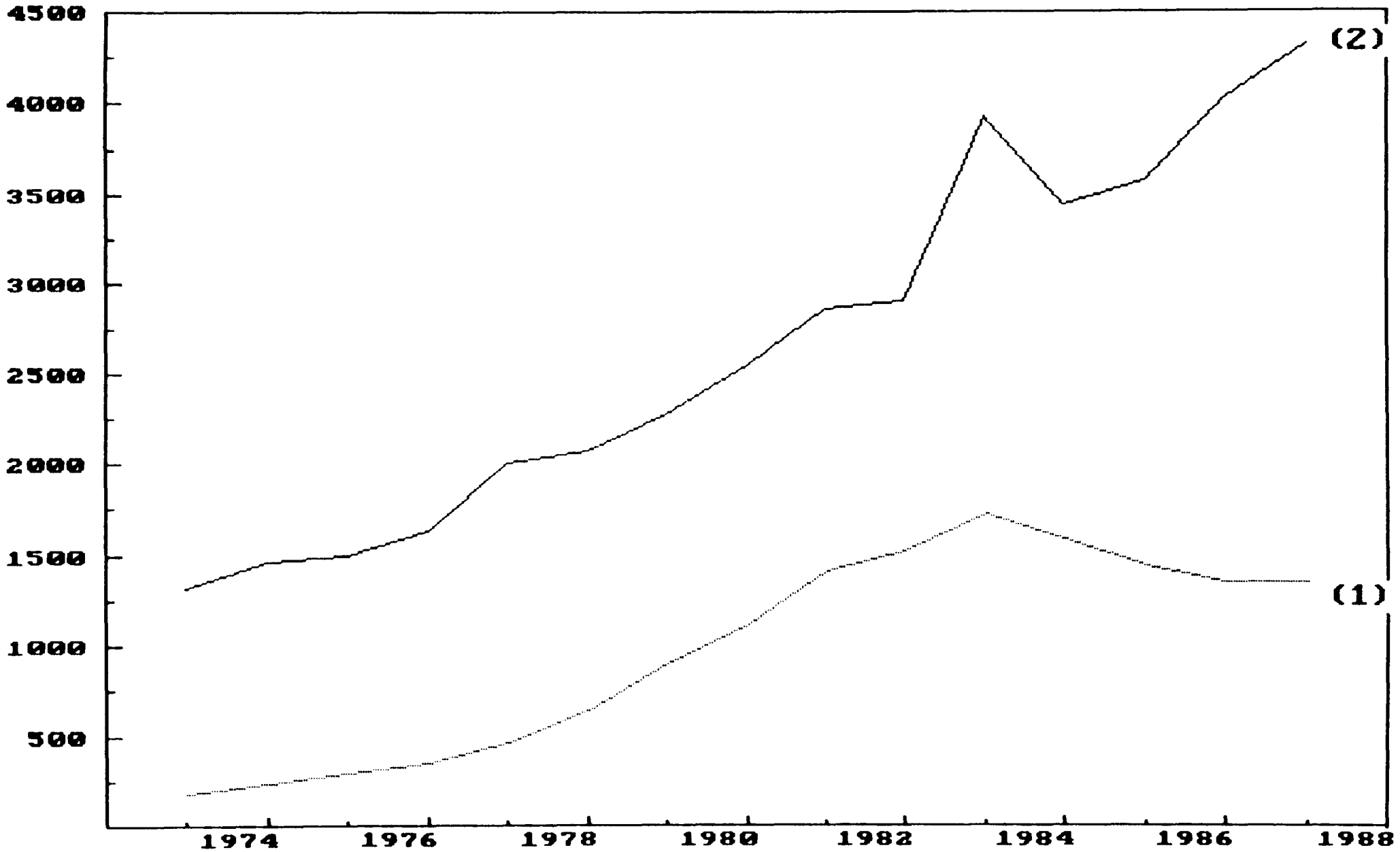


FIGURE 6.2 - REAL GDI (FCFABN, 1980 PRICES)

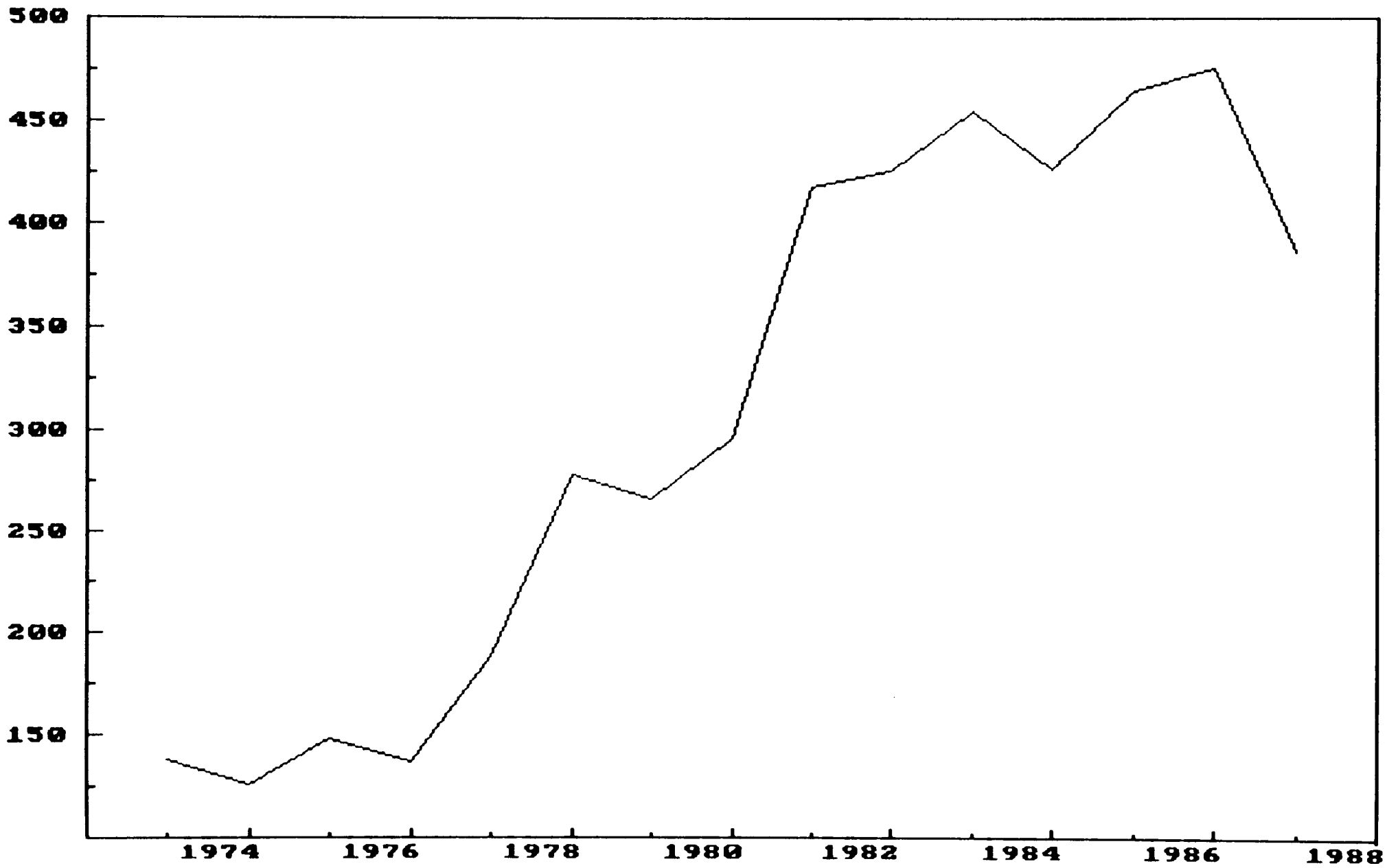
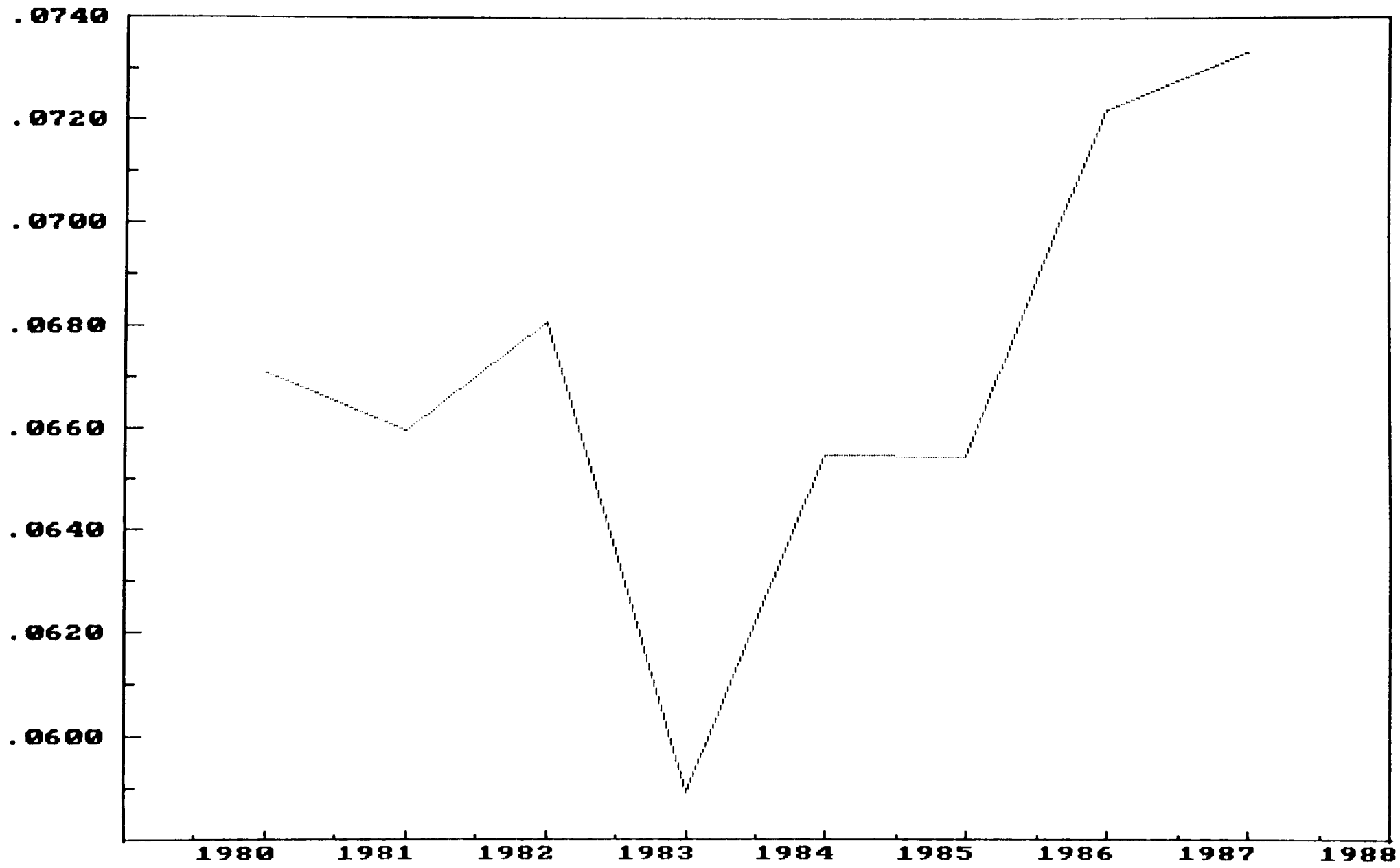


FIGURE 6.3 - RATIO OF PLAFOND D'AVANCES (LONG / MOYEN TERME) TO MLTC



CHAPTER 7

THE ROLE OF RELATIVE PRICE STABILITY ACROSS AFRICA

THE ROLE OF RELATIVE PRICE STABILITY ACROSS AFRICA

In previous chapters, we have seen that in certain countries investment is affected by the instability of capital goods prices, this instability reflecting the variability of returns to investment. Now it is not possible to investigate the time series relationship between investment and variability of returns in all African countries, since in many countries the data as wanting. However, it is possible to study the link between investment and variability using cross-country data, and so to widen the scope of our investigation. The factors which explain differences in rates of investment between countries are not necessarily the same as those which explain differences in one country over time; but we can ask whether the variability of returns is important in both cases. If we also find that variability is lower in the Franc Zone, then we have one explanation for the cross-country results which show that investment in the Franc Zone is higher.

This is not the end of the story, however. It remains to be shown why variability is lower in some countries than in others. Attention has often been drawn to the fact that Franc Zone members have a nominal exchange rate which is fixed with respect to a major western economy (see chapter 1). However, a fixed nominal exchange rate does not entail fixed relative prices (a fixed "real" exchange rate), whether these are consumer good prices or capital good prices. For any domestic price of an internationally traded good, p, and equivalent foreign price, p*, the relative price will be p/ep*, where e is the nominal exchange rate[1]. p* is likely to be exogenous from the point of view of a small domestic economy, but there is no a priori reason why p should not be determined by the "law of one price", p/ep* = 1. In this case, the process which determines e has no effect on the relative price, which is constant at unity. Again, if p is not flexible, then having a fixed e is unlikely to lead to greater relative price stability when p* is variable. There are cases in which a fixed e corresponds to stability of p/ep*, for example when both p and p* vary little, but a floating e is likely to be highly volatile. However, it remains to be shown that this is the case which corresponds to the experience of African economies.

[1] I.e., the price of foreign exchange in terms of the home currency. Outside the CFA, e is typically either floating, or subject to discretionary changes by the government.

On the other hand, there are reasons why the law of one price should not hold, even with flexible domestic prices. Tariffs and quotas will drive a wedge between p and ep*, and the good may not be a perfect substitute for any internationally traded commodity. In these cases, it would be interesting to know whether the commercial and financial institutions of the CFA have some effect on the determination of domestic prices, if only in limiting domestic governments' ability to impose tariffs and quotas. If membership of the Franc Zone does indeed lead to lower relative price instability, and in particular to lower variability of relative returns to investment, we will need to investigate which of the Zone's institutions is responsible for this effect.

1. Determinants of investment in Africa

In the first part of this chapter, we will present a cross-country model of gross domestic investment, using data from the World Bank World Tables (1989-90) and Debt Tables (1989).[2] There are a number of existing cross-country models of investment in the literature, which employ a wide range of variables to explain differences in investment between countries.[3] The model below is in the same style as these, using explanatory variables which have been significant in previous studies, and in addition, an index of the variability of returns to investment.

The dependent variable in the equations is a measure of gross domestic investment, calculated for each country as an average for the period 1970-87. (This period is chosen because 1970 is the first year for which comprehensive debt tables exist, and 1987 is the last in which investment is recorded in all countries in the sample.) It is possible to express gross domestic investment as a fraction of GDP - the "investment ratio", I/Y (I and Y measured in $, as reported in World Bank World Tables[4]), or as a fraction of total population - "per caput investment", IPC. Note that the investment ratio is an average of I/Y for each year, rather than the ratio of total gross investment for the period to total income, though substituting the latter for the former does not significantly alter the results. We consider both I/Y and IPC below; the two measures turn out to produce comparable results.

The following variables appear on the RHS of the equations:

i) the ratio of the $ value of exports to GNP (X/Y). A higher X/Y will mean more foreign exchange, and so more funds available for the importation of capital goods. (Here, there is an implicit acknowledgement of the existence of foreign exchange rationing,

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[2] All Sub-Saharan African countries for which data for the sample period exist are included in the model. These are, in the Franc Zone: Benin, Burkina Faso, Cameroun, Congo, Centrafrique, Cote d'Ivoire, Mali, Niger, Senegal, Tchad and Togo; outside the Franc Zone: Botswana, Burundi, Ghana, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mauritanie, Maurice, Nigeria, Sierra Leone, Somalia, Sudan, Tanzania, Zaire, Zambia and Zimbabwe.

[3] See for example S. Guillaumont (1988a).

[4] The dollar value of a variable is taken to be its current domestic currency value converted at the official exchange rate. This will misrepresent the true value of the variable to the extent to which there is forex rationing. However, parallel exchange rates are not available in all countries in all years, so the official rate is used in all cases.

although this is never made explicit in existing studies: if a country's currency is fully convertible, then the share of forex-earning activities in total production will not affect the ability of firms to buy capital goods.) X/Y is calculated as an average for the period 1970-87.

ii) the $ value of total debt as a fraction of GNP (D/Y). This variable too indicates the availability of funds for investment, this time in the form of foreign lending. The higher the level of foreign lending, the more funds are available for investment. (This assumes that a constant fraction of foreign lending is being allocated to investment activities.) Note that total debt is a stock of credit, not a flow, so it is inappropriate to calculate an average D/Y for the sample period. Since debt in 1970 is negligible for all countries, D in 1987 represents the sum of past flows. Dividing D by 18 would therefore produce a figure for average annual flow. However, scaling of D by an arbitrary constant does not affect the statistical model, so D in 1987 is used as the explanatory variable, divided by average Y for the period.

iii) $ per caput GNP (GNPPC). If higher output levels are correlated with higher investment (this relationship depends on the value of the ICOR), then the appropriate dependant variable is IPC. If higher income per caput entail higher I/Y, as a wealthier community allocates more of present income to investment, then the appropriate dependant variable is I/Y.

iv) The ratio of extractive industries output to agricultural output (M/A). In countries where this is high, with a heavy reliance on the extractive sector, investment may be higher just because their natural resources favour activities which are very capital intensive. This is true independently of the size of the manufacturing sector, which may be endogenous. The ratio is calculated as the constant price value of extractive industries output as a fraction of the constant price value of agricultural output, in order to produce an index of relative quantities.

v) The variability of returns to investment. This variable is analogous to that used in the time series equations in chapters 4 and 5. The interpretation is the same: in countries where variability is higher, the prices which trigger entry into investment activities will be higher, and actual investment correspondingly lower, because of the hysteresis effects already discussed.

The calculation of the variable is also analogous. For each year of the sample period, a "foreign capital price" eP_I^* is constructed for each African country outside the Franc Zone, where

$$eP_I^* = \Sigma w_i e_i P_{Ii}, \ \Sigma w_i = 1$$

P_{Ii} being an index of the gross domestic investment deflator in the country's i^{th} trading partner, e_i the price of this partner's currency and w_i its share in the country's non-primary imports, this being a proxy for its share in export of physical or financial capital to the country. The weights are calculated from the UN Yearbook of International Trade Statistics (1988). The domestic investment deflator, P_I, is divided by eP_I^*, and expressed as an index with 1980 = 1. The measure of variability, VAR, is the average of $|\Delta P_I/eP_I^*|$ between 1971 and 1987. The weights w_i are listed in Table 7.1. For the Franc Zone, $w_{FRANCE} = 1$, reflecting the dominance of France in the CFA financial system.

Again, one may point out that P_I represents the marginal return to investment (qua the marginal Tobin's Q) under certain conditions (see chapters 4-5), which may or may not be fulfilled. Even if the conditions are not fulfilled, P_I represents a major component of investment profitability, and so ought to be important in investment determination.

This model does not have the elaborate structure of the time series models of earlier chapters, simply explaining differences in investment between countries by a number of general economic indicators for which data are readily available for a wide selection of Sub-Saharan African economies. It would be extremely rash to interpret the coefficients as investment elasticities (in, for example, using the parameters estimated to calculate hypothetical levels of investment for a country for different hypothetical values of the explanatory variables). However, between them, these variables are able to explain most of the variation in investment from country to country.

There is no obvious functional form for this type of estimation. In order to see whether non-linearity makes a difference, and whether a logarithmic model is more appropriate than a model in simple levels, the following approach was used. The model is estimated in four basic forms, using either I/Y or IPC, and either a quadratic or a log-quadratic equation.

We might reasonably be worried about collinearity in the case of two of the explanatory variables, GNPPC and D/Y, which may depend on the level of investment rather than vice versa. However,in all countries, privately funded debt actually makes up a small proportion of total debt. Most lending is lending from governments and multinational agencies, such as the World Bank and the IMF. It is reasonable to suppose that such international borrowing is supply constrained: at the interest rates at which the lending takes place, debtor governments would like to engage in more net borrowing (if this were not so, the multinational agencies would not be able to impose extra conditions on the governments, for instance, structural adjustment programmes). The CFA Operations Accounts are an exception, but they are coming to make up an increasingly small fraction of total CFA debt, and eleven Franc Zone members are now engaged in structural adjustment programmes. The magnitude of borrowing depends on the IMF's supply curve. The maintained hypothesis is that this supply curve is independent of the other explanatory variables.

There is no obvious solution to the problem of endogeneity of GNPPC: it is difficult for example to find instruments adequate for estimating GNPPC across countries. However, since GNPPC is sometimes an important explanatory variable, it is included in the equations below; it is recognised that ensuring the independence of the GNPPC term would be an improvement on the models below. The relative price variability term is also treated as independent. As we will see later, relative price variability does depend on a number of government policy choices, but it is unlikely to be affected by the other variables in the equations here.

Tables 7.2-7.5 present the results of the estimation, with the unrestricted general form of each equation, and a final model from which insignificant variables have been omitted. In certain cases, dummy variables are included for Niger and Sudan, since these countries tend to represent outliers which make the error terms non-spherical.[5]

Using IPC produces a better fit than using I/Y, although most of the variability in I/Y across countries can also be explained. The two variables which are of universal importance in the models are D/Y and VAR. Again, there is support for the hypothesis that variability in the returns to investment reduce levels of investment, with significant

[5] See Chow (1987) for a discussion of alternatives ways of correcting for non-normality of the error term.

negative coefficients on VAR in all models: countries with a higher VAR tend to have lower investment rates. GNPPC and M/A account for much of the variation in per caput investment between countries; the ratio of exports to GDP is more important in explaining the cross country variation in the investment ratio. Note that this type of cross country model does not produce parameters which are country-specific, and it is not appropriate for the calculation of investment elasticities: the parameters of the model should not be used to predict what investment in Mali would have been, had Malian M/A for the sample period been 10% higher. However, the model does indicate some of the factors which are important in explaining why investment is different in different countries.

Tables 7.6-7.7 show the values of explanatory variables used in the estimation of I/Y and IPC: X/Y, GNPPC, D/Y and VAR. Also included is PD/Y, measuring that part of D/Y which comes from private creditors (i.e., loans other than those form multilateral aid agencies and individual governments). They show that neither per caput income nor the ratio of primary commodity exports to GDP in the Franc Zone are significantly different from the average for the rest of Sub-Saharan Africa. Given the wide disparity in natural resources in both groups of country, this is not surprising. Nor is the average value of the residual for CFA members in each estimated equation significantly different from zero (the mean is less than 0.2 times the standard deviation), so there is no evidence for a hidden "X" factor favourable to Franc Zone members. There must then be another explanation for the higher investment in the Franc Zone.

The tables show that privately financed credit (as a fraction of GNP) is higher on average in the Franc Zone than in the rest of Africa.[6] However, this difference depends on a very high ratio in just three countries: Benin, Congo and Cote d'Ivoire. Elsewhere in the Franc Zone, the ratios are not significantly different from the average for the rest of Africa. Moreover, there is no significant difference between the ratios of total debt to GNP in the two groups: in fact, the ratio for the rest of Africa is very slightly higher. Total credit is dominated by credit from public sources, and these sources do not favour the Franc Zone.

The one variable for which a difference does appear is VAR, as Table 7.8 shows.

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[6] One possible explanation for this is that privately funded credit is influenced by VAR.

The average value of VAR for the CFA is 0.091; for the rest of Africa it is 0.131.[7] The only Franc Zone countries with a value of VAR higher than the average for the rest of Africa are Benin and Niger. The others enjoy returns to investment which are markedly more stable than is typical for Africa, even in the economies of the Sahel, where investment is very low because of the scarcity of natural resources (which shows up in the regressions as low X/Y and low GNPPC): Burkina, Mali, Senegal and Tchad. Here there is a definite benefit from Franc Zone membership. An explanation for the higher rates of investment in the CFA must include an account of what it is that generates this stability.

[7] Both groups of countries have a standard deviation of VAR = 0.065, which yields a t ratio for a test of the significance of the difference between the two means of $t_{27} = 1.608$, which is significant at 15%.

2. Determinants of VAR

As a first step in investigating the relationship between Franc Zone membership and the variability of returns to investment relative to the return to investment in the West, it is useful to look at the components of the measure of variability. In particular, it is important to elaborate the role of the nominal exchange rate, e. Table 7.9 shows the value of three variables for the non-CFA countries included in the model above: a measure of the variability of the nominal exchange rate - the mean of the absolute value of the first difference of e ($\mu_{|\Delta e|}$), the coefficient of correlation for e and P_I/P_I^* and the correlation coefficient for $|\Delta e|$ and $|e - P_I/P_I^*|$.[8]

Corr(e, P_I/P_I^*) is between 0.85 and 1.00 for most of the countries in the table. This is because the money supply is expanding very rapidly in most countries, so there is high domestic inflation, including inflation of P_I, and upward pressure on e, to which e responds, at least to an order of magnitude. There are two exceptions, countries with no significant correlation between e and P_I/P_I^*: Burundi and Mauritanie. Note that these are two of the countries with a value of VAR greater than 0.2: in these countries, neither the nominal exchange rate nor P_I respond to a rise in P_I^*, so P_I/eP_I^* can stray a long way from parity. In the case of e, this is to be expected, because the nominal exchange rate is being driven by other relative prices (for example, of consumer goods), and is subject to government intervention. In the case of P_I, it may be the result of some imperfection in the capital goods market. The possible nature of such imperfections will be discussed below.

$|e - P_I/P_I^*|$ is included in order to discriminate between the other countries. It is a measure of exchange rate misalignment, assuming that there is no misalignment in 1980.[9] One hypothesis is that misalignment will be greater when e and P_I/P_I^* are moving more quickly, i.e., when $|\Delta e|$ is higher.[10] P_I may always adjust so that it is approximately equal

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[8] Both e and P_I/P_I^* are defined so that they are equal to unity in 1980. $e = \Sigma w_i e_i$, $P_I^* = \Sigma w_i P_i$.

[9] $|e - P_I/P_I^*|$ measures exchange rate misalignment on the assumption that there was no misalignment in 1980. In fact, it matters little what base year between 1970 and 1980 is used: in all cases, $|e - P_I/P_I^*|$ turns out to be very small in the 1970s and much larger in the 1980s. The important assumption we are making is that there was negligible misalignment from 1970 to 1980, and increasing misalignment after that. The consensus of economic opinion is that this was the case - as demonstrated by the rapidly expanding gap between official and black market exchange rates for African countries in the last few years.

[10] Since e and P_I/P_I^* are so highly correlated, using $|\triangle P_I/P_I^*|$ instead of $|\triangle e|$ in the correlation coefficient produces very similar results. Both indicate the speed with which prices are moving.

to eP_I^*, but when both are moving rapidly, for example, when P_I^* jumps in response to an oil price shock to world markets, or when e jumps in response to an external trade shock, P_I may exhibit some inertia, having difficulty "catching up": so the magnitude of price changes is correlated with the degree of exchange rate misalignment. This hypothesis is confirmed for a number of countries: Ghana, Guinea-Bissau, Madagascar, Nigeria, Sierra Leone, Tanzania, Zaire and Zambia. Not surprisingly, it is these same countries which exhibit the highest $|\Delta e|$: in other countries, where movements in e and P_I/P_I^* are generally small, the relative inertia effect is not significant and so there is no significant correlation between the present speed of price changes and exchange rate misalignment.

Note that the very high correlation coefficients for $|\Delta e|$ and $|e - P_I/P_I^*|$ in Table 7.8 are partially due to the large rises in e (and in exchange rate misalignment) experienced in 1987. However, similar results are obtained using 1970-86 as the sample period, as Table 7.10 illustrates.

The picture we arrive at is of one or two countries (Burundi, Mauritanie) which have a high VAR because the law of one price has completely broken down, at least where capital good prices are concerned. Of the other countries with high VAR (i.e, greater than 0.15: Ghana, Guinea Bissau, Somalia, Sierra Leone and Zaire), all but Somalia seem to suffer misalignment because prices and exchange rates are moving very rapidly: in periods of rapid adjustment, e diverges from P_I/P_I^*. Nominal exchange rate variability seems to be linked to relative price variability. One explanation for this is that when e is subject to a large shock, inertia in P_I prevents immediate adjustment of P_I/eP_I^* to unity. It is important to note also that countries in which Δe is high are also ones in which the rate of domestic consumer price inflation is high. In countries where the general rate of price increase is high, there tends also to be a greater degree of relative price misalignment, as some prices exhibit more inertia than others. However, inertia is not the whole story: some countries have a high correlation between $|\Delta e|$ and $|e - P_I/P_I^*|$ but, for Africa outside the CFA, low VAR (Madagascar, Nigeria, Tanzania, Zambia), whilst one (Somalia) has a low correlation coefficient but high VAR. We need to find some other explanation for high variability of P_I/eP_I^*.

One point which we have neglected so far is that the law of one price does not necessarily entail that $P_I = eP_I^*$. If there are import tariffs or quotas, then P_I and eP_I^* will diverge, and it will be the case that $P_I = (1 + \tau)eP_I^*$, where τ is the tariff on imported

capital goods or the implicit tariff equivalent of a quota. It may be that the lower variability of P_I/P_I^* in the Franc Zone is as much to do with lower barriers to trade as with lower nominal exchange rate variability.

No work has been done specifically on the openness of capital goods markets in the CFA. However, Geourjon (1988) presents a study of the magnitude of overall protection in Sub-Saharan Africa, using as indicators of this magnitude the following variables:

i) total customs receipts (TCR) / total govt. receipts (TRG)

ii) TCR + fiscal receipts on imports (FRI) / TRG

iii) TCR / total value of imports (TVI)

iv) TCR + FRI / TVI

There is no significant difference between the Franc Zone and the rest of Sub-Saharan Africa with respect to these four measures over the period 1979-81. However, if Franc Zone trade restrictions were less Draconian than anglophone African restrictions, result would not be not surprising, since most anglophone African governments use quotas rather than tariffs (see Bevan et al. (1990)). Implicit rents on quotas are not included in any of Geourjon's four measures, but are probably much larger than tariff revenues. Moreover, the CFA does exhibit a significantly higher degree of import penetration qua (non-fuel imports / total domestic supply) than the rest of Africa. Since most imports are industrial products, we should expect a smaller wedge between p and ep* in the Franc Zone, where p is the domestic price of industrial output and p* its international price.

No results are quoted for imports specifically of capital goods. However, UNCTAD data on tax bands for capital goods imports suggest a lower degree of protection, at least by means of tariffs, in the Franc Zone. Table 7.11 lists the recorded tax bands as of 1987: single figure percentage tariffs are typical of CFA members. The only exception is Senegal, with a rate of around 40% for most capital goods. Outside the Franc Zone, rates are more variable, and can rise beyond 75%.

It is important to note that the existence of tariffs does not in itself entail a higher

variability of P_I/eP_I^* or of p/ep^*. If the tariff is constant, then p/ep^* will ceteris paribus be equal to some constant greater than one. What generates instability of relative prices is a variable tariff, or, more plausibly, a variable implicit τ from a quota. Figure 7.1 illustrates this. With a tariff, the domestic price at which imports are sold is raised above ep^*, as shown in Figure 7.1. $0Q_1$ is supplied domestically and Q_1Q_2 imported. Shifts in the domestic demand and supply curves alter the quantity of imports and domestic production, but not the domestic price, $(1 + \tau)ep^*$. With a quantitative restriction on imports, effective supply is domestically produced supply plus the quota, as shown in Figure 7.1a. The market clears at price p_1, and the implicit tariff is $\tau = p_1 /ep^* - 1$. Now, however, shifts in demand and supply will alter p_1, and so the implicit tariff will change. If the quota is kept constant, then any variation in domestic demand or supply over time will create instability in p/ep^*. One reason for the higher variability of P_I/eP_I^* outside the Franc Zone may be that members of the Franc Zone impose fewer trade restrictions, and in particular, less stringent quotas.

A second possibility is that high variability of P_I/eP_I^* is due to movements in the prices of nontraded capital goods (for example, prices in the construction industry). There is no reason why the law of one price should apply to these goods, and the aggregate domestic price of nontraded capital goods (and therefore the cost of investing in the domestic economy) could be very different from that in other countries. One hypothesis is that nontraded capital goods prices are more variable outside the CFA than inside.

Why might this be the case? One explanation is that Franc Zone members have better access to international financial markets, so that net domestic saving and borrowing in response to temporary rises and falls in domestic income is relatively easy. In response to a positive income shock, domestic residents increase their holdings of net foreign assets in aggregate; in response to a negative shock, they reduce their foreign asset holdings. Outside the Franc Zone, with only limited access to international financial markets, changes in the ratio of consumption to income in response to a temporary shock can be accomplished only by changes in the investment ratio. For example, domestic investment will rise and fall in response to a positive income shock, and to the extent to which the investment is in notraded capital, the price of nontraded capital goods will rise and fall. Capital goods price variability is a sign of limited access to international financial markets. Moreover, it will over the long run in itself reduce investment, since the returns to

investment are more uncertain.[11]

We have seen in previous chapters that the distinction between CFA members and others in Africa with respect to financial market integration is not at all clear cut. However, one might argue that even with an equal degree of integration, a non-CFA economy is likely to experience more variable investment and capital goods prices than a CFA economy. In the former, booms may be accompanied by expectations of exchange rate appreciation (or, more realistically, expectations of less future devaluation), and slumps by expectations of depreciation/devaluation. To the extent that capital markets are integrated, a higher (lower) future expected Δe will mean a lower (higher) domestic interest rate, via covered interest parity, and so more (less) investment, and higher (lower) nontraded capital goods prices.

Data on notraded capital goods prices in Africa are limited. However, one comparison which it is possible to make is between the responses of Nigeria and Cameroun to their respective positive oil shocks. Figures 7.2-7.3 show capital goods price series for the two countries. The prices of traded and nontraded capital goods in Cameroun are taken from Devarajan (1991) - the major component of the nontraded capital is construction, and the major component of traded capital is equipment. The prices for Nigeria are taken from the Nigerian Digest of Statistics (various editions), which gives current and constant price investment series which are disaggregated into equipment and construction.

The Nigerian oil shock began in 1973-4. The figure shows a subsequent sharp rise in the price of nontraded capital relative to traded capital, and a sharp rise in P_I relative to eP_I^*, with the peak of both series in 1976. After 1978, both series are relatively stable. This is consistent with an investment boom following the first oil price shock (see Figure 7.4). The absence of a second peak after the second oil price shock reflects the fact that the increase in investment the second time round was much smaller.

In Cameroun, the oil price shock began with the oil discovery in the late 1970s, and the start of oil exports in 1978. Figure 7.3 shows that this boom did not have a noticeable determinate effect on relative capital goods prices. In fact, from 1978 to 1983, there is

[11] See Bevan et al. (1990) for a detailed account of the possible investment responses to a temporary trade shock.

a spurious negative correlation between Pn/Pt and P_I/eP_I^*, since ΔPn and ΔeP_I^* are relatively stable, whilst ΔPt (and therefore ΔP_I) is more variable. The oil price shock here seems not to have generated the price instability it did in Nigeria.

It would be rash to generalise on the basis of this comparison of Nigeria and Cameroun: the difference between the two countries may be for reasons other than those discussed above (for example, the Nigerian government used the oil revenue to finance a large public investment programme, whilst the Camerounian government saved most of its revenue in the form of foreign assets). However, if this pattern were repeated for other comparable CFA and non-CFA economies, then there would be more substantial evidence for the arguments discussed above.

3. Conclusion

There is strong evidence that the variability of domestic goods prices relative to international prices is an important factor in explaining differences in rates of investment amongst the economies of Sub-Saharan Africa. In particular, it is one of the most striking ways in which the members of the Franc Zone differ from their neighbours. There are a number of possible reasons for this: nominal exchange rate stability and low inflation certainly contribute to relative price stability. In the Franc Zone, e is fixed, and there is low inflation, but P_I relative to other prices is flexible and, since CFA capital goods markets are relatively open, P_I adjusts so that P_I/eP_I^* is approximately unity. A flexible e would not improve on this mechanism, and might even make things worse by introducing another variable susceptible to short run shocks. However, we still do not know how CFA membership leads to low inflation: a later chapter will investigate whether low inflation is indeed a direct result of the monetary rules of the Franc Zone.

Outside the Franc Zone, capital goods markets are often insulated from the rest of the world by trade restrictions: P_I is determined by government fiscal policy and by conditions in the domestic market. A high proportion of nontraded capital goods in investment will amplify this effect. In so far as these conditions are variable, there will be variability in P_I. So the continued equality of P_I and eP_I^* depends on compensating movements in e; but e is determined by other prices as well as P_I, and is subject to the influence of government intervention when the market exchange rate is seen as unacceptable. Moreover, with a flexible exchange rate, non-CFA governments are prone to rapid expansion of the money supply, which induces high inflation of all prices, and currency depreciation. So even if there is a degree of integration between domestic and international capital good markets, and P_I tends to eP_I^* (or at least to a constant fraction of eP_I^*) then when all prices are changing rapidly, any difference between inertia in domestic prices and inertia in the exchange rate will lead to a gap between P_I and eP_I^* in the short run.

There is more work to be done in this area: it would be useful to quantify the impact of different variables - the nominal exchange rate, the rate of inflation, the magnitude of trade restrictions and the nontradability of certain capital goods - on the variability of relative prices. However, this would require more data than is at present

available on government trade policy and on disaggregated investment behaviour. Nevertheless, there is evidence that all these factors play a role.

TABLE 7.1: TRADE WEIGHTS USED TO CALCULATE P_I*

COUNTRY	B	D	E	F	I	J	NL	P	SA	SW	US	UK
Botswana									1.00			
Burundi	.41	.21		.23		.16						
Ghana		.22									.28	.50
Guinea-Bis.				.19			.13	.54		.14		
Kenya		.20				.23					.16	.42
Liberia												
Madagascar		.20		.80								
Malawi		.07				.10			.55			.28
Mauritania			.16	.84								
Mauritius				.30					.38			.32
Nigeria		.21		.13		.21					.17	.29
Sierra Leone		.35									.26	.39
Somalia				.13	.59						.16	.13
Sudan		.31			.16						.17	.36
Tanzania		.30				.30						.40
Zaire	.58	.19									.23	
Zambia		.11							.31		.14	.44
Zimbabwe		.12				.10			.49		.12	.17

Key: B -Belgium, D - Germany, E - Spain, F - France, I - Italy, J - Japan, NL - Netherlands, P - Portugal, SA - South Africa, SW - Sweden, US - United States, UK - United Kingdom

TABLE 7.2: CROSS COUNTRY EQUATION 1: I/Y

	MODEL (1)		MODEL (2)	
Variable	Coefficient	HCSE	Coefficient	HCSE
CONSTANT	0.896	0.271	0.924	0.095**
X/Y	-0.134	0.199		
$(X/Y)^2$	0.131	0.063	0.102	0.027**
D/Y	0.117	0.207		
$(D/Y)^2$	0.052	0.060	0.090	0.029**
VAR	-0.103	0.475	-0.189	0.066**
VAR^2	-0.032	0.192		
M/A	0.011	0.066		
M/A^2	0.002	0.009		
R^2	0.794		0.777	
σ	0.174		0.162	
$X^2(2)$ norm test	1.56		1.89	
SC	-2.824		-3.323	

Key

* significant at 5%; ** significant at 1%

HCSE: heteroskedasticity-consistent standard error

SC: Schwartz Criterion (see Hendry (1989))

Explanatory variables are defined in the text.

Note: variables (but not their squares) are defined so that the sample mean = 1.

TABLE 7.3: CROSS COUNTRY MODEL 2: ln(I/Y)

	MODEL (1)		MODEL (2)	
Variable	Coefficient	HCSE	Coefficient	HCSE
CONSTANT	-0.039	0.084	-0.059	0.058
ln(X/Y)	0.227	0.088	0.271	0.084**
$\ln(X/Y)^2$	0.193	0.087	0.214	0.124*
ln(D/Y)	0.327	0.074	0.230	0.085**
$\ln(D/Y)^2$	0.116	0.055		
VAR	-0.246	0.093	-0.161	0.087*
VAR^2	-0.217	0.193		
ln(M/A)	0.067	0.239		
$\ln(M/A)^2$	-0.039	0.085		
R^2	0.715		0.650	
σ	0.205		0.207	
$X^2(2)$ nt	1.54		1.23	
SC	-2.497		-2.755	

TABLE 7.4: CROSS COUNTRY MODEL 3: $IPC

	MODEL (1)		MODEL (2)		MODEL (3)	
Variable	Coeff	HCSE	Coeff	HCSE	Coeff	HCSE
CONSTANT	-0.138	0.415	-0.025	0.400	0.339	0.918
D/Y	0.441	0.286	0.422	0.292	0.216	0.058**
$(D/Y)^2$	-0.093	0.094	-0.074	0.093		
$GNPPC	0.432	0.421	0.373	0.392		
($GNPPC)^2	0.201	0.148	0.229	0.138	0.357	0.023**
M/A	0.096	0.146	0.113	0.099	0.202	0.035**
M/A^2	0.018	0.021	0.014	0.020		
VAR	0.118	0.611	-0.081	0.522	-0.259	0.076**
VAR^2	-0.116	0.203	-0.061	0.203		
NIGERDUM			0.708	0.073	0.743	0.074**
R^2	0.930		0.951		0.946	
σ	0.269		0.230		0.219	
$X^2(2)$ nt	4.16		3.20		2.14	
SC	-1.955		-2.200		-2.575	

Note: the error corresponding to the observation for Niger is an outlier, and if left untreated generates excess kurtosis in the error term in models 2-3 (the null of a normally distributed error term being rejected at 15% and 1% respectively), hence the inclusion of a dummy variable (NIGERDUM) for this observation. Investment in Niger is inexplicably high.

TABLE 7.5: CROSS COUNTRY MODEL 4: ln($IPC)

	MODEL (1)		MODEL (2)		MODEL (3)	
Variable	Coeff	HCSE	Coeff	HCSE	Coeff	HCSE
CONSTANT	-0.103	0.178	-0.049	0.081	-0.009	0.076
ln(D/Y)	0.315	0.128	0.418	0.073	0.461	0.079**
$\ln(D/Y)^2$	0.072	0.103	0.140	0.054	0.162	0.074*
ln($GNPPC)	1.033	0.086	1.017	0.094	1.119	0.075**
$\ln(\$GPC)^2$	0.070	0.218	0.003	0.168		
ln(M/A)	0.057	0.478	0.056	0.284		
$\ln(M/A)^2$	0.098	0.262	0.084	0.141		
VAR	-0.452	0.144	-0.621	0.086	-0.649	0.084**
VAR^2	-0.474	0.270	-0.695	0.181	-0.644	0.188**
NIGERDUM			1.102	0.064	1.107	0.967
SUDANDUM			-0.710	0.083	-0.743	0.074**
R^2	0.877		0.964		0.955	
σ	0.328		0.187		0.197	
$X^2(2)$ nt	15.30**		0.79		0.26	
SC	-1.554		-2.552		-2.644	

Note: again, the observation for Niger produces an outlier; so too does the observation for Sudan, hence the inclusion of a dummy variable for that country (SUDANDUM). Investment in Sudan is inexplicably low.

TABLE 7.6: SUMMARY STATISTICS #1

Country	$\mu[\Delta P_I/eP_I^*]$	D/Y	PD/Y
Benin	0.235	1.364	0.476
Burkina Faso	0.057	0.936	0.040
Cameroun	0.069	0.607	0.109
Centrafrique	0.108	0.818	0.054
Congo	0.041	2.698	1.718
Cote d'Ivoire	0.072	1.283	0.647
Mali	0.037	1.827	0.053
Niger	0.197	0.862	0.150
Senegal	0.047	1.299	0.161
Tchad	0.066	0.035	0.286
Togo	0.069	1.479	0.144
Botswana	0.056	1.186	0.086
Burundi	0.209	1.137	0.046
Ghana	0.238	0.365	0.045
Guinea-Bissau	0.225	2.806	0.651
Kenya	0.042	0.953	0.139
Liberia	0.119	1.325	0.212
Madagascar	0.074	1.353	0.176
Malawi	0.056	1.396	0.120
Maurice	0.101	0.668	0.118
Mauritanie	0.208	3.802	0.276
Nigeria	0.083	0.305	0.230
Sierra Leone	0.176	0.688	0.123
Somalia	0.180	3.348	0.260
Sudan	0.103	1.261	0.187
Tanzania	0.112	0.929	0.161
Zaire	0.192	0.822	0.119
Zambia	0.083	1.487	0.269
Zimbabwe	0.096	0.570	0.267

TABLE 7.7: SUMMARY STATISTICS #2

Country	X/Y	$YPC
Benin	0.246	224
Burkina Faso	0.147	139
Cameroun	0.283	565
Centrafrique	0.258	233
Congo	0.487	721
Cote d'Ivoire	0.440	657
Mali	0.158	155
Niger	0.191	264
Senegal	0.351	361
Tchad	0.186	138
Togo	0.396	265
Botswana	0.898	608
Burundi	0.116	166
Ghana	0.223	331
Guinea-Bissau	0.080	176
Kenya	0.291	284
Liberia	0.532	458
Madagascar	0.183	237
Malawi	0.276	139
Maurice	0.516	908
Mauritanie	0.469	348
Nigeria	0.200	647
Sierra Leone	0.219	261
Somalia	0.196	141
Sudan	0.120	324
Tanzania	0.161	209
Zaire	0.239	272
Zambia	0.420	484
Zimbabwe	0.286	586

TABLE 7.8: IMPORT TAXES ON INTERMEDIATE AND CAPITAL GOODS

FRANC ZONE		
Burkina Faso	-	5% + fiscal taxes
Centrafrique	-	2.5 - 20%
Congo	-	2.5 - 20%
Cote d'Ivoire	-	7 - 10%
Gabon	-	2.5 - 20%
Mali*	-	5% + fiscal taxes
Niger	-	5% + fiscal taxes
Senegal	-	@40%
Tchad	-	3.5 - 11%
Togo	-	5 - 10%
OTHERS IN AFRICA		
Botswana	-	0 - 25%
Burundi	-	15 - 25%
Eq. Guinea*	-	9 - 48%
Ethiopia	-	0 - 60%
Gambia	-	0 - 30%
Ghana	-	@35%
Guinea	-	@3%
Guinea-Bissau	-	0 - 25%
Kenya	-	0 - 50%
Lesotho	-	0 - 25%
Liberia	-	0 - 45%
Madagascar	-	0 - 15%
Malawi	-	0 - 35%
Mauritania	-	5 - 87%
Mauritius	-	0 - 50%
Mocambique	-	0 - 32%
Nigeria	-	5 - 75%
Rwanda	-	0 - 15%
Seychelles	-	10 - 30%
Sierra Leone	-	0 - 45%
Somalia	-	0 - 10%
Sudan	-	10 - 80%

Swaziland	-	0 - 25%
Tanzania	-	0 - 55%
Uganda	-	0 - 30%
Zaire	-	0 - 50%
Zambia	-	0 - 30%
Zimbabwe	-	0 - 22.5%

* denotes membership of the CFA for part of the sample period

TABLE 7.9: EXCHANGE RATE STATISTICS (1970-87)

Country	$\mu[\lvert\Delta e\rvert]$	$Corr[e, P_I/P_I^*]$	$Corr[\lvert\Delta e\rvert, \lvert e - P_I/P_I^*\rvert]$
Botswana	0.021	0.729	0.139
Burundi	0.082	0.253	0.458
Ghana	2.740	0.987	0.922
Guinea-B	0.457	0.872	0.887
Kenya	0.080	0.966	0.448
Madagascar	0.172	0.835	0.930
Maurice	0.040	0.773	-0.285
Mauritanie	0.066	0.019	-0.344
Nigeria	0.365	0.960	0.992
Sierra Leone	1.519	0.991	0.997
Somalia	0.266	0.996	0.167
Sudan	0.296	0.996	0.447
Tanzania	0.416	0.974	0.937
Zaire	2.032	0.983	0.975
Zambia	0.367	0.962	0.988
Zimbabwe	0.056	0.852	-0.042

TABLE 7.10: EXCHANGE RATE STATISTICS (1970-86)

Country	$\mu[\lvert\Delta e\rvert]$	$Corr[\lvert\Delta e\rvert, \lvert e - P_I/P_I^*\rvert]$
Botswana	0.045	0.387
Burundi	0.162	0.155
Ghana	3.426	0.945
Guinea-B	0.471	0.822
Kenya	0.069	0.109
Madagascar	0.075	0.128
Malawi	0.038	0.652
Maurice	0.039	-0.339
Mauritanie	0.060	-0.345
Nigeria	0.135	0.946
Sierra Leone	0.219	0.504
Somalia	0.197	0.172
Sudan	0.183	0.179
Tanzania	0.183	0.562
Zaire	0.984	0.892
Zambia	0.282	0.991
Zimbabwe	0.051	0.006

(Note: Liberia's exchange rate is pegged against the US $.)

TABLE 7.11: RELATIVE INDUSTRIAL PRICE VARIABILITY

Country	$\lvert \Delta P_i / eP_i^* \rvert$
Benin	0.042
Burkina Faso	0.082
Cameroun	0.064
Centrafrique	0.079
Congo	0.053
Cote d'Ivoire	0.088
Mali	0.069
Niger	0.061
Senegal	0.068
Tchad	0.034
Togo	0.185
Botswana	0.134
Burundi	0.155
Ghana	0.254
Guinea-Bissau	0.258
Kenya	0.101
Liberia	0.135
Madagascar	0.108
Malawi	0.110
Maurice	0.076
Mauritanie	0.108
Nigeria	0.104
Sierra Leone	0.180
Somalia	0.392
Sudan	0.158
Tanzania	0.141
Zaire	0.089
Zambia	0.253
Zimbabwe	0.067

FIGURE 7.1

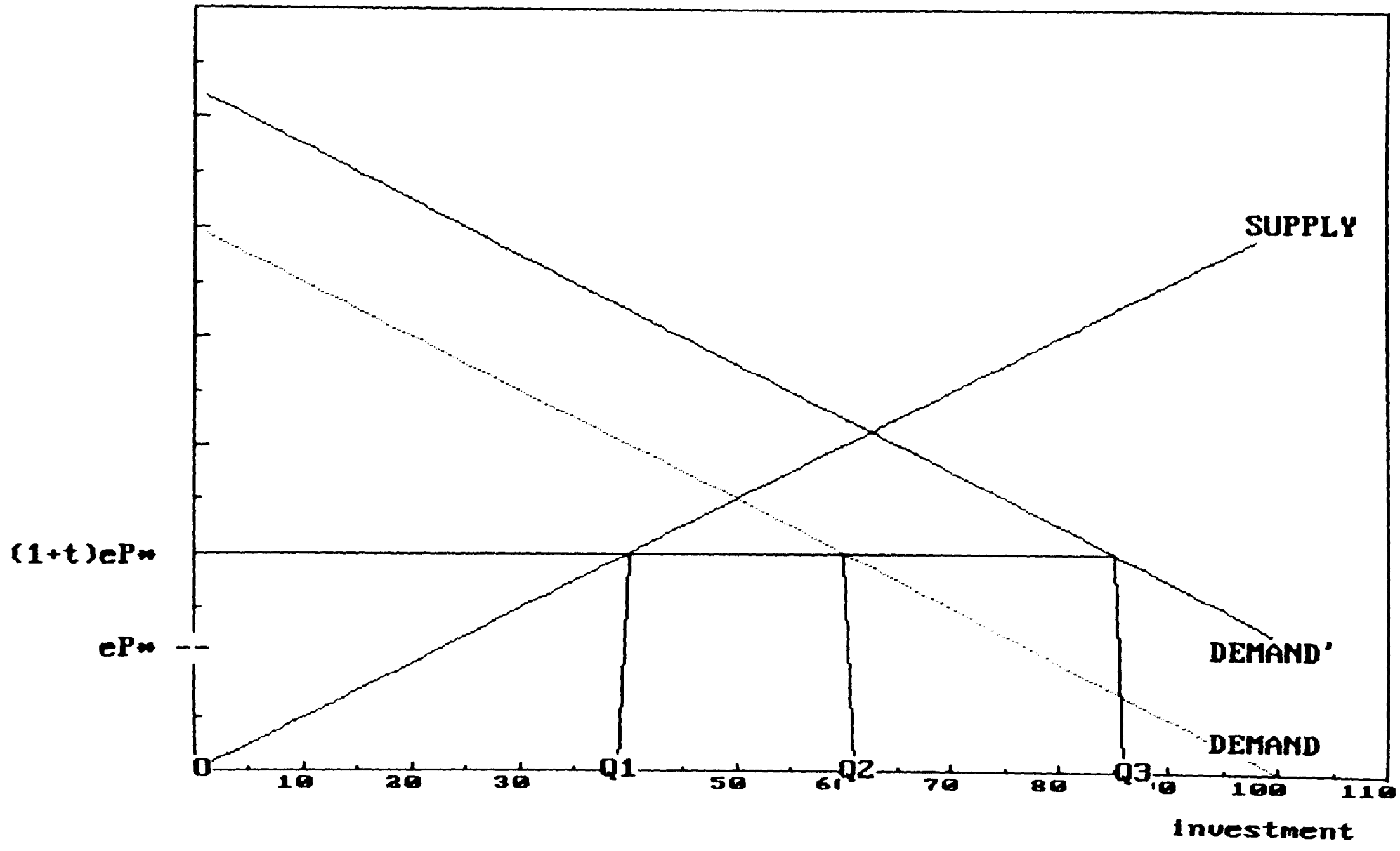

SUPPLY
(1+t)eP*
eP*
DEMAND'
DEMAND
0
Q1
Q2
Q3
10
20
30
50
70
80
100
110
Investment

FIGURE 7.1a

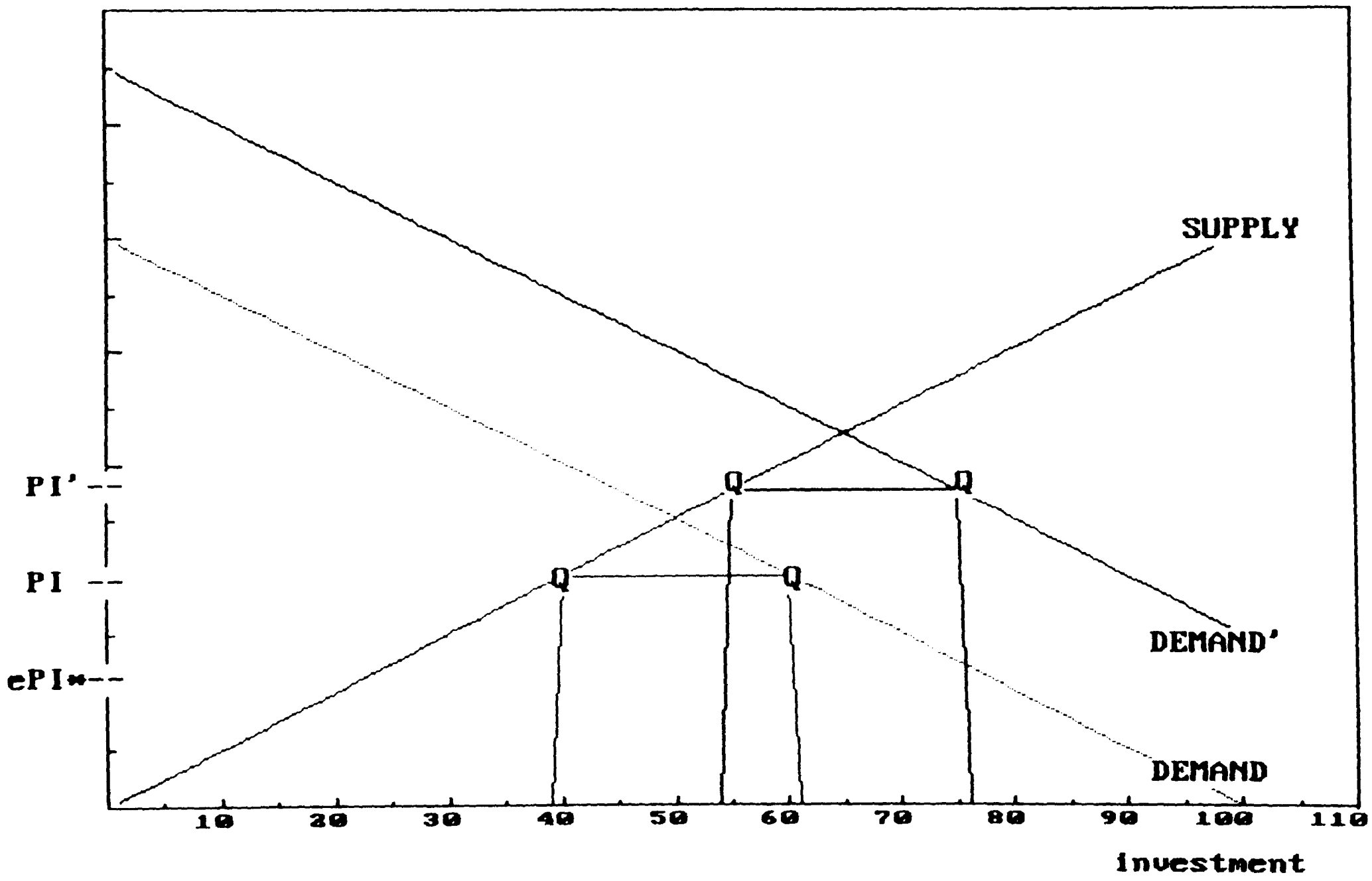

SUPPLY
PI'
PI
ePI*
Q
Q
Q
Q
DEMAND'
DEMAND
10
20
30
40
50
60
70
80
90
100
110
investment

FIGURE 7.2 - RATIO OF NONTRADED TO TRADED CAPITAL GOODS PRICES
NIGERIA

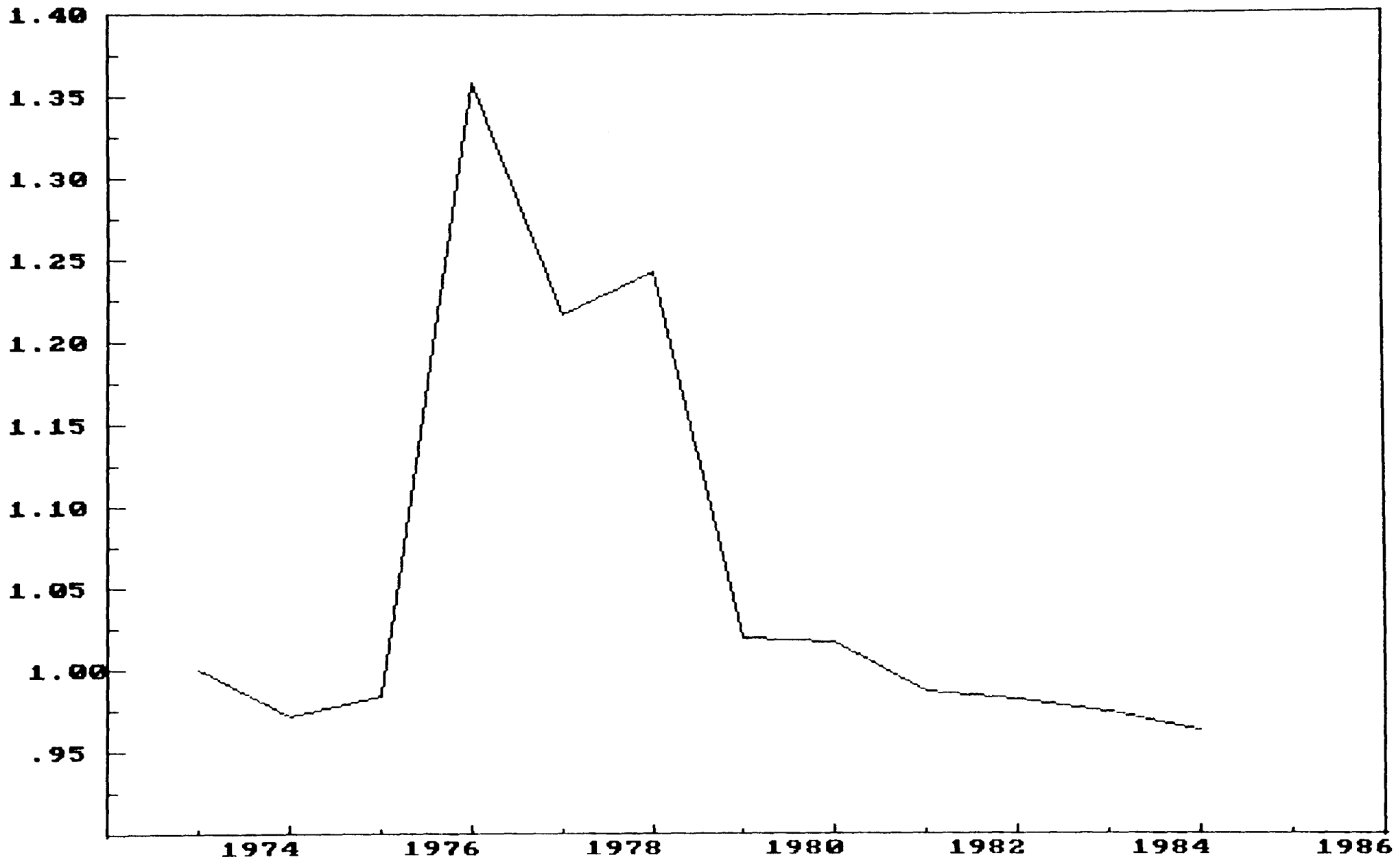


FIGURE 7.3 - RATIO OF NONTRADED TO TRADED CAPITAL GOODS PRICES
CAMEROUN

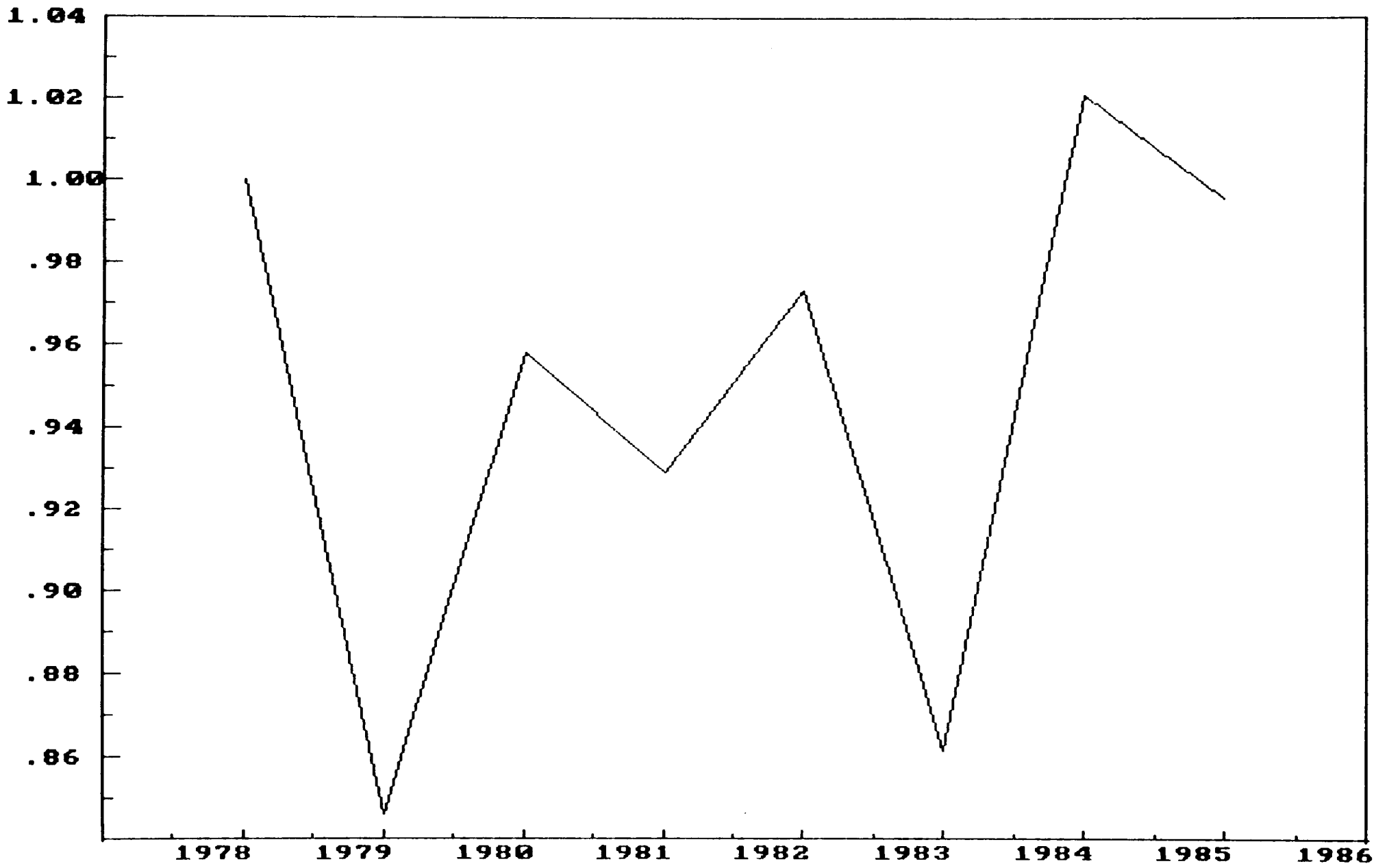
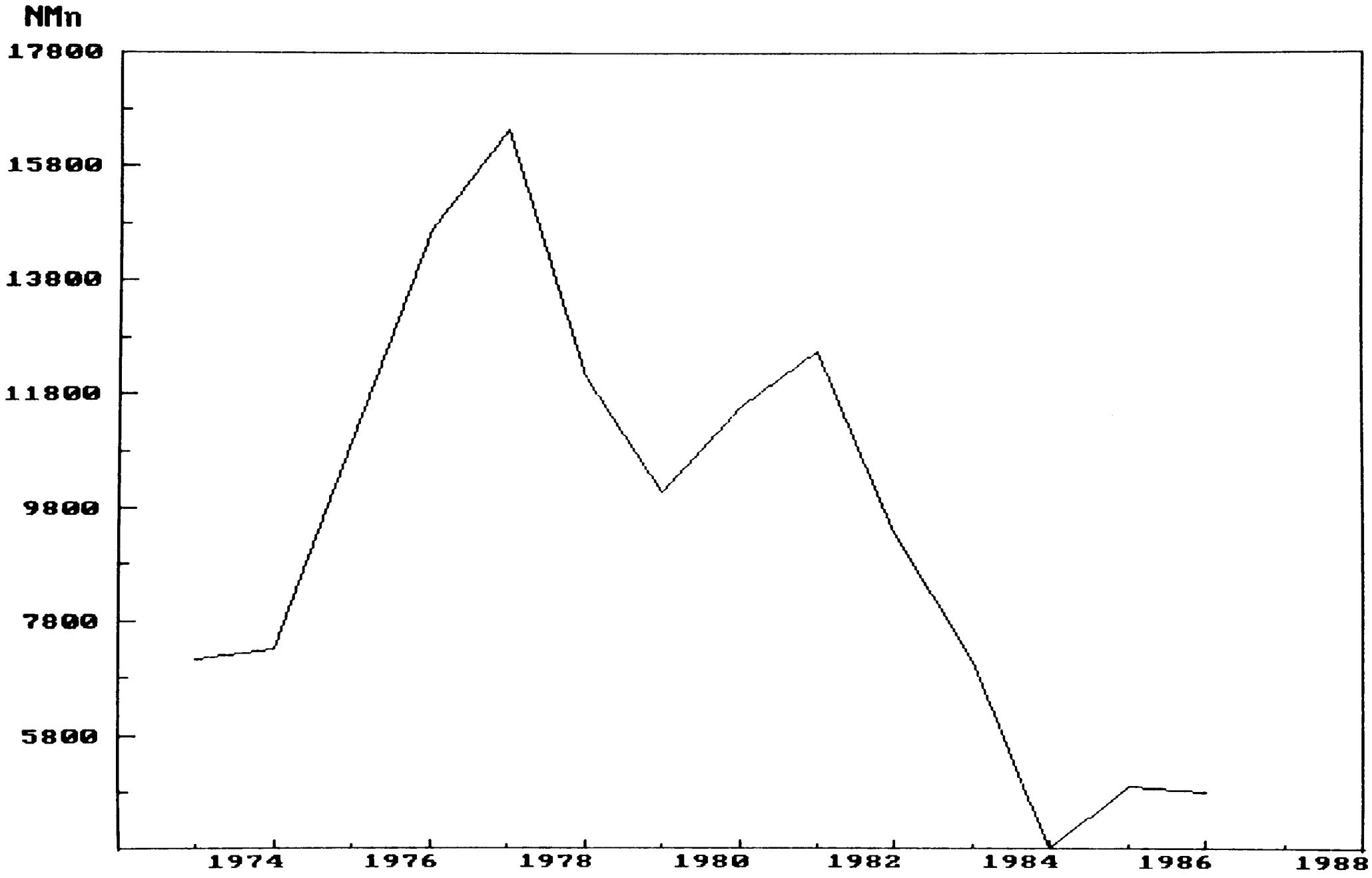


FIGURE 7.4 - GROSS DOMESTIC INVESTMENT IN NIGERIA (1980 PRICES)



CHAPTER 8

MODELS OF FINANCIAL ASSET DEMAND IN THE CFA

MODELS OF FINANCIAL ASSET DEMAND IN THE CFA

In previous chapters, we have seen how the accumulation of physical assets - investment - depends on the variability of relative prices. In so far as CFA membership reduces relative price variability, Franc Zone countries enjoy higher rates of investment growth than they would do otherwise. We have also seen that investment depends on domestic saving, as measured in National Accounts statistics.

The models of earlier chapters used aggregate savings data when looking at financial asset holding. The main task then was to produce consistent estimates of parameters in the investment function, and all that was required was a regression of savings on instruments which would ensure the independence of the savings terms in the investment equation. However, some of the coefficients on parameters in the savings equation occasionally took surprising values, and potentially important factors had to be omitted from savings equations because there were not enough observations of the dependant variable, the data being only annual. It was clear that more work was required in this area, if a complete picture of the impact of price variability on the domestic financial system was to be built up. Moreover, understanding private domestic asset accumulation is important, not only in forming a picture of the determination of private domestic investment, but also in understanding how domestic monetary adjustment takes place. This chapter will fill the gap. First of all, we need to look in more detail at the theoretical background to our model of asset accumulation, and provide a more sophisticated account than the simple savings model of chapters 4-5. On the basis of this theory, a model will be constructed which uses quarterly data on financial assets.

1. Theoretical background to the model

In this chapter, the key extension to the chapter 4 model of asset demand is the inclusion of a term which captures the idea that variability in the return to financial assets might affect the propensity of private agents to hold these assets. If holding financial assets becomes less risky because their return becomes less variable, the demand for financial assets is likely to rise. In this chapter, we shall attempt to determine whether the variability of returns effect is significant by modelling financial assets in two CFA member countries where data are readily available: Cote d'Ivoire and Cameroun.

Before constructing an empirical model of the demand for financial assets, it is useful to elaborate the possible theoretical models on which an empirical model might be based. Amongst existing models of asset holding, a number of approaches are evident. These models serve to highlight some of the problems involved in the construction of an empirical model.

(i) A starting point for many models is an intertemporal utility maximising framework. Utility maximisation entails a certain consumption path over time, and this path is achieved for a given income path by appropriate saving and borrowing. Consumers are seen as solving a maximisation problem of the form:

$$\max_{\underline{c}} U(c_0,.....,c_T) \text{ subject to } \Sigma[c_t/(1+r)^{t-1}] = \Sigma[Y_t/(1+r)^{t-1}]$$

where $t = 0,.....,T$, c_t is consumption at t, Y_t income and r a real interest rate. The constraint implies that unlimited borrowing or lending is possible, as long as net borrowing for the T periods is zero. In the simplest form of the model, future income is known, and a solution for $\underline{c}$ can be found as a function of U(), $\underline{Y}$, and r. This provides a model of (net) asset holding, since the change in assets at t (ΔA_t) is identical to $(Y - c)_t$.

(ii) A realistic model of asset holding will allow for uncertainty with respect to future income. Future income will not be known, and the effect of a change in present income on consumption (and therefore on asset holding) will depend on whether the change was anticipated and on how much the change induces people to revise their

expectations about future income. An anticipated change will already have been built into the planned consumption path, and the change in income will not have an impact on contemporary consumption. An unexpected change in present income which is regarded as temporary will not change present consumption by very much: a corollary of the fact that most specifications of U() in the model of (i) above entail a very small value of $\delta c_t/\delta Y_t$. If an unexpected rise in income is not expected to last, most people will save a large part of the windfall, spreading out the benefit over time. If, however, the rise in Y_t induces higher expectations of future income, present consumption will rise more, and the propensity to save out of the present windfall will be lower.

This analysis relies on the assumption that there are no quantity constraints in the credit market. If, for example, unlimited borrowing is not possible (this is likely if interest rates are maintained by the government at a very low level[1]), a temporary negative income shock may substantially reduce consumption. Nevertheless, if some agents have some access to credit facilities, we might still observe a difference between the response to an unexpected permanent income shock and the response to an expected or temporary shock.

There may also be uncertainty with respect to the returns to financial assets. This uncertainty might be manifested in a number of ways. First of all, returns are uncertain because the rate of inflation is variable, so the real interest rate is variable. A model of asset demand ought to include a measure of such uncertainty. Secondly, the risk of holding financial assets might be a positive function of the real return to these assets. In other words, there may be Stiglitz-Weiss effects on the deposits side of the loans market. This has been discussed already in chapter 5, noting the high frequency of banking collapses in the CFA region, which was described in chapter 2. To reiterate: it may be that a higher real interest rate leads to a higher perceived risk of bank insolvency. This may mean that, over some real interest rate ranges, asset holding is a negative function of the real interest rate. Some of the aggregate savings functions in chapter 5 seemed to exhibit such a phenomenon. It will be interesting to see if the same phenomenon occurs in the same countries when financial asset data is used.

(iii) Another approach to the demand for financial assets is embedded in Keynesian

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[1] This issue is discussed in more detail in chapter 4.

theory. On the one hand, savings (the change in total asset holdings in a period) are taken to be a function of income; on the other, the liquidity of the portfolio of assets held depends on both income (since a higher income entails a higher demand for liquid assets for transactions purposes) and on the interest rate differential between liquid and illiquid assets. This approach highlights the theoretical distinction which it is necessary to make between the demand for a flow of financial assets (which affects the IS curve) and the demand for a stock of a certain kind of asset (which affects the LM curve). In constructing an empirical model of demand for a certain kind of asset, it is important to give some thought to the order of differencing which is applied to the dependant variable. A priori, we might expect the demand for a more liquid asset to be more likely to be for a stock, since the transactions demand component will be more important. In previous chapters, gross domestic saving (a flow) has been modelled as a function of income. However, the dependant variables in this chapter are much narrower aggregates than Y-C, excluding most corporate financial activity (for example, borrowing from banks and retaining profits), and it is not to be assumed that the former will follow the same pattern as the latter.

In modelling the demand for assets, we will have to deal with a number of key issues, highlighted by the theory above. (i) What type of asset do we use as the dependant variable? What explanatory variables ought we to consider? (ii) How is risk to be characterised? It will be necessary to construct an appropriate measure of the variability of returns. (iii) How is income to be decomposed to take account of different expectational patterns? (iv) What is the functional form to be employed: what degree of differencing is appropriate? Does A or ΔA depend on Y? We will deal with these issues in turn, before proceeding to estimation of the asset demand functions.

(i) selection of dependant and explanatory variables

In choosing an appropriate asset to model, our choice is limited by the data. The type of asset for which data are most readily available is money, in its various definitions. BEAC and BCEAO statistics include quarterly data on various forms of money. These include (1) notes and coins (M_0), (2) demand deposits (M_1 - M_0) and (3) time and savings

deposits (M_2 - M_1).[2] We shall assume that consumers' asset demand is a demand for real financial assets, and therefore deflate by the CPI. Of the various possible aggregations of these assets, (1) + (3) is not a sensible dependent variable, since it aggregates just the most and least liquid assets. However, if (1) and (2) are close substitutes, then (1) + (2) is a sensible aggregation, and if (2) and (3) are close substitutes, then (2) + (3) is a sensible aggregation. Other possibilities are (1) + (2) + (3), (1) alone, (2) alone and (3) alone.

The drawback to a high degree of aggregation is that the true coefficients on parameters for different assets may vary. If assets of very different kinds are aggregated, then estimated coefficients will be (i) misleading indicators of true elasticities and (ii) probably insignificant anyway. Estimated equations using the aggregate (1) + (2) + (3) did not meet with much success. The drawback to a low degree of aggregation is that it is difficult to determine elasticities of substitution between different assets, especially since it is often unclear from the statistics which interest rate is meant to apply to which kind of deposit.[3] The equations reported below are for those aggregates for which significant results were found: (1) + (2) (defined as M) and (2) + (3) (defined as D). This gives an overall picture of the impact of various explanatory variables on the asset market. Moreover, (2) + (3) is a measure of financial deepening, which is interesting in its own right.

Typically, asset demand functions used in empirical modelling are of the form:

$$A(t) = f(A(t-1),\ldots,A(t-n),r(t),\ldots,r(t-n),Y(t),\ldots,Y(t-n),\underline{Q})$$

where A(t) is a real measure of asset holdings, r(t) is the real interest rate on the asset, Y(t) is real income and $\underline{Q}$ is a set of quarterly dummies.[4] In the light of the observations

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[2] Strictly speaking, the aggregates represent gross domestic assets of the private sector. To the extent that the private sector is borrowing from banks, they do not represent net assets. However, since no form of private borrowing is as liquid as M_0, this aggregate represents both gross and net (very) liquid assets. It can also be argued that bank deposits are more liquid than the vast majority of private loans, which are typically for a fixed term: the private sector does not have liquid liabilities. Since we are excluding illiquid assets (i.e., ones outside M_2) from the aggregate, it is also appropriate to exclude these liabilities.

[3] Typically, interest rates are categorised by term: "six month deposit rate", "twelve month deposit rate", etc., whilst deposits are categorised by type: "demand deposits", "savings deposits", etc.

[4] It is quite likely that asset holding in agriculturally based economies exhibits a seasonal pattern, since farmers' incomes exhibit strong seasonality.

above, it is prudent to modify this model in three ways. A measure of the variability of returns is needed, as is a decomposition of the income terms. These are discussed below. Also, the real interest rate is decomposed into the nominal interest rate and inflation. There are two reasons for this. As noted above, it is not obvious which type of asset a nominal interest rate applies to: it may be that only part of the asset aggregate is yielding the nominal return indicated by the recorded interest rate. In this case, we would expect the rate of inflation (which affects the real return to all assets) to have a coefficient of a different magnitude from the nominal interest rate. Moreover, a change in inflation may alter predictions of the return to assets next period in a different way from a change in the nominal interest rate. Changes in the nominal interest rate are likely to be regarded as permanent (the interest rate changes very seldom), whilst changes in the rate of inflation are not.

For both countries, there are quarterly data for assets (1) - (3) for the period, 1977-87, reported in the IMF International Financial Statistics. There is also a deposit interest rate (six months' maturity), and a CPI. Thus one can construct a quarterly series for real assets, M/P or D/P (in billions of 1980 FCFA), an annual CPI inflation rate, π, and a nominal interest rate, rDEP.

The income terms - terms of trade adjusted real GDP in billions of 1980 FCFA - are extracted from National Accounts statistics in the World Bank World Tables, so they exist only in annual form. An approximate quarterly series is constructed for annually reported variable x by transforming x(t) (where t is a quarter) thus:

$$x'(t) = \sum_{t-2}^{t+2}\sum_{t-2}^{t+2} x(t)/25$$

Note that a consequence of this approach is that x'(t)/x'(t-1) is never very large, and sometimes x(t)/x(t-1) will be underestimated. This will tend to make the coefficients on x'(t) too large. This will mean that the magnitude of the coefficients is not a reliable indicator of the relative importance of each transformed series, although the sign and significance of the coefficients will be reliable.[5]

[5] An alternative procedure for construction of the quarterly income series might be to regress annual income on annual industrial production, and then use the coefficients to construct a quarterly income series based on quarterly industrial production data. Data for this exist for Cameroun, but not for the whole sample series for Cote d'Ivoire (there was a hiccup in collection of national statistics at the end of the 1970s). For Cameroun, this technique would be of questionable reliability,

(ii) measuring variability

We need a measure of the variability of the real return to holding assets. This variability can be split into two components: that due to nominal interest rate variability (of which there is virtually none), and that due to inflation variability. The variability of inflation could be measured as a moving standard deviation of $\ln(1+\pi)$ (or some other transformation), or, in the spirit of previous chapters, as a polynomial lag of $|\Delta\ln(1+\pi)(t)|$. One restriction on the second alternative is to use a moving average of $|\Delta\ln(1+\pi)(t)|$. All three measures were tried out; in the equations reported below, it is the annual moving average of $|\Delta\ln(1+\pi)(t)|$ (MAVARP) which appears. This is the measure which produces significant coefficients. The natural interpretation of the significance of this transformation is that agents use only recent prices in their assessment of future price variability. This is compatible with rationality in an economy which is subject to large trade shocks and in which information costs are high.

(iii) income decomposition

In dealing with expectations formation, we have to find a way of decomposing changes in income into expected and unexpected changes, and into changes expected to be permanent and changes expected to be temporary. The decomposition of income is discussed below for each of the two countries.

(i) Cameroun. During the period we are considering, the main external shock to the economy was the discovery of oil, combined with the international oil price shocks of 1980 and 1986. Cameroun became a net oil exporter in 1978, at the beginning of the sample period. This is likely to have had two effects: first, there will have been an increase in income due to the oil revenue; secondly, there will be a movement of resources into the oil sector from other sectors, reducing the income of other sectors, and increasing the income of the oil sector. The net income from oil is thus the total oil revenue less the loss in income in other sectors resulting from the boom. A rough estimate of the magnitude of

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as the period we are considering is one when mineral extraction (not counted as industry) rose from less than 5% of GDP to over 30% (see chapter 6).

the windfall can be constructed in the following way.[6] Up until the second year of the boom, domestic income (real GDP adjusted for the relatively minor terms of trade changes of the 1970s, less oil revenue) followed closely to an exponential time trend: for the period 1967-79 (annual observations), non-oil income (NOY) in billions of 1980 FCFA is described by:

$$\ln NOY(t) = \underset{(0.026)}{6.457} + \underset{(0.004)}{0.053}t$$

$$R^2 = 0.950$$

Thereafter, non-oil income declined sharply. The net oil income term used for Cameroun is total income less this trend term extended into the period 1980-87. The implicit assumption here is that without the oil, the Camerounian economy would have continued to grow at the same rate, or rather, since what really matters is the perceived magnitude of the boom, that Camerounians assumed that their income would have continued to grow at the same rate. The effect of this windfall on savings will depend on whether the oil boom was expected to last. It more plausible that it was expected to be temporary, since the oil reserves were known to be limited, and expected to run out within thirty years (see Devarajan (1991)). However, it may actually have been more temporary than expected, due to the collapse in oil prices in 1986. In any case, we ought not to impose the a priori restriction that the coefficient on windfall oil income is the same as that on trend non-oil income.

On the basis of this disaggregation, the two income terms appropriate for the model of asset demand are a trend term and the net oil income term (OI). Income is disaggregated according to whether it is temporary and unexpected or permanent and anticipated. This precludes other disaggregations; in particular, there is no category for unexpected permanent changes in income. However, as noted above, the permanent component of the income resulting from the oil windfall is likely to have been very small. Note that since a trend term is included in the model anyway (see below), it will not be possible to specify

[6] Devarajan (1991) includes a detailed study of the impact of the Camerounian oil boom on other sectors of the economy, finding evidence of "Construction Boom" and "Dutch Disease" effects. Quantification of the effects is based on a CGE model of the Camerounian economy. The quantitative results are therefore sensitive to initial parameter values, and it is difficult to construct a robust quantification of the impact of the boom based on a structural model of the economy. Hence the more direct approach to quantification presented here, which yields significant results.

the elasticity of asset holdings with respect to non-oil income.[7]

(ii) Cote d'Ivoire. Here, external shocks have been much smaller: there was a short-lived boom in the international price of coffee and cocoa in 1977, which raised the terms of trade. There was little output response, however, since the domestic producer prices of cash crops are fixed by the government, and did not respond to the international price changes (see Jarret and Mahieu (1991)). There is therefore likely to have been little resource movement into the booming sector. The income shock is thus captured wholly by the terms of trade adjustment term in the National Accounts. The later, less marked changes in the terms of trade are treated in the same way, so that the terms of trade adjustment series is used as the unexpected, transient income series, and anticipated, permanent income is identical to (real) GDP. The transient income term for Cote d'Ivoire is defined as terms of trade adjustment, indexed so that 1976 = FCFA 200bn.[8] There may still be some component of income which is unexpected, namely, unexpected changes in GDP. However any estimate of this unexpected component will be sensitive to the form of expectations used. The model below assumes that the major component of unexpected income comes from international price changes, simply disaggregating income into GDP and terms of trade adjustment (TTA).[9]

(iv) functional form

Although the data sets for these assets are larger than those of previous chapters, they are still not large enough to leave much room for manoeuvre with respect to functional form. In the models below, a log-linear specification is used, as is conventional with models of asset demand, embodying a long run solution of the form:

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[7] With a larger data set, an alternative way of decomposing income would be to use the Beveridge-Nelson technique (Beveridge and Nelson (1981)), which employs an ARIMA model of the series of interest. Whatever the pros and cons of ARIMA modelling, this alternative is certainly not available here, since an ARIMA model requires a data set of at least forty observations (see Hall (1988)), which would mean here an annual income series running back to the 1940s.

[8] The choice of 200 as a base is of course arbitrary. An index of zero would mean that the terms of trade adjustment variable could not be expressed in logs, which we will want to do later. Experimenting with different indices in the estimated equations showed that the significance of explanatory variables is not sensitive to changes in the base.

[9] Ghanem (1991) uses a disaggregation of Ivorian income which adds a counterfactual investment effect to the terms of trade effect. Again, however, the robustness of the quantification is questionable: Ghanem's is based on an ICOR estimated over five annual observations.

$$\ln A = \beta_0 + \beta_1 \ln Y_P + \beta_2 \ln Y_T + \beta_3 \ln(1+\pi) + \beta_4 \ln(1+rDEP) + \beta_5 MAVARP + \Sigma \alpha_i Q_i$$

where Y_P is the appropriately measured permanent component of income and Y_T is the transient component. With a larger data set, the linearity assumption could be tested. Certainly, the log-linear models reported work better than simple linear models (which did not yield significant coefficients). It is also prudent to include a trend term. Asset demand may be non-stationary even when all other variables are constant: financial innovation may increase or decrease the demand for a certain asset, by making that asset - or its substitutes - more readily available.[10]

With respect to the choice between a stock of assets and a flow of assets as the dependant variable, it is important to point out that the order of differencing of the dependant variable in an econometric model is not determined by theoretical considerations, but by the stationarity requirement. It is likely that at least first order differencing to the asset stock will have to be applied. Nevertheless, there is scope for an error correction model again, embodying a relationship between variables at a lower order of differencing. What is important to the theory is whether $\Delta \ln M/P$ depends on $\ln Y$ or on $\Delta \ln Y$ (in the first case, income levels influence saving, in the second, they influence the demand for a stock of assets). However, the choice between $\ln Y$ and $\Delta \ln Y$ is not to be made a priori. If there is a long run relationship between $\Delta \ln M/P$ and $\ln Y$, then if $\ln Y$ is I(1), $\Delta \ln M/P$ will be I(1) and co-integrated with $\ln Y$. If there is a long run relationship between $\ln M/P$ and $\ln Y$, then $\ln M/P$ will be co-integrated with $\ln Y$. The data will tell us whether to match $\Delta \ln M/P$ or $\ln M/P$ with $\ln Y$.

[10] For example, the opening of more post offices in rural areas may induce people to save in the form of savings accounts instead of cash.

2. Estimated equations

Augmented Dickey-Fuller and Durbin-Watson stationarity statistics[11] on lnM/P, lnD/P and explanatory variables are as follows:

1. DW statistics

	lnM/P	ΔlnM/P	lnD/P	ΔlnD/P
Cameroun	0.13	2.11	0.05	1.24
Cote d'Ivoire	0.83	2.02	0.27	1.91

	ln(1+r)	Δln(1+r)	ln(1+π)	Δln(1+π)
Cameroun	0.29	2.02	0.33	1.88
Cote d'Ivoire	0.31	1.53	0.42	2.18

	MAVARP	ΔMAVARP
Cameroun	0.96	2.53
Cote d'Ivoire	0.23	1.76

2. ADF statistics[12]

	lnM/P	lnD/P	ln(1+r)	ln(1+π)	MAVARP
Cameroun	1.59	0.50	-0.46	0.57	-0.95
Cote d'Iv	0.81	0.45	-0.38	2.50	1.99

On the basis of the ADF statistics, the hypothesis of non-stationarity cannot be rejected for the variables of interest (in levels). For all variables except lnM/P in Cote d'Ivoire and MAVARP in Cameroun, the DW statistics lead to the rejection of the hypothesis of stationarity at the 5% level. Moreover, in all cases, the first differences of variables have DWs close to 2, whilst the DWs for the variables in levels are much lower. This suggests

[11] See chapter 5 for a description of these statistics.

[12] The test statistic is calculated on the basis of 8 lags.

that all variables are I(1) across the two countries.[13] The final regressions should have ΔlnM/P and ΔlnD/P as dependant variables. The income series being used are based on a very small number of (annual) observations, so statistical tests of stationarity of income series are very weak. However, visual inspection of the series suggests that they are I(1). If this is indeed the case, then it is likely that the relationship between asset holding and income, if there is one, is in terms of stocks.

For each country, the procedure used in estimation of the asset demand functions is the same. First of all, a dynamic regression of the asset stock (lnM/P or lnD/P) on other I(1) variables is estimated. It turns out that in all cases there is a strong relationship between the asset stock and income in the static solution, which is therefore interpreted as a long run asset stock demand function, and used as the basis of an error correction term. This ECM is constructed from the static solution to the equations estimated for the I(1) variables, as in chapter 5. The ECM is tested for stationarity, and then included in a regression of ΔlnM/P or ΔlnD/P on I(0) variables. First of all, an AD(2) model of ΔlnM/P or ΔlnD/P is estimated, then the data set is marginalised. The final model, the result of valid reductions, is then tested for parameter constancy by using the last eight observations of the sample for a Chow test. The results of this procedure are reported in Tables 8.1 to 8.6. The equations in first differences pass the standard diagnostic tests, which are described and reported in the tables. Interesting features of the models are discussed below.

Cameroun

The long run static solutions are shown in the tables. In the long run, there is a significant relationship between lnM/P, the deposit interest rate, oil income and price variability. The trend term may be important partly because it captures non-windfall income, but its coefficient cannot be treated as an income elasticity, since, as noted above, there may be other reasons for a trend in lnM/P.

[13] The DW statistics for D/P in Cameroun suggest that one ought to consider the possibility that lnD/P is I(2). However, the low DW is a result of the series finishing at the end of 1987, as deposits are declining rapidly in response to the negative income shock following the fall in oil prices. DW statistics for shorter time series (for example, up to 1986/4) are much higher. In the model below, lnD/P is treated as an I(1) variable.

The ADF statistic (with four lags) was calculated for the ECM, ie., the residuals from the long run static solution, to provide a formal test for cointegration. The test statistic turns out to be very sensitive to the sample period used. Estimation up to 1987(1) yields a statistic of 2.96, which is significant at 10% (the hypothesis that the linear combination of variables estimated in the long run solution is non-stationary can be rejected at this level). Adding subsequent quarters up to the last observation (1987(4)) reduces the ADF statistic: for the full sample period, it is 1.86, which is insignificant. The end of the sample period is a time of rapidly falling income and money demand, in the wake of the negative oil price shock, and this takes the model far from the estimated long run equilibrium (the ECM is atypically low, as there is a slow response of money demand to the large fall in income). Given that the sample period ends with a large negative shock, and that the subsequent adjustment period is not observed, it is not surprising that the ADF statistic should behave in this way in a small sample, even when the variables are cointegrated. On this basis, and on the basis of the significance of variables in the long run solution, the variables in the long run equation are taken to be cointegrated.

The long run solution implies an income elasticity of demand for M/P of 0.15. With an average propensity to hold money out of oil income of approximately unity during the oil boom period (the figure for 1979-88 is 1.08), this implies a marginal propensity of approximately 0.15, which is very small. This suggests that the main motive for holding M is for transactions purposes rather than as a store of wealth: otherwise, demand for M should rise sharply with a rise in windfall income. The long run coefficient on the price variability term is -0.096. This requires some interpretation. For the sample period, average MAVARP is 0.51. This means that, on average in the steady state, (M/P)/(M/P)' is equal to 0.95, where (M/P) is actual asset demand and (M/P)' is the hypothetical level of asset demand in a world where price variability has no impact. That is, the price variability leads to a level of asset demand which is 5% lower. Note that the coefficient on the interest rate is negative (-0.11). As noted above, this may indicate Stiglitz-Weiss effects on the deposits side of the financial market. This corresponds to the negative effect of interest rates on savings in chapters 5-6, and has an explanation in the financial crises in Cameroun in the 1980s, discussed in chapter 2.

In the static solution for lnD/P, there are significant coefficients on the deposit

interest rate and total income.[14] No other term is significant in the long run solution. The interest rate term is similar to that for M/P, whilst the income coefficient is surprisingly large (1.63). As noted above, this coefficient may overestimate the true income elasticity, since the income series used is based on annual observations.[15] The ADF statistic for the ECM is 1.28, and more or less invariant to changes in sample size, so the hypothesis of non-cointegration cannot be rejected. One possible cause for this is that an important explanatory variable has been omitted. In this case, treating the static solution as a basis for the ECM may not produce satisfactory results. This surmise is confirmed by the model for ΔlnD/P described below.

The tables then show the model for ΔlnM/P which uses the static solution for lnM/P in the error correction term (ECM). The first model shown includes lags up to order 2. In this model, the error term is not normally distributed (X^2 test for normality = 7.58), since the residual for 1983/2 is an outlier. This violates one of the conditions for the efficiency of the least squares estimator, so an alternative specification must be found. The simplest solution is to include a dummy variable for 1983/2: including this dummy means that the estimator is now efficient, since the error term is now normally distributed, although it leaves the observation for 1983/2 unexplained. The second model includes a dummy for 1983/2.

The next model shows the result of model reduction, with tests for the validity of the omission of insignificant variables. The final model includes ΔlnM/P(t-1), Δln(1 + rDEP)(t-1), ΔlnOI(t), ΔMAVARP and ECM(t-1) as explanatory variables. The coefficients on these variables require careful interpretation. Note that the coefficients on the lagged dependant variable and the ECM together imply non-monotonic adjustment to the long run equilibrium. The coefficient on the lagged change in the interest rate is approximately equal in absolute value to that on the interest rate in the ECM, but with the opposite sign. If we solve out the equation in ΔlnM/P, ECM and Δln(1 + rDEP) for lnM/P(t) and ln(1 + rDEP), we see that the major impact of the interest rate on asset holding is negative (as in the long run equilibrium), but lagged two quarters. Asset demand takes about six months to adjust to a change in the interest rate.

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[14] Disaggregating income led to static solutions which produced non-stationary ECMs.

[15] Estimated income elasticities of money demand vary widely (see for example Darrat (1985) and Mwega (1990)). However, the one study which incorporates quarterly observations of income (Adam (1992)) shows elasticities close to unity for a wide range of aggregates.

The coefficient on ΔlnOI(t) is of the same sign as the corresponding coefficient in the long run solution, but larger. The impact effect of windfall income is larger than its long run effect. It may be the case that M is used for savings purposes in the short run, but that in the long run savings are converted into more illiquid assets. M is an intermediate form of saving. This would explain the large short run coefficient on windfall income. The short run coefficient on ΔMAVARP is not significantly different from the corresponding long run coefficient.

The modelling of ΔlnD/P is less successful, with a poor fitting final equation (R^2 = 0.63) and only ΔlnD/P(t-1), ΔlnINC(t-2) and ECM(t-1) as significant explanatory variables. With a smaller coefficient on the error correction term (-0.75), estimated convergence to long run equilibrium is slower. Again, the short run income effect is larger than the long run income effect, although this result should be treated with caution, since the estimates of income elasticity are probably biased upwards.

It is interesting that the rate of inflation is not a significant explanatory variable in any of the Camerounian equations. Inflation in Cameroun was very low over the sample period - on average, around 4% - and all the large real interest rate changes are due to nominal interest rate changes. This may explain the absence of significant inflation coefficients. Nevertheless, price variability *is* the major component of real interest rate variability, since the nominal interest rate exhibits very little variability, and price variability plays an important part in the determination of liquid asset holding.

Cote d'Ivoire

The static solutions for Cote d'Ivoire, for both M/P and D/P, include the two components of income - GDP and TTA - inflation, the nominal interest rate and price variability. The signs on the inflation and interest rate terms imply that equilibrium asset holding is a negative function of the real interest rate, which corresponds to the result for Cameroun above and for the savings equations in chapters 5-6. Not surprisingly, the coefficients on inflation, the nominal interest rate and price variability are higher in absolute value in the equation for lnD/P. Total deposit holding is more sensitive to the real deposit interest rate and its variability than is the demand for M1. The ADF statistic calculated for the resulting ECM for lnM/P is 2.42: the hypothesis of non-cointegration can be rejected

only at around 15%. However, this may result from the small sample size. The Dickey-Fuller test (an ADF with zero lags) yields a value of 4.37, significant at 1% - with no lags, the sample size can be larger. Given the sensitivity of the result to the number of lags employed, the results of a formal test are inconclusive, but are at least on the boundary of the rejection region for the hypothesis of non-cointegration. For lnD/P, the ADF statistic is 3.20, which is significant at 5%, and the hypothesis of non-cointegration can be rejected. In the model below, the variables in the static solution are taken to be cointegrated.

Again, one of the income elasticities (that on lnGDP) is surprisingly large, and is probably an overestimate. The reasons for this have already been discussed. The coefficient on MAVARP is smaller than in Cameroun: -0.061 for M/P and -0.083 for D/P. However, the level of MAVARP in Cote d'Ivoire is typically higher over the sample period: the mean value for the sample is 0.65. Overall, the reduction in asset holding due to price variability is slightly less than in Cameroun in the case of M/P. For Cote d'Ivoire, (M/P)/(M/P)' is 0.96, whilst (D/P)/(D/P)' is 0.94. That is, M/P is 4% lower than it would have been if price variability had no impact on asset holding, and D/P is 6% lower.

The final equation for ΔlnM/P is similar in many ways to the corresponding equation for Cameroun. The coefficients on ΔlnM/P(t-1) and ECM(t-1) are almost identical to those for Cameroun, again implying that asset holding adjusts very quickly to its long run equilibrium value. Again, the short run coefficients on the income terms are larger than the long run coefficients, although the usual caveat on the interpretation of these coefficient applies.[16] And again, the short run coefficient on price variability is not significantly different from the long run coefficient.

Again, there are interest rate terms with opposite signs from those in the long run static solution. If the equation in ΔlnM/P, $\Delta\ln(1+\pi)$, $\Delta\ln(1+\text{rDEP})$ and ECM is solved out for lnM/P, $\ln(1+\pi)$ and $\ln(1+\text{rDEP})$, the coefficients are:

rDEP(t)	rDEP(t-1)	rDEP(t-2)	π(t-1)	π(t-2)
-0.035	-0.054	-0.053	0.033	0.014

[16] In the case of △lnGDP, the problem of overestimation of income elasticities is particularly acute, with estimated coefficients above 5.0.

There is an immediate response to a change in the nominal interest rate, but the full impact of the change takes several months to happen. The response to a change in the rate of inflation is smaller and delayed.

The final equations for ΔlnD/P in Cote d'Ivoire are similar to those for ΔlnM/P. Unlike in Cameroun, the behaviour of D/P is very similar to that of M/P. This is partly due to the fact that there is more overlap between the two measures in Cote d'Ivoire, since time and savings deposits make up a smaller fraction of total money holdings. In the Ivorian equation for ΔlnD/P, the short run income coefficients are larger than the long run coefficients, whilst the short run coefficient on MAVARP is not significantly different from the long run coefficient. Solving out for lnD/P produces the following coefficients on real interest rate terms:

rDEP(t)	rDEP(t-1)	rDEP(t-2)	π(t-1)	π(t-2)
-0.077	-0.110	-0.037	0.019	0.013

which is a pattern similar to that for lnM/P.

3. Conclusion

The exploration of the behaviour of monetary aggregates in Cameroun and Cote d'Ivoire produced a number of interesting results. The following are among the most important:

(1) Demand for cash and bank deposits (which are largely demand deposits) appears to be demand for a stock in the sense that a higher income will lead to the holding of a larger stock of money (and not a larger flow of money). This suggests that money demand is primarily for transactions purposes, since it is the transactions model which predicts a link between income and the money stock. Intertemporal consumption smoothing models predict a link between income and an asset flow. Nevertheless, it may be the case that cash and bank deposits are used to smooth consumption in the short run. The evidence for this is that the short run coefficients on income in the money demand equations are larger than the long run coefficients. This means that when income rises, money holdings rise substantially, then tail off. One explanation for this is that in the tailing off period, wealth is being converted into more illiquid assets which are not immediately accessible after a sudden rise in income.

(2) The nominal interest rate and, in Cote d'Ivoire, the rate of inflation, are significant explanatory variables in the estimated equations. However, the coefficients estimated imply that a higher real interest rate leads to a lower level of assets. This result is consistent with a result of earlier chapters: that savings (more broadly defined than in this chapter) were a negative function of the real interest rate. That the same result should appear for two different data sets, the one based on annual National Accounts statistics and the other on quarterly central bank data, for two different Franc Zone countries, suggests that this is not a statistical anomaly. In view of the unhealthy state of the banking systems in the two countries in the 1980s, one explanation for the perverse effect is that a higher interest rate makes banks a more risky prospect for depositors, and there is a Stiglitz-Weiss effect in the deposits market. If this is indeed the case, it represents a dramatic failure of the domestic financial sector.

(3) The other source of risk for depositors is real interest rate variability. Given the constancy of nominal interest rates, the level of real interest rate variability depends on the

variability in the rate of inflation. In both countries, higher variability, appropriately measured, leads to lower asset demand. Countries with high levels of inflation also tend to exhibit high price variability. So Cote d'Ivoire and Cameroun would, were it not for the perverse coefficients on inflation due to Stiglitz-Weiss effects, have benefited from the low inflation delivered by the CFA: lower variability in itself has led to higher levels of private financial asset holding, and thus, for a given level of government debt, a lower level of foreign debt.

TABLE 8.1

Cote d'Ivoire

Solved STATIC LONG RUN Equation

LM/P = - 5.845 - .010 TREND - .060 Q2
(2.45456)(.00253) (.03184)
- .077 Q3 + 1.615 LGDP + .114 LTTA + .031 π
(.03281) (.34479) (.02625) (.01159)
- .061 MAVARP - .097 rDEP
(.02300) (.02318)

WALD Test Chi^2(9) = 1816237.861

Tests on the Significance of each Variable

Variable	F[NUM,DENOM] =	Value	Probability	Unit Root t-test
LM/P	F[2, 29]	3.559	.041	-6.250
CONSTANT	F[1, 29]	4.651	.039	-2.157
TREND	F[1, 29]	10.344	.003	-3.216
Q 2	F[1, 29]	6.780	.014	-2.604
Q 3	F[1, 29]	12.349	.001	-3.514
LGDP	F[3, 29]	9.854	.000	3.607
LTTA	F[3, 29]	7.298	.001	3.344
π	F[3, 29]	3.735	.022	2.609
MAVARP	F[1, 29]	6.336	.018	-2.517
rDEP	F[3, 29]	4.531	.010	-3.486

Solved STATIC LONG RUN Equation

LD/P = - 6.318 - .006 TREND + .041 Q1

(2.99908)(.00309) (.01645)

+ 1.735 LGDP + .127 LTTA + .046 π - .083 MAVARP

(.42035) (.03547) (.01398) (.02873)

- .192 rDEP

(.02928)

WALD Test Chi²(8) = 1234068.952

Tests on the Significance of each Variable

Variable	F[NUM,DENOM] =	Value	Probability	Unit Root t-test
LD/P	F[2, 30]	2.563	.094	-6.164
CONSTANT	F[1, 30]	3.950	.056	-1.987
TREND	F[1, 30]	4.115	.051	-2.029
Q 1	F[1, 30]	9.975	.004	3.158
LGDP	F[3, 30]	17.879	.000	3.488
LTTA	F[3, 30]	14.808	.000	2.660
π	F[3, 30]	5.129	.006	2.846
MAVARP	F[1, 30]	7.063	.012	-2.658
rDEP	F[3, 30]	12.954	.000	-5.563

TABLE 8.2

Modelling DLM/P by OLS

The Sample is 1978(2) to 1987(4)

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLM/P 1	.78294	.27846	.27518	2.81167	.2938
DLM/P 2	.37508	.16404	.14627	2.28645	.2158
CONSTANT	.11913	.02463	.02483	4.83746	.5519
Q 1	-.15511	.04389	.04343	-3.53435	.3967
Q 2	-.23849	.04356	.03632	-5.47446	.6120
Q 3	-.14685	.03200	.02807	-4.58938	.5257
ECM 1	-2.22426	.40331	.40367	-5.51501	.6155
DLGDP	8.91223	1.97326	1.89231	4.51650	.5178
DLGDP 1	-1.88292	3.21364	3.21949	-.58591	.0177
DLGDP 2	2.60777	1.96682	2.31436	1.32588	.0847
DLTTA	1.12620	.30874	.29330	3.64775	.4119
DLTTA 1	.11492	.51894	.50015	.22145	.0026
DLTTA 2	.06557	.31840	.29919	.20594	.0022
Dπ	.00179	.00765	.01066	.23436	.0029
Dπ 1	-.03390	.01422	.01375	-2.38391	.2302
Dπ 2	-.00919	.00929	.00877	-.98908	.0490
DMAVARP	-.05883	.02929	.02628	-2.00885	.1752
DrDEP	-.03465	.01881	.01925	-1.84261	.1516
DrDEP 1	.09753	.03683	.03787	2.64821	.2696
DrDEP 2	.03301	.02765	.02588	1.19360	.0698

R^2 = .9789070 σ = .0267335 F(19, 19) = 46.41 [.0000] DW = 1.941

RSS = .0135789206 for 20 Variables and 39 Observations

Information Criteria: SC = -6.084049; HQ = -6.631069; FPE = .001081

Testing for Serial Correlation

CHI^2(1) = .007 and F-Form(1, 18) = .00 [.9556]

ARCH TEST CHI^2(1) = .014 with F(1, 17) = .01 [.9374]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .093

Modelling DLM/P by OLS

The Sample is 1978(2) to 1987(4)

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLM/P 1	.36048	.13121	.11929	2.74726	.2185
CONSTANT	.08006	.01443	.01432	5.54630	.5326
Q 1	-.08278	.02544	.02316	-3.25435	.2817
Q 2	-.16796	.02413	.02261	-6.96176	.6422
Q 3	-.13274	.02166	.01803	-6.12922	.5818
ECM 1	-1.55905	.21171	.22580	-7.36413	.6676
DLGDP	7.47458	.97114	1.12352	7.69669	.6869
DLTTA	.98990	.12765	.14493	7.75509	.6902
Dπ 1	-.01350	.00714	.00652	-1.89197	.1171
DMAVARP	-.06259	.02599	.02638	-2.40869	.1769
DrDEP	-.03528	.01529	.01257	-2.30767	.1647
DrDEP 1	.05282	.01662	.01157	3.17895	.2723

R^2 = .9710497 σ = .0262729 F(11, 27) = 82.33 [.0000] DW = 2.151

RSS = .0186371753 for 12 Variables and 39 Observations

Information Criteria: SC = -6.518909; HQ = -6.847121; FPE = .000903

Testing for Serial Correlation

CHI^2(1) = .836 and F-Form(1, 26) = .57 [.4571]

ARCH TEST CHI^2(1) = .529 with F(1, 25) = .35 [.5580]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .144

Modelling DLM/P by OLS
The Sample is 1978(2) to 1987(4) less 8 Forecasts

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLM/P 1	.46163	.12446	.13070	3.70907	.4200
CONSTANT	.08189	.01360	.01329	6.01939	.6560
Q 1	-.09965	.02369	.02130	-4.20571	.4821
Q 2	-.17402	.02350	.02117	-7.40383	.7426
Q 3	-.10963	.02079	.02217	-5.27270	.5940
ECM 1	-1.63955	.21410	.25624	-7.65784	.7553
DLGDP	7.74031	.98488	1.10720	7.85913	.7648
DLTTA	1.02592	.12732	.15249	8.05747	.7736
Dπ 1	-.01353	.00695	.00755	-1.94696	.1663
DMAVARP	-.07984	.02452	.02610	-3.25603	.3581
DrDEP	-.04750	.01654	.00888	-2.87146	.3026
DrDEP 1	.04898	.01668	.01091	2.93595	.3121

R^2 = .9798644 σ = .0230223 F(11, 19) = 84.05 [.0000] DW = 2.215
RSS = .0100704644 for 12 Variables and 31 Observations
Information Criteria: SC = -6.702850; HQ = -7.076996; FPE = .000735

Tests of Parameter CONSTANCY over: 1986(1) - 1987(4)
Forecast Chi^2(8)/ 8 = 2.75
CHOW TEST(8, 19) = 2.02 [.0995]

Testing for Serial Correlation
CHI^2(1) = 1.213 and F-Form(1, 18) = .73 [.4032]
ARCH TEST CHI^2(1) = .011 with F(1, 17) = .01 [.9372]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = .378

TABLE 8.3

Modelling DLD/P by OLS

The Sample is 1978(2) to 1987(4)

VARIABLE		COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLD/P	1	.36837	.28961	.26938	1.27195	.0785
DLD/P	2	.03668	.14739	.15332	.24889	.0032
CONSTANT		.00147	.01864	.01719	.07878	.0003
Q	1	.03670	.02249	.01843	1.63220	.1230
Q	2	-.06803	.03019	.02623	-2.25350	.2109
Q	3	-.02487	.02518	.02904	-.98767	.0488
ECM	1	-1.27717	.42260	.42848	-3.02219	.3247
DLGDP		10.82520	2.64668	2.75137	4.09011	.4682
DLGDP	1	-3.40619	4.41304	5.16352	-.77185	.0304
DLGDP	2	4.08905	3.55469	3.88158	1.15033	.0651
DLTTA		2.03371	.42325	.41762	4.80499	.5486
DLTTA	1	-.12813	.70254	.93854	-.18238	.0017
DLTTA	2	.23438	.48898	.53535	.47933	.0119
$D\pi$		.00923	.00890	.01019	1.03722	.0536
$D\pi$	1	-.00604	.01854	.01858	-.32562	.0055
$D\pi$	2	-.00797	.01165	.01157	-.68457	.0241
DMAVARP		-.08967	.03985	.03492	-2.25032	.2104
DrDEP		-.06910	.02406	.01724	-2.87184	.3027
DrDEP	1	.06447	.06601	.05924	.97663	.0478
DrDEP	2	.00300	.04059	.04112	.07384	.0003

R^2 = .8996009 σ = .0342773 F(19, 19) = 8.96 [.0000] DW = 1.819

RSS = .0223237705 for 20 Variables and 39 Observations

Information Criteria: SC = -5.586915; HQ = -6.133936; FPE = .001777

Testing for Serial Correlation

CHI^2(1) = .516 and F-Form(1, 18) = .24 [.6291]

ARCH TEST CHI^2(1) = .293 with F(1, 17) = .13 [.7207]

CHI-SQUARED Test for NORMALITY : $CHI^2(2)$ = .665

Modelling DLD/P by OLS
The Sample is 1978(2) to 1987(4)

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLD/P 1	.21744	.11267	.08484	1.92985	.1174
CONSTANT	-.00992	.01066	.01073	-.93001	.0300
Q 1	.05721	.01762	.01545	3.24667	.2735
Q 2	-.04465	.01871	.01856	-2.38620	.1690
ECM 1	-1.16688	.12051	.10950	-9.68284	.7700
DLGDP	10.41278	1.13918	1.19397	9.14059	.7490
DLTTA	1.94243	.19603	.19486	9.90893	.7781
Dπ	.01917	.00691	.00935	2.77468	.2157
DMAVARP	-.11002	.03174	.02495	-3.46582	.3002
DrDEP	-.07728	.01964	.00974	-3.93381	.3559
DrDEP 1	.03718	.01876	.01371	1.98233	.1231

R^2 = .8624428 σ = .0330508 F(10, 28) = 17.56 [.0000] DW = 1.781
RSS = .0305858911 for 11 Variables and 39 Observations
Information Criteria: SC = -6.117466; HQ = -6.418327; FPE = .001400

Testing for Serial Correlation
CHI^2(1) = .491 and F-Form(1, 27) = .34 [.5623]
ARCH TEST CHI^2(1) = 2.673 with F(1, 26) = 1.97 [.1725]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = .390

Modelling DLD/P by OLS
The Sample is 1978(2) to 1987(4) less 8 Forecasts

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLD/P 1	.20383	.10722	.07538	1.90105	.1530
CONSTANT	-.00439	.01128	.01090	-.38940	.0075
Q 1	.04352	.01760	.01631	2.47244	.2341
Q 2	-.06054	.01840	.01641	-3.29004	.3512
ECM 1	-1.20452	.11797	.08826	-10.21011	.8390
DLGDP	10.78232	1.13497	.99009	9.50013	.8186
DLTTA	2.03367	.19383	.15134	10.49220	.8463
$D\pi$	.01463	.00681	.00987	2.14793	.1874
DMAVARP	-.11484	.03057	.02324	-3.75631	.4137
DrDEP	-.06818	.02223	.01204	-3.06701	.3199
DrDEP 1	.04371	.02076	.01308	2.10583	.1815

R^2 = .9025530 σ = .0306389 F(10, 20) = 18.52 [.0000] DW = 1.517
RSS = .0187748383 for 11 Variables and 31 Observations
Information Criteria: SC = -6.190713; HQ = -6.533680; FPE = .001272

Tests of Parameter CONSTANCY over: 1986(1) - 1987(4)
Forecast Chi^2(8)/ 8 = 2.11
CHOW TEST(8, 20) = 1.57 [.1954]

Testing for serial correlation
CHI^2(1) = 2.064 and F-Form(1, 19) = 1.36 [.2588]
ARCH TEST CHI^2(1) = .352 and F-Form(1, 18) = .21 [.6493]
CHI-SQUARED Test for NORMALITY: CHI^2(2) = .252

TABLE 8.4

Cameroun

Solved STATIC LONG RUN Equation

LM/P = - .114 rDEP + .152 LOI - .096 MAVARP
(.02973) (.01535) (.03186)
+ 5.228 + .007 TREND
(.16164)(.00103)

WALD Test Chi²(5) = 1404446.204

Tests on the Significance of each Variable

Variable	F[NUM,DENOM] =	Value	Probability	Unit Root t-test
LM/P	F[2, 33]	5.196	.011	-8.172
rDEP	F[3, 33]	7.449	.001	-3.940
LOI	F[3, 33]	23.448	.000	7.516
MAVARP	F[1, 33]	9.402	.004	-3.066
CONSTANT	F[1, 33]	72.607	.000	8.521
TREND	F[1, 33]	24.899	.000	4.990

Solved STATIC LONG RUN Equation

LD/P = - 5.615 - .148 rDEPOSIT + 1.634 LINC
(.55321)(.04905) (.10776)

WALD Test Chi²(3) = 103746.117

Tests on the Significance of each Variable

Variable	F[NUM,DENOM] =	Value	Probability	Unit Root t-test
LD/P	F[2, 35]	8.841	.001	-4.536
CONSTANT	F[1, 35]	21.715	.000	-4.660
rDEP	F[3, 35]	4.385	.010	-2.673
LINC	F[3, 35]	10.373	.000	4.661

TABLE 8.5

Modelling DLM/P by OLS

The Sample is 1979(2) to 1987(4)

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLM/P 1	.49115	.24424	.21375	2.01092	.1615
DLM/P 2	.05202	.15743	.10916	.33045	.0052
CONSTANT	.01203	.00770	.00889	1.56168	.1041
DrDEP	.04247	.05008	.03804	.84806	.0331
DrDEP 1	.14331	.07281	.08289	1.96836	.1558
DrDEP 2	.05455	.05489	.05212	.99372	.0449
DLOI	.23458	.23675	.19306	.99083	.0447
DLOI 1	.38859	.43366	.46476	.89608	.0368
DLOI 2	-.16709	.26001	.37173	-.64263	.0193
DMAVARP	-.15521	.50428	.37071	-3.07786	.3109
$D\pi$	-.00322	.01124	.01483	-.28614	.0039
$D\pi$ 1	.00838	.00887	.00859	.94439	.0407
$D\pi$ 2	.00621	.00961	.00880	.64589	.0195
ECM 1	-1.81955	.40551	.40243	-4.48710	.4895

R^2 = .8498281 σ = .0318281 F(13, 21) = 9.14 [.0000] DW = 1.898

RSS = .0212735247 for 14 Variables and 35 Observations

Information Criteria: SC = -5.983501; HQ = -6.390878; FPE = .001418

Testing for Serial Correlation

CHI^2(1) = .097 and F-Form(1, 20) = .06 [.8162]

ARCH TEST CHI^2(1) = .111 with F(1, 19) = .06 [.8054]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = 7.580

Modelling DLM/P by OLS
The Sample is 1979(2) to 1987(4)

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLM/P 1	.38833	.18110	.12758	2.14429	.1869
DLM/P 2	.05576	.11573	.07675	.48177	.0115
CONSTANT	.02073	.00601	.00442	3.45191	.3733
DrDEP	.04611	.03683	.03020	1.25203	.0727
DrDEP 1	.09349	.05474	.05795	1.70805	.1273
DrDEP 2	.01821	.04121	.03561	.44175	.0097
DLOI	.24874	.17407	.19022	1.42899	.0926
DLOI 1	.60967	.32282	.33241	1.88857	.1513
DLOI 2	-.41441	.19944	.21686	-2.07787	.1775
DMAVARP	-.13603	.03733	.03329	-3.64381	.3990
Dπ	.00956	.00877	.00836	1.08942	.0560
Dπ 1	.00965	.00653	.00694	1.47839	.0985
Dπ 2	.00389	.00709	.00782	.54898	.0148
ECM 1	-1.66812	.30012	.28393	-5.55811	.6070
DUM83/2	-.12130	.02793	.01924	-4.34296	.4853

R^2 = .9227139 σ = .0233971 F(14, 20) = 17.06 [.0000] DW = 1.651
RSS = .0109484413 for 15 Variables and 35 Observations
Information Criteria: SC = -6.546186; HQ = -6.982661; FPE = .000782

Testing for Serial Correlation
CHI^2(1) = 1.584 and F-Form(1, 19) = .90 [.3545]
ARCH TEST CHI^2(1) = .203 with F(1, 18) = .11 [.7459]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = 1.070

Modelling DLM/P by OLS

The Sample is 1979(2) to 1987(4)

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLM/P 1	.35743	.09114	.09154	3.92189	.3546
CONSTANT	.01552	.00444	.00452	3.49411	.3036
DrDEP 1	.13041	.03436	.02723	3.79607	.3398
DLOI	.43790	.03809	.04606	11.49751	.8252
DMAVARP	-.12805	.03314	.02554	-3.86350	.3477
ECM 1	-1.56346	.15478	.15664	-10.10115	.7847
DUM83/2	-.10004	.02615	.00766	-3.82502	.3432

R^2 = .8798277 σ = .0246575 F(6, 28) = 34.17 [.0000] DW = 1.974

RSS = .0170237494 for 7 Variables and 35 Observations

Information Criteria: SC = -6.917424; HQ = -7.121113; FPE = .000730

Testing for Serial Correlation

CHI^2(1) = .032 and F-Form(1, 27) = .03 [.8754]

ARCH TEST CHI^2(1) = .060 with F(1, 26) = .05 [.8324]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = 1.350

Modelling DLM/P by OLS
The Sample is 1979(2) to 1987(4) less 8 Forecasts

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLM/P 1	.39735	.10023	.12467	3.96440	.4400
CONSTANT	.01952	.00714	.00633	2.73384	.2720
DrDEP 1	.15689	.03633	.03111	4.31859	.4825
DLOI	.42534	.06577	.08417	6.46723	.6765
DMAVARP	-.10074	.05006	.04896	-2.01238	.1684
ECM 1	-1.67734	.16675	.17928	-10.05911	.8350
DUM83/2	-.10890	.02780	.01505	-3.91801	.4342

R^2 = .8914585 σ = .0237015 F(6, 20) = 27.38 [.0000] DW = 2.296
RSS = .0112352225 for 7 Variables and 27 Observations
Information Criteria: SC = -6.930062; HQ = -7.166122; FPE = .000707

Tests of Parameter CONSTANCY over: 1986(1) - 1987(4)
Forecast Chi^2(8)/ 8 = 1.69
CHOW TEST(8, 20) = 1.29 [.3043]

Testing for Serial Correlation
CHI^2(1) = 1.159 and F-Form(1, 19) = .85 [.3676]
ARCH TEST CHI^2(1) = .077 with F(1, 18) = .05 [.8199]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = 2.236

TABLE 8.6

Modelling DLD/P by OLS

The Sample is 1979(2) to 1987(3)

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLD/P 1	.41998	.20258	.19627	2.07310	.1769
DLD/P 2	-.02665	.20224	.14663	-.13178	.0009
CONSTANT	.00125	.01702	.01652	.07343	.0003
DLINC	-3.09787	2.61599	2.23643	-1.18420	.0655
DLINC 1	2.95138	4.30956	5.02652	.68485	.0229
DLINC 2	3.30386	3.00652	4.17475	1.09890	.0569
DrDEP	.02004	.05848	.03790	.34264	.0058
DrDEP 1	.02135	.07492	.06288	.28493	.0040
DrDEP 2	.01984	.06003	.03521	.33049	.0054
Dπ	-.01195	.01585	.01567	-.75393	.0276
Dπ 1	.00559	.01451	.01518	.38505	.0074
Dπ 2	-.00826	.01504	.01314	-.54954	.0149
DMAVARP	-.06203	.07801	.06788	-.79514	.0306
ECM 1	-.87186	.26580	.28574	-3.28013	.3498

R^2 = .7169911 σ = .0459024 F(13, 20) = 3.90 [.0032] DW = 1.806

RSS = .0421405897 for 14 Variables and 34 Observations

Information Criteria: SC = -5.241074; HQ = -5.655238; FPE = .002975

Testing for Serial Correlation

CHI^2(1) = .725 and F-Form(1, 19) = .41 [.5277]

ARCH TEST CHI^2(1) = .010 with F(1, 18) = .01 [.9407]

CHI-SQUARED Test for NORMALITY : CHI^2(2) = .295

Modelling DLD/P by OLS
The Sample is 1979(2) to 1987(3)

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLD/P 1	.33974	.14133	.14032	2.40384	.1615
CONSTANT	-.00238	.01204	.00906	-.19770	.0013
DLINC 2	3.31760	.62424	.51788	5.31464	.4849
ECM 1	-.74828	.13054	.12214	-5.73196	.5227

R^2 = .6349283 σ = .0425676 F(3, 30) = 17.39 [.0000] DW = 1.959
RSS = .0543599120 for 4 Variables and 34 Observations
Information Criteria: SC = -6.023623; HQ = -6.141956; FPE = .002025

Testing for Serial Correlation
CHI^2(1) = .021 and F-Form(1, 29) = .02 [.8946]
ARCH TEST CHI^2(1) = .142 with F(1, 28) = .12 [.7307]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = .463

Modelling DLD/P by OLS
The Sample is 1979(2) to 1987(3) less 8 Forecasts

VARIABLE	COEFFICIENT	STD ERROR	H.C.S.E.	t-VALUE	PARTIAL r^2
DLD/P 1	.35613	.18951	.19819	1.87919	.1383
CONSTANT	.00752	.02611	.02950	.28797	.0038
DLINC 2	2.71306	1.16791	1.03728	2.32300	.1970
ECM 1	-.69196	.17496	.16503	-3.95496	.4155

R^2 = .4402706 σ = .0450756 F(3, 22) = 5.77 [.0046] DW = 1.960
RSS = .0446998859 for 4 Variables and 26 Observations
Information Criteria: SC = -5.864635; HQ = -6.002452; FPE = .002344

Tests of Parameter CONSTANCY over: 1985(4) - 1987(3)
Forecast Chi^2(8)/ 8 = .73
CHOW TEST(8, 22) = .59 [.7722]

Testing for Serial Correlation
CHI^2(1) = .000 and F-Form(1, 21) =.00 [.9999]
ARCH TEST CHI^2(1) = 1.031 with F(1, 20) = .86 [.3647]
CHI-SQUARED Test for NORMALITY : CHI^2(2) = .259

CHAPTER 9

LABOUR MARKETS AND FRANC ZONE MEMBERSHIP

LABOUR MARKETS AND FRANC ZONE MEMBERSHIP

Despite the potential long run benefits of CFA membership in terms of investment, it has been argued that the Franc Zone inhibits economic development of its members by preventing efficient short run economic adjustment. In the next two chapters, we will examine some of the arguments which have been proposed to support this point of view.

One claim which has been made is that government and industrial formal sector wages in the Franc Zone are too high (see for example Chamley (1991)). If wages are too high, then there will be inefficient allocation of labour in the economy, with suboptimal employment in industry. Moreover, if employment in the public sector is fixed - either because employees are providing essential services, or because it is politically impossible to reduce public sector employment - then high urban real wages entail a high public sector wage bill which the government can do nothing about. This may well lead to budgetary problems, and impair the ability of the government to reduce public sector debt.

It has been suggested that excessive real wage levels are a result of the low inflation in the Franc Zone, which is a consequence of the restrictive monetary policy which adherence to the CFA entails. This line of argument attributes labour market inefficiencies directly to CFA institutions: it is not simply that labour market institutions in francophone Africa happen to work less efficiently than in anglophone Africa, but that the difference has its origins in monetary policy. In this chapter, we will investigate evidence for this claim. In the first section, we need to look at the theoretical basis for the argument that excessive real wages are associated with low inflation. In later sections, we will investigate evidence relevant to this theory.

1. Inflation and models of the labour market

In order to substantiate the claim that the low inflation of the Franc Zone makes a difference to real wage determination, it is necessary first of all to provide a theoretical account of how wage determination may depend on the rate of inflation. We begin with models based on nominal wage stickiness.

(i) nominal wage inertia

The simplest scenario in which low inflation leads to higher real wages is in the case of nominal wage inertia. If nominal wages in the formal urban industrial sector of an economy are downwardly sticky, then when the marginal product of labour falls (for example, in the wake of a negative trade shock), misallocation of labour will arise in a country where inflation is very low. There is an upper bound on the rate by which real wages can fall, which depends on the rate of inflation: the lower inflation, the lower this limit, and the more likely it is that the fall in real wages required for efficient adjustment will be unattainable. In this case, employment in the formal urban industrial sector will be sub-optimal.

In a country where there is no commitment to a fixed exchange rate, the government can avoid this problem by expanding the money stock, generating domestic inflation and eroding real wages. (Or it may be the case that real wage flexibility is an unintended by-product of an expansionary monetary policy.) In the Franc Zone, where member states are committed to a fixed exchange rate, and do not have the power to expand the money supply at a rate which would generate high inflation, labour market inefficiency is more likely to arise.

It is first of all important to elaborate the reasons why nominal, as opposed to real, wages might be sticky. One possible reason for nominal wage stickiness is that it is a result of government minimum wage legislation. In all countries of the CFA, there is a minimum industrial wage ("SMIG")[1], often augmented by occupationally specific minima.

[1] Salaire minimum industriel garanti

This will introduce a lower bound on the basic industrial wage. If seniority structures are a result of skills acquired on the job, then an increase in the basic minimum will tend to raise all salaries at the bottom end of the pay scale. Figure 9.1 illustrates this. Without a binding minimum wage in an industry, the optimal pay scale for the firm is shown by the curve AA. Having invested in a worker, firms will initially pay her less than her marginal product, and increase her wage year by year, thus deterring defection to another firm. If a minimum wage (M) is introduced, the costs to the firm of a steep pay scale are increased (for a curve as steep as AA with an intercept at M, the wage bill is higher), so ceteris paribus, the curve will be flattened ("wage compression"). However, it will become horizontal only in extreme cases, where the minimum wage is so high that it is too costly to invest in workers at all. A likely outcome is a shift in the pay scale to MB, where wages at the lower end of the scale are higher than before, and wages at the upper end of the scale are lower. This new scale will be associated with more job queuing, as the entry wage for an industry is higher than the supply price of labour, and less investment in skills.[2]

In a high inflation country, any inherited nominal minimum wage would soon cease to be binding, the pay scale AA would be reintroduced, and optimal employment and investment in human capital would be reattained. In a low inflation country, the minimum wage constraint would last for longer.

This account leaves unexplained why governments should introduce minimum nominal wages in the first place. Surely if the government is interested in increasing the welfare of unskilled workers, and believes that minimum wage legislation will achieve this, it will be a real minimum which is enforced? Even if the statutory minimum is expressed in terms of a nominal wage, this wage will be adjusted upwards with inflation. However, it is possible to construct models of political economy where nominal minimum wage legislation is a likely outcome. For example, an increase in minimum wages may be used as a way to reduce urban unrest. Increases in the minimum will occur just when there is unrest, which will not necessarily coincide with large price changes. In a country with moderate inflation, this new minimum can quietly be eroded in real terms in subsequent periods, but in a low inflation country, there is no such discrete method of restoring labour market equilibrium.

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[2] For a more detailed analysis of the effect of minimum wage legislation on pay structures, see Collier and Lal (1986).

It remains to be seen whether governments (and not, for example, trades unions) are the source rigidity, and whether this rigidity is in real or nominal terms. In the light of this section, evidence on the political economy of labour markets will be of central importance.

(ii) game-theoretic models

Another possibility is that a government's ability to generate domestic inflation will improve its bargaining position with respect to other agents in the economy. If this is the case, and if higher output via lower labour costs is a government objective, then we may observe higher real labour costs in the Franc Zone. (Again, political economy is important: whose interests does the government represent?)

Whether the government's ability to control the money supply affects macroeconomic equilibrium depends on the structure of the game being played. In a simple model where the government sets the money supply and workers simultaneously set their wage, with complete information about the relationship between the money supply and prices, long run output is typically unaffected by the level of inflation. In Barro and Gordon (1983), for example, the equilibrium outcome is at the full employment level of output, regardless of whether the government is precomitted to a certain monetary policy: only the rate of inflation is different. However, in more complicated games, this is not always the case. In Cuckierman and Metzler (1986), where prices are a stochastic function of the money supply, private agents learn slowly about the government's objective function by observing prices. The government has an incentive to ensure that the stochastic component of price determination is large, so that people learn more slowly and the government has an informational advantage. Typically, the stochastic component is positively correlated with the expected rate of inflation, so there is an extra incentive to inflate. Precommitment to a certain money supply would mean that the government lost this advantage, leading to different equilibrium outcomes.

In order to determine which of the theoretical structures above is most readily applicable to the Franc Zone, we must look in some detail at the labour market institutions

of member states. Particular issues of interest are:

(i) Are trades unions a powerful force, either independently of the government, or in influencing government policy? If unions are very powerful, then they may well be able to enforce real wage inertia in times of recession. Even if unions are not this powerful, they may still be able to influence wages, perhaps within the framework of a game-theoretic model. Perhaps minimum nominal wages are easier to defend than minimum real wages.[3] The power of trades unions will depend partly on the power of other socio-economic groups in the economy, including farmers and entrepreneurs. To maintain high real wages is to maintain a high price of industrial labour relative to the price of agricultural labour and profits; if farmers and entrepreneurs are powerful economic groups, then high real wages are less likely.

(ii) If unions are weak, then wages could be determined by perfectly competitive markets, or subject to nominal minimum wage legislation, or determined in a game-theoretic way, with the government as the dominant player with interests opposed to those of workers. Which is the best characterisation?

Data on CFA labour markets are scarce, and it is not possible to test specific models. However, what is possible is to examine the institutional structure of francophone labour markets to see which models are most plausible. In three Franc Zone members - Senegal, Cote d'Ivoire and Cameroun - there is enough evidence to do this. This will be the subject of the following three sections. In the subsequent section, this will be complemented by an analysis of the variation in wage rates across countries and across time, to see whether these show signs of nominal inertia.

[3] For example, if contracts are in terms of nominal wages, maintaining a real wage in times of inflation involves renegotiating the contract, with all the costs this entails, whilst maintaining a nominal wage simply means defending the existing contract.

1. Institutional background (i): Senegal

How powerful are trades unions in Senegal? Observation of the Senegalese labour market suggests that it has a high "corporatism index", favourable to the concentration of union power.[4] Industrial output is concentrated both in a small number of firms and in a small number of products. By 1986, 140 out of 600 firms in the formal sector produced 94% of the output (see Svejnar and Terrell (1990)). All branches of industry are dominated by one or two large firms. Output is concentrated in three main sectors: groundnut processing, fish processing and phosphate extraction. These three sectors together make up over 90% of industrial value added. The import competing sector is very small, and needs to be supported by high tariffs: domestic importables prices are around 150% of c.i.f. import prices. Given the high degree of corporatism, we would not expect wage determination to be perfectly competitive. It is much more likely that wages in such an economy will be determined by some more centralised process. In understanding this process, it is essential to note the central role played by the government.

The Senegalese government is the main formal sector employer, and closely regulates the labour market, basing its legislation on the colonial French Overseas Labour Code. Until 1987, the government oversaw all hiring and firing through the Service de la Main d'Oeuvre (Labour Office). All unemployed workers were required to register with the Service, which contacted employers with suitable vacancies. It was illegal for workers to contact firms privately, or vice versa. Private employment agencies were also illegal. Recently, these restrictions have been relaxed, but the Service still handles almost all vacancies in private firms. The government recognises three types of contract: seasonal, fixed-term and permanent, but strongly encourages the last of these. In 1986, 0.317mn workers were reported in permanent formal sector employment, 0.494mn in seasonal employment and 0.079mn in temporary/fixed term employment. All basic wages and bonuses are fixed by law for different occupational categories. Layoffs of permanently employed workers are allowed only for disciplinary reasons or "acts of nature" with serious economic consequences. General recession is *not* admitted as a reason for layoffs.

Government dominance in the labour market means that in theory at least, it has

[4] For a discussion of the corporatism index, see Offe (1984).

the power to adjust wages in both the public and private components of the formal sector. Whether in fact this is a possibility depends on the process by which decisions concerning the labour market are made. Formally, the decisions are made in accordance with the National Collective Agreement (1982). This agreement was signed by the Confederation Nationale des Travailleurs du Senegal (National Senegalese Workers' Union) and all the major employers' confederations, of which the most important is the Union Syndicale des Industriels. Together with the Ministry of Public Affairs, these form a "tripartite commission" which determines the annual statutory minimum wage (SMIG). The SMIG can be augmented by "primes" (bonuses) and "sursalaires" (supplements). Some of these are chosen by employers, some by government representatives and some by the CNTS. The SMIG makes up about 70% of the salary of unskilled workers, and about 20% of that of cadres. How wages are determined is likely to depend on the relative bargaining power of the CNTS in times of economic recession. A powerful CNTS is likely to lead to real wage stickiness; a weak CNTS may mean that real wages are inflation-dependant.

How powerful is the CNTS? Opinions in the existing literature vary. Svejnar and Terrell (op. cit.) claim that it is very weak, and has little or no independent bargaining power. Certainly, the union has traditionally been very closely aligned to the government, both under the former ruling Union Progressiste Senegalais and the current ruling party, the Parti Socialiste. The current general secretary of the CNTS, Madia Diop, is a member of the Central Committee of the PS. However, other authors point to growing independence of the union in recent years.[5] It is not always clear whether leaders of the CNTS and PS see themselves primarily as government officials controlling trades unions or as trades unionists with a hand in government.

The power of the CNTS will also depend on the influence of the informal urban sector in Senegal, i.e., those workers who do not officially register for employment and who are beyond the scope of labour market legislation. Government statistics show estimated urban informal sector employment rising from 147,000 in 1960 to 276,000 in 1980. In the same period, formal sector employment rose from 112,000 to 228,000. I.e., the informal sector makes up just over half of the modern sector, and is growing at the same rate as the formal sector. Many informal sector workers are small entrepreneurs, whose income comes from the profit of their own enterprises. Their "wage" is thus

[5] See for example the Economist Intelligence Report for Senegal (1989/2)).

entirely flexible. Even those who are not self-employed are unlikely to be able to bargain for a high wage, falling as they do outside official legislation. Predominance of these workers in a particular activity will mean that activity is characterised by neither real nor nominal wage inflexibility, since neither trades union power nor minimum wage legislation will apply. The uncertainty surrounding estimates of the size of the informal urban sector introduces an extra degree of uncertainty about overall wage determination.

Wage determination will also depend on the bargaining power of employers. Here the large literature on the nature of the Senegalese bourgeoisie is relevant. Examples of this literature are Cruise O'Brien (1979) and Boone (1990a,b). The consensus of opinion amongst political authors is that the post-colonial Senegalese state has used existing French institutions to create a bourgeoisie which is dependant on that state. The ruling party at the time of independence (the UPS) represented the interests of a small group of party cadres. In order to maintain power, the party co-opted the new African business class, along with foreign - mainly French and Lebanese - businessmen. This was done by making rent-seeking more profitable than investment in physical capital. Once acquired, import licenses guaranteed a high income in an extensive import quota system. Existing French monopolies (for example, in banking) were maintained, the monopolists being dependant for their income on profits ensured by anti-competitive legislation.

Meanwhile, the government ensured that investment in physical capital, which would endow entrepreneurs with a measure of financial independence, remained expensive and very risky: intermediate input costs were inflated by tariffs, profits from investment taxed heavily and bureaucratic transactions costs were high. The government organised commercial lending via the Societe Nationale des Etudes et de Promotion Industrielle (National Society for Industrial Research and Development). Loans were typically on political rather than economic grounds, encouraging dependence on the state rather than investment in physical capital. Of the 50 firms which had received SONEPI loans by the late 1970s, most were Dakar-based, created to fulfil government service and supply contracts. When loan repayments became due, the firms were declared bankrupt.

The result of this state policy was the achievement of a considerable degree of state regulation of both employers and employees, as manifested in the National Collective Agreement. The price paid to achieve this regulation was the formalisation of a bargaining

structure at a national level. All three players: the state, employers and employees, were endowed with a degree of bargaining power, and wages were determined by an annual meeting of representatives of the three groups. What is not clear is whether the bargaining power of the private agents in the Collective Agreement is great enough to make any substantive difference to the annual outcome.

There is a fourth player in the Senegalese economy, the *marabouts*. These are the religious and political leaders of rural Senegal, who collectively control the production of the groundnut crop. They maintained enough collective organisation in the 1970s to ensure that the producer price of groundnuts did not fall too low. Implicit in the bargaining agreement with the marabouts was the government's turning a blind eye to illegal imports of consumer goods into rural areas. However, by the mid 1980s, the power of the marabouts was so extensive that it severely damaged government parastatal organisations. Free from state interference, the large groundnut growers started to smuggle their crop into the Gambia, where prices were higher. During this period, it is estimated that around 2/3 of the groundnut crop of Senegal was illegally exported.[6] This forced first the liquidation of the Office Nationale de Cooperation et d'Assistance pour le Developpement (National Office for Development Aid and Co-operation), the groundnut marketing parastatal, which had been bankrupted by loss of revenues, and then official recognition that the monopoly of its successor, the Societe Nationale de Commercialisation des Oleagineux du Senegal (Senegalese National Society for Vegetable Oil Marketing), was a fiction. Since 1986, private traders have been allowed to buy groundnuts wholesale, though still at an official producer price.[7]

The 1980s were characterised by increased costs of inputs in the industrial sector, mainly due to oil price rises, falling revenue in this sector, as phosphate prices fell, and falling international groundnut prices. The optimal response to such changes is likely to involve lower (real) industrial wages and producer prices, as marginal returns to both industrial labour and the export crop fall. How much these variables are likely to fall depends on the relative bargaining power of the different groups we have identified. In the existing literature, there is one attempt to quantify these powers, in Beghin and Carp (1991).

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[6] See Coulon (1981) and Caswell (1984).

[7] See van der Laan and van Haaren (1990) for a more detailed account of the demise of the groundnut parastatals.

In Beghin and Carp's model, there are three players: urban industrial workers, the government and the groundnut growers. They are assumed to reach a co-operative Nash equilibrium[8] each year in the following variables: official fertilizer prices, official groundnut prices, official wheat prices and official rice prices. (The last two prices determine the urban cost of living, and, since rice and wheat are imported by government agents, net government revenue.) The model allows for different ex ante bargaining powers (reflecting either institutional factors or different expectations), and estimates the "endogenous" bargaining power of each group, which is determined by such factors as international prices and the cost to each group of political disruptions. They find that the farmers' ex ante bargaining power is the strongest, but that workers have had the strongest endogenous bargaining power. Overall, in most years, the ratio of urban to rural income is higher than that consistent with maximum GDP, although the magnitude of the difference is often very small.

This study is to some extent tangential to the discussion above, however, since (i) wages are not included as a bargaining variable and (ii) the urban bourgeoisie is not included as a player. If wages were included in the model, and similar bargaining power coefficients to Beghin and Carp's were produced, then wages might well be too high. However, the absence of sufficient labour market data prevents the testing of this hypothesis. More directly relevant to the hypothesis that the fixed nominal exchange rate may lead to real wages that are too high is the possibility that the low bargaining power coefficients for the government obtained by Beghin and Carp are partly due to the absence of the nominal exchange rate in the set of bargaining variables. If the government had more policy instruments at its fingertips, instruments which if used could seriously hurt workers and farmers (for example, devaluation), then it could improve its bargaining position and force lower real wages and producer prices.

The institutional literature on labour and cash crop markets does not produce a conclusive answer on the question of the bargaining power of industrial workers. The mainstream view on Senegalese unions is that they are weak and closely aligned to the government, although this may have changed to some extent with the decline of the UPS. However, this close alignment may endow workers with some institutional bargaining

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[8] This may be a strong assumption: the marabouts' beggaring of ONCAD is hardly an instance of a co-operative equilibrium result.

power, which might be used to prevent wage reductions. The limits and effects of this power are unclear. The groundnut growers definitely are very powerful. However, this has led them in the past to trade their crop on parallel markets rather than to obstruct attempts to reduce the producer price.

Of the possible theoretical frameworks for modelling labour markets - fixed real wage, fixed nominal wage, game-theoretic and perfectly competitive - only the last can safely be rejected. There are three interpretations of the Collective Agreement:

(i) It is dominated by the CNTS, which has considerable influence over the PS. In turn the PS has control over employers' organisations and (to a lesser extent) farmers, making the unions the dominant socio-economic group in the economy. Real wages are set by the CNTS, and will exhibit downward inertia.

(ii) It is dominated by the PS, which has co-opted the leaders of the unions and employers' organisations in order to reinforce its influence over domestic wage and price determination. It is the government which determines minimum wages. In this case, the possibility of nominal wage inertia arises.

(iii) There is a balance of power between the government, the CNTS and the employers' organisations in the Collective Agreement, and a balance between the urban groups and farmers, best modelled in a game-theoretic framework. In such a framework, it is possible that the government's position is handicapped by its limited control over domestic monetary policy.

Thus, Senegalese labour market institutions are consistent with the existence of nominal wage inertia, but also with other forms of wage determination.

3. Institutional background (ii): Cote d'Ivoire

The government of Cote d'Ivoire has a less extensive influence over the private formal urban sector than that of Senegal. It maintains a SMIG, but bonuses and overtime pay rates in the private sector are largely beyond its control. All trades unions, apart from the teachers' unions, are part of the Union Generale des Travailleurs de la Cote d'Ivoire, which maintains a degree of independence from the government. Statutory benefits (including operation of the SMIG) are much more extensive in the public sector than in the private sector (see Table 9.1). Moreover, the industrial sector is larger and more diverse than in Senegal: there is a substantial manufacturing sector producing a variety of import-competing and exportable commodities.[9] This entails a wide range of wage rates and wage agreements, with substantial difference between different sectors of the economy.

Relations between Ivorian trades unions and the ruling Parti Democratique de la Cote d'Ivoire have been mixed. Although leaders of the large unions profess loyalty to the President, there is a history of dissent amongst white collar workers in a number of sectors. In 1987, for example, the leaders of the teachers' union, Synesci, were convicted of dubious charges of misappropriating union funds, after they had been critical of government policy. Evidence of the government's fear of their continuing power is that on their release from prison, they were met by the ministers of education and defence, and the army Chief of Staff.[10] In February 1990, the government announced a 40% cut in public sector wages, along with a 7% increase in tax for the private sector. After a series of strikes, the government backed down, saying that the cut applied only to ministers, and made concessions on the wage and tax changes. There is no equivalent of the Senegalese National Collective Agreement in Cote d'Ivoire, and the UGTCI has demonstrated its ability to act independently of the government on a number of occasions. Given the greater independence of unions, real wage inertia would seem more likely than in Senegal.

There is a large empirical literature on the Ivorian labour market, which concentrates on the government's microeconomic surveys, conducted about once every four years. This

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[9] Note however that there are a number of large corporations which are in joint public-private ownership (see chapter 5): government influence in the wage policy of these firms may well be extensive.

[10] See Economist Intelligence Report (1988/3)

literature is mostly micro-econometric, focusing on such issues as the role of sex and educational achievement in determining the wages of individual workers. However, a number of studies are relevant to the issue of wage formation.

Van der Gaag and Vijverberg (1988) construct a model in which different rates of pay reward different skill levels, but in which the public sector wage for a given skill level is higher than the corresponding private sector wage. They estimate that for a typical worker, the public sector wage is FCFA 518 per hour, whilst for an equivalent private sector worker it is FCFA 462 per hour. (I.e., the expected wage of a typical worker conditional on that worker being in the public sector is higher than the expected wage conditional on the same worker being in the private sector.) The differences are more marked for the less able worker, and at the very top of the educational spectrum, the private sector worker earns more. The latter can be explained by the more generous fringe benefits which are typically offered in the public sector (see Table 9.1), but the higher wage *plus* more benefits for a typical worker in the public sector suggests some form of labour market segmentation. That public sector workers can maintain a wage differential over comparable private sector workers suggests some form of union power.

Lavy and Newman (1989) use the microeconomic survey data to tackle the issue of wage flexibility directly. They show that between 1979 and 1984, at a time when formal sector employment fell sharply, average real wages actually rose. However, they also demonstrate that this overall rise in real wages can be misleading, since the composition of the labour force changed. Real wages for every employment category below that of company director actually fell. The rise in the aggregate wage was due to upward mobility of workers through categories. Moreover, regressing individual wages on variables reflecting skill levels shows that a specific level of skill was rewarded by a lower real wage (typically in the order of 25% lower) in 1984 compared with 1979.

However, their results are not enough to reject the hypothesis of slow wage adjustment. First of all, the skill variables may reflect a screening model of the labour market rather than a human capital model. In this case, the higher skill levels recorded in 1984, and the upward occupational mobility, do not reflect higher marginal productivity of labour. It may still be the case that productivity has remained constant whilst wages have risen. Secondly, even if the wage for a worker endowed with a certain level of

productivity has fallen, it may not have fallen as much as the return to labour in other sectors of the economy. I.e., urban formal sector workers may not be able to resist some fall in wages, but they may be able to resist falls commensurate with those of others in the economy, and to resist falls of a magnitude consistent with efficient resource allocation.

The Ivorian informal urban sector has been studied by Vijverberg (1990,1991).[11] Vijverberg estimates that 28.7 % of males and 72.8% of females in the non-agricultural workforce are self-employed. His econometric model suggests that the average return to these workers' labour is somewhere between FCFA 20 and FCFA 210 per hour, and probably less than FCFA 100 per hour, much lower than the average formal sector wage. This is at least partly due to a lower level of skills amongst informal sector workers (less than 30% having the "three Rs", as compared with over 70% in the formal sector). However, it may also be partly a result of labour market segmentation. Again, the existence of a large and distinct informal urban sector is potential evidence for formal sector wage inertia whilst at the same time reducing the inertia of aggregate urban wages.

What of the bargaining power of other groups in the economy? Some political authors claim that the dominant ruling class in Cote d'Ivoire is a "planters' bourgeoisie". Campbell (1978), for example, notes that the leaders of the independence movement and the post-independence government (and most importantly Houphouet-Boigny himself) all owned large cocoa farms. This would suggest that farmers have the power to resist falls in the producer prices which they receive.

However, Faure and Medard (1982) argue that soon after independence, young urban cadres came to dominate the government, forming a rentier class similar to that in Senegal. They note that between 1960 and 1975, the ratio of rural to total GDP fell from 0.52 to 0.33, whilst the corresponding population ratio only fell from 0.8 to 0.66. This entails a substantial fall in the per caput rural share of GDP, hardly evidence of planter power. The 1976-80 Five Year Plan allocated FCFA 216bn of investment to agriculture out of a total investment budget of FCFA 1 591bn. Neither does there exist a rural elite corresponding to the Senegalese marabouts. Hecht (1983) estimates that only 0.4% of

[11] Another study has been published by Lachaud (1988). However, the techniques used in this paper are less sophisticated than in the Vijverberg papers (Lachaud, for example, uses OLS when Logit would be more appropriate).

farmers in 1975 owned more than 30 hectares of land, and only 2.1% owned more than 20 hectares. The annual per caput income of this group was $802, little more than the national average income of $653. Around 90% of farmers earned less than this average.

The evidence with respect to producer price formation is mixed. In the 1970s, the ratio of producer to export price of cocoa fell as low as 0.19, suggesting that farmers had little bargaining power. However, some authors (see for example Crook (1990)) argue that the CAISTAB crisis of 1987-90 was a result of downward immobility of the nominal producer price of cocoa enforced by powerful farmers. As the international price of cocoa fell below the official producer price of FCFA 300 / kilo in the late 1980s, the government was urged by international donors to cut the producer price. Houphouet-Boigny refused, citing his "historic obligation to cocoa farmers". The marketing of cash crops in Cote d'Ivoire is semi privatised: private traders buy crops from farmers at the official price and sell them abroad, paying the Caisse de Stabilisation the difference between the price they receive and an "allowed" exporter's price; if this difference is negative, the Caisse pays out. Thus the Caisse was able to survive for some time with producer prices higher than world prices. It simply reneged on its commitment to pay the private traders the difference. In response, traders stopped buying cocoa, or tried to buy at illegal prices, until the Caisse paid up. Eventually, after back payments to traders, CAISTAB reported losses of FCFA 112bn, and the domestic producer price was finally cut.

Of course, it is the nominal objective of a cash crop marketing board to resist both upward and downward movements in domestic producer prices. However, the resistance of CAISTAB has brought it close to financial ruin. After the extremely low producer prices of the 1970s, the mechanism by which prices are decided remains a mystery.

Again the evidence on wage and producer price formation is mixed. Evidence suggests that unions may be somewhat stronger and more independent than in Senegal, so the case of real wage inertia is more likely than in Senegal. There is some evidence that unions have been able to resist pressure to cut real wages in the recent past. However, some of the econometric evidence suggests that wages might be flexible. The majority of political authors argue that farmers are relatively weak, and unable to resist cuts in the official prices of their crops. If this is so, unions might be able to maintain high urban incomes whilst rural incomes were falling. However, this characterisation does not explain

the government's unwillingness to reduce producer prices in the late 1980s.

4. Institutional background (iii): Cameroun

Industrial relations in Cameroun are governed by the 1974 Labour Code. This embodies the changes in the structure of Camerounian trades unions which the government managed to effect in the early 1970s. Until then, trades unions were affiliated to one of a number of confederations reflecting differences in political ideology, religion and ethnic background, without formal ties to the ruling party, the Cameroun National Union. Since 1972, these groups have been unified under the auspices of the National Union of Cameroun Workers. The president of the NUCW is also ex officio a member of the Central Committee of the CNU. Activity outside the NUCW is in practice prohibited,[12] and before a potential new union is admitted to the NUCW, it must be vetted by the CNU.

Statutory minimum wages are agreed as a result of collective bargaining, as in Senegal. Different minima are agreed for different categories of worker. However, Clignet (1976) suggests that these minima may be of little effect in many sectors, since it is a common practice for employers to place a worker in an occupational category lower than that associated with his actual job, whilst paying him a bonus on top of the SMIG corresponding to the former. Thus the worker receives a wage roughly equivalent to the statutory minimum for the job he does, but this wage is flexible downwards.

Clignet also provides evidence that nonmanual workers have more bargaining power than manual workers. Wages for nonmanual workers are relatively homogenous across economic sectors, perhaps because their white collar skills are easily transferable between occupations. There is much more variability in the wages earned by manual workers, even those with similar levels of education and experience. Clignet suggests that this is because their skills are industry- or even firm-specific. Once the skills are acquired, the firm has a monopsony over a worker's human capital. Thus the market for different kinds of manual worker is segmented, and workers in each part of the market may have little bargaining power.

There is a large and thriving informal sector in Yaounde, accounting for 20% of the

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[12] It is theoretically possible to form a union independently of the NUCW, but only if it covers an occupational category outside the scope of existing unions in the NUCW. Needless to say, the NUCW covers every conceivable occupational category. See Hodson (1983).

economically active population there. Demol and Nihan (1982) report that this sector employs almost 7,000 workers, of whom over 5,000 are employed in productive and manufacturing sectors. There is a wide variety of incomes in this category of worker. 2,600 are entrepreneurs, earning between FCFA 6,800 and FCFA 15,900 per week in various sectors. (The basic inter-occupational SMIG is FCFA 2,994.) 3,300 are apprentices, earning around FCFA 800 per week, i.e., less than 1/3 of the basic SMIG. Again, there appears to be some labour market segmentation, with unions able to enforce minimum wages higher than minima in the informal sector. However, the informal sector is large enough for it to weaken the unions' bargaining strength.

Little work has been done on the market for agricultural commodities in Cameroun. Cash crops are of relatively minor importance to the Camerounian economy, since the discovery of oil in the late 1970s. As in Senegal and Cote d'Ivoire, the marketing of the major cash crops (in this case, coffee and cocoa) has been under the auspices of a single parastatal, the Office Nationale de Commercialisation des Produits de Base (National Office for the Marketing of Primary Commodities). As in Cote d'Ivoire, the government resisted the cutting of producer prices in the late 1980s, the ONCPB relying on its financial reserves to subsidise farmers. (Unlike the Ivorian system, there were no private traders in the Camerounian marketing system.) However, the financial crisis of 1988 meant that the ONCPB could not draw on all its reserves, and it had to be bailed out by the central government. Following this, private traders were allowed into the marketing system, and the producer price was cut.

The Camerounian labour market is based on a centralised framework similar to the Senegalese system, and the possible interpretations of that system are relevant here too. The evidence authors such as Clignet suggest that unions are not very powerful, so that real wage inertia is unlikely. However, there is no conclusive evidence.

5. Quantitative evidence on wage stickiness and government expenditure

The institutional literature does not produce conclusive results regarding wage formation. Both real and nominal wage inertia are possible, although Ivorian institutions seem more likely to generate real inertia than those of Cameroun and Senegal. In this section, we will examine wage figures which do exist, to see if these indicate a particular form of wage determination.

Labour market data are limited, but the following sources exist:

(i) A number of African countries report figures for the ILO October Survey, which collects wage figures by occupational category. Some countries report minimum wages, and some average wages, for at least one year in the 1980s. This can form the basis of a cross-country comparison which may shed light on the relationship between inflation and wage formation.

(ii) The World Bank Living Standards Measurement Survey for Cote d'Ivoire (1986) and Ghana (1988) can be used to derive sectoral income series which also provide a cross-country comparison.

(iii) For Senegal, Cote d'Ivoire and Cameroun, there are limited time series on aggregate industrial wages, reported by domestic sources. Franc Zone members also report annual SMIGs. The evolution of wages over time may also shed light on wage determination.

(i) Wages across countries

If nominal wage inertia is prevalent across Africa, then the rate of inflation in a country ought to make a difference to real wage determination. This difference could be exhibited in the long run trend level of real wages, or in the short run adjustment of real wages to an external shock. If nominal wages in a country were fixed at too high a level at independence (as is argued, for example, in Collier and Lal (op. cit.)), then a higher rate

of inflation would mean that real wages would reach their market-clearing level sooner. By the mid 1980s, we should observe higher real wages in low inflation countries. However, the main problem with nominal wage inertia may be in the adjustment of the economy to a negative external shock. As national income falls, real wages should fall too. With downwardly sticky nominal wages, the ability of real wages to adjust will depend on the rate of inflation. We might therefore (a) compare wages across different countries in the mid 1980s, to examine the long run trend argument, and (b) look at the adjustment of wages over the late 1980s, when per caput incomes in most African economies were falling.

Some care needs to be taken in the construction of comparable wage series across countries. What is important is the industrial wage relative to the returns to labour in other sectors of the economy. One measure of this is the industrial wage as a fraction of private per caput income. Private income figures, however, are not typically available for the years which the wage data cover. A proxy is private per caput consumption, which will be an unbiased numeraire as long as private average propensities to consume out of income are constant across countries. In the tables below, private per caput consumption is used as the numeraire. Table 9.2 reports propensities to consume in the most recent years when private income data are available for all of the countries (1979-81).[13] Propensities are very similar in the most of countries for which wage data are reported, although the figures for Burundi and Rwanda are slightly higher, and that for Zambia slightly lower. This should be born in mind when comparing the wage series.

Another factor which needs to be taken into account in cross-country comparisons is that the composition in the labour force may vary from one country to another. In a country with a highly skilled workforce, it is not necessarily a sign of inefficiency that wages are higher than in a country where workers are relatively unskilled. This can be accounted for partly by looking at wages in individual occupations: this will control for occupationally specific skills. This does not account for skills acquired "on the job", but one might argue that these will not vary from one country to another, and look at average wages in each occupation. The drawback with this approach is that there *are* reasons why on the job skill acquisition may vary from country to country: wage compression may vary

[13] The data are constructed using reported gross domestic saving (a), government saving (b) and private consumption (c). Private income is taken to be (a-b+c). In Nigeria, data for 1979-81 are unavailable, so 1978 is used instead.

across countries, for example, and this may be associated with different rates of skill acquisition. One way of controlling for this phenomenon is to compare entry wages for different professions.

Using the ILO October Survey, we can construct entry wage series over a wide range of occupational categories for six Sub-Saharan African countries for either 1985 or 1986: Cote d'Ivoire, Niger and Cameroun (CFA members), and Rwanda, Sierra Leone and Zambia. The entry wages are either the statutory minimum for an occupation, or the prevailing minimum basic wage. In addition, average prevailing occupational wage series are available for Cote d'Ivoire, Cameroun, Nigeria, Burundi and Kenya, which provide an additional comparison, subject to the caveat that it does not control for varying degrees of on the job training. These figures are reported in Tables 9.3-9.7.[14]

Although data for only a few countries are available, they exhibit a wide range of inflation rates. In the three CFA members, the ratio of consumer prices in 1985 to prices in 1965 was: 5.3 (Cote d'Ivoire), 4.9 (Niger) and 5.0 (Cameroun). Of the other countries, two had comparable rates of inflation, with ratios of 5.6 (Burundi) and 5.0 (Rwanda), two moderately higher inflation, with ratios of 6.3 (Kenya) and 8.8 (Zambia), and two much higher inflation, with ratios of 13.0 (Nigeria) and 27.8 (Sierra Leone). If the long run nominal rigidity argument is correct, the ratio of wages to per caput consumption in 1985-6 in the high inflation countries should be much lower.

Tables 9.3-9.7 show that this is not universally the case. Amongst the countries reporting entry wages, the ratio of wage to per caput consumption in Niger is typically higher than in the other countries (tests of significance are not possible, since some occupational categories will employ a larger proportion of the labour force than others, and employment figures by occupation are unavailable). However, the ratios in the remaining low inflation countries (Cote d'Ivoire, Cameroun and Rwanda) are not universally higher than those in the high inflation countries (Sierra Leone and Zambia). In Cote d'Ivoire, wages tend to be relatively high in light industry and commerce, and relatively low in heavy industry, construction and many highly skilled occupations. There is no obvious

[14] Wage figures by occupation are reported in Tables 9.3, 9.5 and 9.7. Tables 9.4 and 9.6 report *unweighted* mean wages by sector, i.e., the average of the reported wages in that sector. Since these figures are not weighted by employment in each occupation (data are unavailable), and since the occupations included in each sectoral mean vary from country to country, Tables 9.4 and 9.6 should be regarded as data description only; no inference is intended to be drawn from them.

theoretical reason for this difference - the division between these two groups of occupation cuts across economic categories (for example, the tradeable - nontradable distinction). In Cameroun and Rwanda, there is no obvious pattern to wage ratios relative to those in the high inflation countries. Amongst the countries reporting average wages, the striking feature is that it is one of the countries with moderately high inflation - Kenya - which has the highest ratios of wages to per caput consumption.

Whilst comparing wages for the mid 1980s provides evidence for the long run trend argument, we also need evidence for the short run adjustment argument. The countries reporting entry wages for 1985-6 also report wages for 1988-90, so we can look at the change in entry wages relative to per caput consumption in this period. Real per caput consumption fell in this period in all countries except Zambia: did wage rates fall more in the countries with higher inflation? Figures are reported in Table 9.7.

Table 9.7 shows evidence on the change in wages during the late 1980s. The figures show the ratio of the second observation of the entry wage (1988, 1989 or 1990) to the first (1985 or 1986), and the corresponding ratios in nominal per caput consumption and consumer prices. Note that in the low inflation countries, a fall in real per caput consumption corresponded to a fall in nominal per caput consumption, whereas in Sierra Leone, a real fall occurred at a time of hyperinflation, so nominal consumption increased threefold. If there is downward inertia in nominal wages, then surely the difference between low and high inflation countries will be observed here.

In neither of the CFA countries - Cote d'Ivoire and Niger - is the nominal inertia argument convincing. In Cote d'Ivoire, the fall in nominal per caput consumption was 10%. In few occupational categories is there a fall in wages less than 8%, and in many, the fall is greater than 10%. As in hyperinflationary Sierra Leone, the rate of change of nominal wages is in some case more than, and in some cases less than the rate of change of nominal per caput consumption. In a number of the highly skilled categories in Cote d'Ivoire, nominal wages rise between 1985 and 1990, but this is an indication, not of nominal inertia, but of workers bidding up real wages: the rise in nominal wages exceeds the rise in consumer prices in these categories. In Niger, real wages are being bid up in almost all occupational categories, which suggests that unions are strong in Niger, and explains the existence of high wages there in the initial cross-country comparison. In one

country, Rwanda, the nominal wage inertia story is more convincing. Nominal wages were unchanged in all but two occupational categories in Rwanda between 1985 and 1989, whilst nominal per caput consumption fell by 14%. However, Rwanda is not a member of the Franc Zone, and its government could have inflated prices if it had chosen.

This evidence against the hypothesis of a link between inflation and real wages relative to per caput consumption is contradicted by the evidence from the LSMS survey, from which analogous wage series for Ghana (1988) and Cote d'Ivoire (1986) can be calculated. From this household survey, a wage distribution for each occupational category can be constructed from each respondent's reported occupation and income. Unfortunately, the occupational categories used in the Ghana survey are not the same as those used for the Cote d'Ivoire survey, so categories must be aggregated for comparability. In Table 9.8, the aggregates used are the same as in Appleton and Collier (1991): government, private formal nontraded goods sector, private formal traded goods sector and informal sector.[15] The table shows mean and median incomes from employment in these sectors, relative to per caput consumption. In Cote d'Ivoire, the formal sector mean wage ratios are comparable to those for average wages as reported in the ILO October Survey, although they are slightly lower than wages in most ILO categories. The informal sector ratio is much lower, suggesting some form of labour market segmentation. In Ghana, the formal sector ratios are much lower, except in the public sector, where the income distribution is very right-skewed, and the median income in Ghana is lower than that in Cote d'Ivoire.

Why are wages so much lower in Ghana than in Cote d'Ivoire, and thus probably than in other African countries, both francophone and anglophone? One possible explanation is that the extremely high rates of inflation in Ghana (consumer prices in 1985 were around 300 times those in 1965; prices in 1990 were around four times those in 1985) has given the government an important strategic advantage in wage bargaining, since prices are so difficult to predict. This suggests that the dichotomy should not be between the CFA and others, but between persistently hyperinflationary countries and the rest. If so, the argument that the Franc Zone prevents efficient labour market adjustment by preventing inflation is very weak, since the economic costs of hyperinflation are surely greater than any potential benefits.

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[15] The occupations making up these aggregates is described in Appleton and Collier (op. cit.).

(ii) wages over time

Time series on industrial wages in the CFA are few and far between. However, it is possible to construct some sort of series for aggregate industrial wages in Senegal and Cote d'Ivoire, and for wages in the construction sector in Cameroun. In Senegal, the Labour Ministry's Division des Statistiques du Travail reported aggregate nominal industrial wage series for 1979-84. In Cote d'Ivoire, the Labour Ministry's Annuaire Statistique du Travail includes formal sector employment statistics, which can be combined with "compensation of employees" figures in the National Accounts to construct an aggregate wage series. Of course, these series do not allow for any of the compositional effects noted in the cross-country analysis above, and should therefore be treated with some caution. In Cameroun, the Notes Annuelles de Statistique include an index of nominal wages in the construction industry, although no aggregate wage series is included.

None of the wage series thus constructed exhibits the features associated with nominal wage inertia, as Figures 9.2-9.4 illustrate. The figures combine the nominal wage series with consumer price indices to produce series. With nominal inertia, we ought to observe real wages falling at a slower rate than per caput consumption in times of recession. In Cote d'Ivoire, aggregate real wages are rising throughout the recorded period (1970-82), even when real per caput consumption is falling, an indication of the power of Ivorian trades unions; in Cameroun, real wages in construction are falling whilst real per caput consumption is rising. In Senegal, there is no obvious pattern to wages, except that they are much more volatile than per caput consumption.

We can pursue the question of real wage inertia by looking at the relationship between the real wage and employment. If there is a negative correlation between a stationary real wage series and a stationary employment series, then it is likely that what we are observing is the tracing out of a labour demand curve. This could be because labour supply is much more volatile than demand, but an interesting alternative explanation is that wages are above their market clearing level, so a rise in wages results in a fall in employment. Given the pattern of real wages over time, this is more likely to be a result of real wage inertia rather than nominal wage inertia with low inflation. Reported real wage

and employment series are not always stationary in levels, but are stationary in first differences.

In Cote d'Ivoire for aggregate wages as reported in AST, there is a marked negative correlation between $\triangle W$ and $\triangle E$. Using the 12 observations available, we can estimate the equation:

$$\triangle E = 0.046 \quad - \quad 0.263 \triangle W$$
$$(4.01) \qquad (-3.31)$$

where E is aggregate employment measured in millions and W is aggregate annual real wage in FCFA billion at 1985 consumer prices. T-ratios are in parentheses. Figure 9.5 corresponds to this equation. The AST data are consistent with real wage stickiness, and if more data become available, the negative correlation which they exhibit would be worth investigating in greater detail.

If we plot $\triangle E$ and $\triangle W$ for the Senegalese DST data, we can observe a similar negative correlation (see Figure 9.6). However, there are not enough observations in this case for a sensible statistical test of the significance of this correlation.

The other source of information on the path of wages over time in CFA members is the reported SMIG in each country. This is an indicator of basic industrial wages. Figures 9.7-9.12 show the (nominal) SMIGs of Franc Zone members, and corresponding per caput consumption paths. The series do show that the SMIG is usually constant whilst nominal consumption is falling: for example in Cote d'Ivoire in 1987-90, in Senegal and Togo in 1988-90 and in Niger in 1984-90. However, even over the late 1980s, these downward movements in nominal consumption are very small in comparison with the long run upward trend in both consumption and the SMIG. The overall trend in most countries is for the ratio between the SMIG and per caput consumption (shown in the figures as the gap between the logarithms of the SMIG and consumption) to fall, since of growth of the SMIG tends to be slightly slower than that of per caput consumption, when consumption is rising. It seems that downward inertia in the SMIG is not very important in practice.

(iii) public sector wages and the government budget

The second issue we are concerned with is the role of the public sector wage bill in determining the budget deficit. Again, data are available for Cote d'Ivoire, Senegal and Cameroun, but we will be concerned just with Cote d'Ivoire and Senegal; as Figure 9.13 shows, Cameroun did not experience large budget deficits over the 1970s and 80s.

There are two alternative sources of government budget data for Senegal. Those figures reported in the UN African Statistical Yearbook take published government figures at face value; in World Bank estimates, "accounting corrections" have been made, mainly to correct for under-reporting of government capital expenditure. Figure 9.14 and 9.15 show the two alternative data series for components of government expenditure. The current and capital expenditure series diverge in the later 1980s.

Current expenditure is more or less constant in real terms, and is composed of expenditure on wages and expenditure on goods and services in roughly equal proportions. Capital expenditure is lower, and in UN data , much more variable. In World Bank data, it is less variable, but rises rapidly after 1980. If UN data is used, the budget deficit is negligible throughout the 1980s, but in World Bank data, there is an increasingly large budget deficit after 1980 (see Figure 9.16).

The World Bank figures suggest that there was an increasingly large budget deficit over the 1980s, and that this deficit was a result of increasing expenditure rather than falling revenue, as Figure 9.16 illustrates. The extra expenditure is expenditure on capital. It would therefore be rash to claim that an uncontrollable wage bill has been the cause of Senegalese budgetary problems. It is much closer to the truth to say that an uncontrollable capital bill has been the root cause.

A similar story is true of Cote d'Ivoire (see Figures 9.17-9.19). UN figures correspond more closely to World Bank figures, and in both, the period of large budget deficits (1977-83) corresponds to a period of high capital expenditure, revenue being relatively stable over the whole of the period. It is possible that a rising real wage bill exacerbated the problem, however: from 1980 onwards, real growth of expenditure on goods and services is curtailed in response to the growing deficit; expenditure on wages,

however, continues to rise.

The main source of budgetary problems in both countries was over-enthusiastic government investment in response to temporary positive trade shocks in the 1970s (coffee and cocoa in Cote d'Ivoire, phosphates in Senegal). These shocks affected the budget deficit not so much through revenue, which was relatively stable throughout the whole period, as through government expectations of higher future income, which would have funded the investment. Current expenditure, including expenditure on wages, plays a relatively minor role in this story.

6. Conclusion

The institutional literature concerning the structure of labour markets in the three countries provides mixed evidence about the nature of wage determination in the formal urban sector. Certainly, the governments of all three have attempted to exercise as much influence as possible over their trades unions (with perhaps more success in Senegal and Cameroun than in Cote d'Ivoire). But given the strong links between government and unions, it is not obvious how much bargaining power the latter have in the determination of legislation concerning wages and labour market institutions. In particular, it is not obvious how much unions could do to prevent erosion of real wages in a recession. In the absence of union power, nominal rather than real wage inertia is more likely, and in this case, the low inflation of the CFA could make a difference determination. However, the present labour market institutions are consistent with a variety of market structures, including structures with real wage inertia, structures with nominal wage inertia and game-theoretic wage bargaining structures.

Before it is sensible to quantify the effects of wage inertia in Franc Zone countries in an econometric model, it will be necessary to have more and higher quality data. Both the cross-country and the time series data which do exist suggest that the rate of inflation experienced by a country will affect real wage determination only in cases of persistent hyperinflation, if at all. If this is indeed the case, than it cannot be claimed that adherence to monetary rules is detrimental to efficient labour market adjustment.

Even if the low inflation of the Franc Zone does lead to higher real wages, the consequences for the government budget deficit are unlikely to be very important. Budgetary problems in the past have arisen out of excessive capital expenditure. Expenditure on labour has made up a relatively small part of the government budget. Nevertheless, it may still be the case that CFA institutions have exacerbated the large budget deficits, and corresponding foreign debt, of the larger Franc Zone economies for other reasons. This will be the subject of the following chapter.

TABLE 9.1: NON-WAGE BENEFITS IN PUBLIC AND PRIVATE SECTORS IN COTE D'IVOIRE

	Public sector	Private sector
% unionised	64.2	39.5
% with wage in contract	54.7	33.2
% with job covered by SMIG	92.9	47.2
% with paid holidays	92.5	53.2
% with paid sick leave	90.1	48.5
% with retirement pension	91.5	40.9
% with Soc. Security benefits	62.7	27.0

(Source: van der Gaag and Vijverberg (1988))

TABLE 9.2: PRIVATE AVERAGE PROPENSITIES TO CONSUME OUT OF INCOME

Country	Period	APC
Cote d'Ivoire	1979-81	0.76
Cameroun	1979-81	0.80
Niger	1979-81	0.79
Kenya	1979-81	0.72
Nigeria	1978	0.79
Sierra Leone	1980-81	0.80
Burundi	1979-81	0.91
Rwanda	1979-80	0.90
Zambia	1979-81	0.66

(Source: Cote d'Ivoire, Cameroun and Niger - Boissonade and Guillaumont (1988); others - IMF Government Finance Statistics Yearbook (1985) and World Bank World Tables (1989-90))

TABLE 9.3: MINIMUM WAGES AS A PROPORTION OF PER CAPUT CONSUMPTION (1985-6)

ILO Class	CI	Ng	Rw	SL	Za
1	----	4.91	----	----	1.25
2	----	3.60	----	----	1.19
3	----	4.91	----	----	----
4	----	3.60	----	----	----
5	----	5.84	6.20	----	----
6	----	3.60	1.94	----	----
7	----	----	1.29	2.11	----
8	----	----	1.29	2.11	----
9	----	----	----	2.62	----
10	----	----	----	2.62	----
11	----	11.24	----	----	5.07
12	----	5.57	----	----	1.44
13	----	4.25	----	----	1.44
14	----	----	----	----	----
15	----	----	----	----	----
16	----	----	----	----	----
17	----	----	----	----	----
18	----	5.57	2.71	2.94	3.37
19	----	----	2.71	2.48	3.10
20	2.34	5.57	6.20	----	3.10
21	2.27	3.41	3.49	----	2.43
22	----	4.91	2.71	----	4.83
23	2.56	4.91	1.94	----	1.27
24	2.34	4.91	6.20	2.08	2.34
25	2.62	4.91	1.94	----	3.48
26	2.85	5.57	1.94	----	3.76
27	2.81	4.25	1.94	----	3.27
28	2.55	2.80	1.94	----	2.98
29	2.56	----	3.49	2.11	1.89

30	2.56	----	6.20	2.11	1.89
31	----	4.91	2.99	2.06	----
32	2.34	4.25	3.42	2.06	----
33	2.34	4.91	2.99	2.11	1.66
34	2.34	4.91	3.42	2.06	3.47
35	2.34	4.91	3.42	2.25	2.08
36	2.34	4.25	5.04	2.11	2.18
37	2.56	4.91	6.20	2.11	2.28
38	2.84	4.91	5.04	2.36	2.28
39	3.01	4.91	5.04	2.31	2.20
40	3.01	4.91	6.20	2.43	2.46
41	3.08	4.91	5.95	2.44	----
42	----	----	5.04	----	----
43	----	----	6.20	----	----
44	----	9.40	8.56	3.41	----
45	4.32	7.02	9.99	----	----
46	3.03	3.60	6.20	----	1.35
47	2.56	4.25	8.56	----	1.58
48	3.05	----	8.56	----	----
49	2.84	----	8.56	----	----
50	2.84	----	6.20	----	----
51	2.16	2.80	1.29	----	----
52	3.03	11.24	16.35	10.59	----
53	4.95	9.18	----	4.53	----
54	4.95	5.84	8.56	1.81	----
55	2.84	----	6.20	2.44	----
56	2.16	2.80	1.29	2.06	----
57	2.56	----	6.20	2.44	----
58	2.27	----	1.94	----	----
59	2.16	----	1.29	2.06	----
60	----	----	----	----	5.86
61	----	----	----	----	----
62	----	----	----	----	----
63	----	----	----	----	----

64	----	----	----	----	----
65	----	----	----	----	----
66	3.08	----	10.67	----	3.58
67	3.08	----	6.20	----	3.58
68	----	----	----	----	----
69	3.08	----	----	----	----
70	2.16	----	----	----	----
71	----	----	----	----	----
72	6.83	----	----	----	----
73	----	----	----	----	----
74	----	----	----	----	----
75	----	----	----	----	----
76	8.58	11.24	16.35	6.51	7.25
77	2.52	3.60	6.20	1.75	3.78
78	3.08	4.25	6.20	1.78	2.21
79	2.84	6.19	7.24	2.13	----
80	2.16	2.80	1.29	1.89	----
81	2.89	4.91	6.20	2.51	3.58
82	2.89	4.25	6.20	2.43	3.58
83	3.22	4.25	6.20	2.51	3.32
84	2.67	4.91	6.20	2.48	3.55
85	2.89	4.25	6.20	2.43	3.58
86	2.89	4.25	6.20	2.51	3.58
87	2.89	4.25	6.20	2.34	3.58
88	2.89	4.91	6.20	2.48	3.58
89	2.72	4.25	6.20	2.37	3.58
90	2.30	2.80	1.29	2.25	3.27
91	4.40	7.02	9.99	2.72	4.20
92	4.40	3.60	6.20	2.55	3.96
93	3.09	3.60	6.20	2.25	3.79
94	3.09	4.91	6.20	2.36	3.30
95	3.76	4.25	6.20	2.33	2.92
96	3.09	3.60	6.20	2.36	2.31
97	2.61	4.91	6.20	2.37	3.37

98	4.69	4.25	6.20	1.98	3.25
99	2.61	3.41	4.27	1.78	3.09
100	2.40	3.41	4.27	1.49	3.00
101	----	----	----	----	4.20
102	----	----	----	----	5.41
103	----	----	----	----	5.26
104	----	----	----	----	3.69
105	----	----	----	----	5.82
106	----	----	----	----	----
107	----	----	----	----	5.22
108	----	9.42	16.35	2.08	4.41
109	----	4.25	5.04	2.03	2.84
110	2.56	5.57	6.20	2.06	3.78
111	2.86	6.19	8.56	2.06	3.15
112	2.84	4.91	8.56	2.03	2.84
113	2.84	5.06	11.42	2.07	3.15
114	----	----	----	----	2.52
115	----	----	----	----	----
116	----	----	----	----	----
117	----	----	----	----	----
118	----	----	20.68	----	9.46
119	----	----	8.56	----	5.04
120	----	----	6.20	----	----
121	----	----	6.71	----	----
122	----	----	8.90	----	6.09
123	----	----	3.49	----	1.30
124	----	----	8.93	5.06	5.26
125	----	----	5.43	1.55	5.26
126	----	----	6.20	1.21	----
127	----	----	3.49	1.31	----
128	----	----	6.20	1.21	----
129	10.60	7.85	16.35	21.40	21.01
130	4.79	7.02	8.56	10.61	7.22
131	3.33	5.57	8.56	7.11	5.45

132	4.14	6.19	8.56	7.11	8.12
133	5.11	----	10.77	----	9.43
134	4.79	4.25	8.56	----	6.40
135	3.33	----	6.20	----	4.52
136	4.14	3.60	8.65	----	6.40
137	----	9.18	10.77	2.18	7.24
138	----	----	12.30	----	6.46
139	----	----	----	----	----
140	----	----	7.99	2.72	4.99
141	----	----	6.20	----	4.69
142	----	----	6.20	1.59	2.61
143	----	----	5.43	1.55	5.26
144	2.16	3.00	2.71	2.03	2.60
145	7.80	----	23.01	----	11.17
146	7.80	----	23.01	----	11.17
147	5.85	----	13.28	----	5.24
148	5.85	----	13.28	----	5.24
149	5.20	----	13.28	----	5.24
150	4.55	----	8.79	----	4.31
151	3.25	----	6.65	----	----
152	7.86	----	15.24	6.43	9.73
153	----	----	14.98	6.43	9.73
154	4.53	----	12.17	4.67	5.42
155	3.58	----	11.63	2.73	4.49
156	----	----	14.97	----	5.42
157	4.53	----	9.42	----	5.42
158	2.56	----	6.20	----	2.72
159	2.84	6.19	6.20	2.44	----

Key

Cl: Cote d'Ivoire (1985)

Ng: Niger (1986)

Rw: Rwanda (1985)

SL: Sierra Leone (1986)

Za: Zambia (1986)

Ca: Cameroun (1986)

See Appendix for definition of occupational categories

(Source: ILO (1987))

TABLE 9.3 (CONT'D): MINIMUM WAGES AS A PROPORTION OF PER CAPUT CONSUMPTION (1986)

	Ca
1	3.76
2	1.21
3	3.76
4	1.21
5	2.56
6	1.21
7	----
8	----
9	----
10	----
11	----
12	----
13	----
14	15.12
15	----
16	----
17	12.66
18	----
19	----
20	4.13
21	1.70
22	----
23	----
24	4.00
25	----
26	4.00
27	2.29
28	1.24
29	1.79
30	1.79

31	----
32	1.79
33	1.79
34	----
35	----
36	3.12
37	----
38	3.12
39	3.12
40	3.12
41	4.87
42	----
43	----
44	10.53
45	2.29
46	3.12
47	3.12
48	3.12
49	3.12
50	4.00
51	1.53
52	13.47
53	7.88
54	6.47
55	3.12
56	1.53
57	3.12
58	1.53
59	1.53
60	----
61	----
62	----
63	----
64	----

65	1.53
66	----
67	3.12
68	----
69	----
70	----
71	----
72	----
73	----
74	----
75	----
76	14.02
77	3.12
78	----
79	4.00
80	----
81	3.12
82	1.79
83	3.128
84	2.49
85	2.49
86	2.49
87	3.12
88	3.12
89	----
90	1.53
91	3.90
92	4.87
93	3.91
94	3.91
95	3.24
96	3.24
97	5.37
98	----

99	2.21
100	2.21
101	----
102	10.53
103	----
104	1.53
105	3.12
106	----
107	3.12
108	11.09
109	4.00
110	4.00
111	4.00
112	----
113	4.14
114	----
115	----
116	----
117	----
118	12.37
119	8.23
120	----
121	----
122	----
123	5.27
124	----
125	----
126	----
127	----
128	----
129	----
130	----
131	----
132	----

133	----
134	5.37
135	5.37
136	5.86
137	6.26
138	----
139	----
140	----
141	----
142	----
143	----
144	1.49
145	----
146	----
147	----
148	----
149	----
150	----
151	----
152	13.29
153	4.87
154	----
155	----
156	----
157	----
158	----
159	4.28

TABLE 9.4: SECTORAL AVERAGE MINIMUM WAGE RATIOS

Sector	Cl	Ng	Rw	SL	Za	Ca
Agric	----	4.41	2.68	2.37	1.22	2.29
Mining	----	6.66	2.71	2.71	2.88	1.89
Food ind	2.38	4.74	4.11	2.08	2.80	3.28
Light ind	2.74	4.86	5.05	2.28	2.43	3.14
Chem ind	3.15	7.27	5.98	3.70	5.86	4.83
Heavy ind	3.74	5.61	7.74	2.81	4.41	5.16
Building	2.83	4.30	5.71	2.43	3.52	2.60
Trade	3.41	4.30	6.20	2.21	3.32	3.65
Tr & Com	2.78	5.90	8.29	2.06	4.46	5.95
Commerce	5.03	6.24	9.67	9.68	8.42	5.71
Govt	2.16	3.00	6.81	1.97	4.44	1.49
Education	6.18	----	15.78	----	7.06	----
Health	4.39	----	11.41	5.07	6.13	9.08

Key

Agric(ulture):	classes 1-10
Mining:	classes 11-19
Food ind(ustry):	classes 20-24
Light ind(ustry):	classes 25-51
Chem(ical) ind(ustry):	classes 52-60
Heavy ind(ustry):	classes 61-80
Building:	classes 81-90
Trade:	classes 91-100
Tr(ansport) & Com(munication):	classes 101-128
Commerce:	classes 129-137
Gov(ernmen)t:	classes 138-144
Education:	classes 145-150
Health:	classes 151-158

(Source: Table 9.3)

TABLE 9.5: MEAN WAGES AS A PROPORTION OF PER CAPUT CONSUMPTION (1985)

ILO class	Cl	Ni	Bu	Ca	Ke
1	----	----	2.59	4.19	4.19
2	----	----	----	1.39	2.23
3	1.10	8.02	----	4.19	4.22
4	0.74	2.23	0.74	1.39	2.24
5	3.82	3.76	----	2.92	----
6	0.74	2.59	----	1.39	3.30
7	----	----	----	2.00	3.05
8	----	----	----	2.00	----
9	----	----	0.84	----	----
10	----	----	----	----	----
11	----	----	----	----	----
12	----	----	----	----	----
13	----	----	----	----	----
14	----	----	----	42.38	----
15	----	18.79	----	----	----
16	----	46.97	----	----	----
17	----	4.70	----	14.46	----
18	----	----	----	----	4.03
19	----	----	----	----	----
20	2.34	2.41	3.27	4.64	5.65
21	2.27	----	2.51	1.70	5.65
22	----	----	6.83	----	10.89
23	2.56	2.07	2.14	----	----
24	2.34	2.15	1.97	4.64	----
25	----	2.41	4.69	----	----
26	----	3.01	10.64	4.64	----
27	----	2.81	4.89	2.77	----
28	----	2.11	4.04	1.65	4.23
29	2.56	----	8.40	2.08	----

30	2.56	----	3.81	2.08	----
31	----	----	----	----	----
32	2.34	----	----	2.08	----
33	2.34	5.22	----	2.08	----
34	2.34	5.83	----	2.77	----
35	2.34	5.23	----	----	----
36	2.34	----	----	3.58	----
37	2.56	----	----	----	----
38	2.84	----	----	3.58	----
39	3.36	3.22	3.74	3.58	4.55
40	3.36	2.47	3.03	3.58	4.55
41	3.43	2.94	3.74	5.41	4.55
42	----	3.23	----	----	----
43	----	3.28	----	----	6.43
44	----	----	----	12.30	----
45	4.32	3.22	----	3.58	14.41
46	3.03	3.30	----	3.58	4.26
47	2.85	15.03	3.82	3.58	----
48	3.05	4.38	3.26	3.58	----
49	2.84	2.48	5.38	3.58	8.63
50	2.84	2.62	4.19	5.41	8.63
51	2.16	1.90	3.15	1.66	4.95
52	6.79	----	----	15.70	56.31
53	5.51	----	----	9.37	10.70
54	4.94	----	5.35	7.27	18.01
55	2.84	----	3.56	3.58	7.69
56	2.16	----	1.94	1.66	3.90
57	2.56	----	8.12	3.58	12.73
58	2.27	----	3.89	1.66	----
59	2.16	----	3.34	1.66	8.83
60	----	----	----	----	----
61	----	4.97	----	----	----
62	----	----	----	----	----
63	----	----	----	----	----

64	----	----	----	----	----
65	----	2.46	----	1.66	----
66	3.08	----	8.41	----	----
67	3.08	----	4.16	3.58	6.63
68	----	----	----	----	----
69	3.08	3.54	----	----	----
70	2.16	1.94	----	----	3.68
71	----	----	----	----	----
72	6.83	----	----	----	----
73	----	----	----	----	12.70
74	----	----	----	----	----
75	----	----	----	----	----
76	8.58	----	----	15.70	26.18
77	2.52	----	13.09	3.58	----
78	3.78	----	5.92	----	----
79	2.84	----	----	4.64	----
80	2.41	----	1.71	1.66	5.88
81	2.89	6.76	6.29	3.58	9.62
82	2.89	6.38	5.19	2.77	9.62
83	3.22	4.27	3.72	3.58	6.59
84	2.67	5.92	2.63	3.58	6.59
85	2.89	7.10	2.87	2.77	6.59
86	2.89	----	2.78	2.77	6.59
87	2.89	5.64	2.41	3.58	6.59
88	2.89	5.01	2.72	3.58	6.59
89	2.89	3.41	1.56	----	6.59
90	2.30	4.70	1.22	1.66	3.99
91	4.40	----	10.48	4.44	10.61
92	4.40	----	9.20	5.44	9.21
93	3.09	----	10.29	4.44	8.14
94	3.09	----	5.61	4.44	3.10
95	3.76	----	6.36	3.54	3.10
96	3.09	----	6.16	3.54	3.50
97	2.61	3.34	----	5.99	----

98	4.69	3.67	3.00	----	6.18
99	2.61	3.02	2.03	2.67	6.18
100	2.40	2.91	----	2.67	----
101	----	----	----	----	----
102	----	----	----	15.70	21.62
103	----	----	----	----	----
104	----	----	----	1.66	6.52
105	----	----	----	3.58	6.45
106	----	----	----	----	----
107	----	----	----	3.58	----
108	----	----	13.87	12.30	12.22
109	----	----	7.26	3.58	----
110	2.56	----	5.08	3.58	5.15
111	2.86	----	4.51	3.58	9.19
112	2.84	----	7.48	----	7.31
113	3.49	----	10.82	----	7.31
114	----	----	6.71	----	----
115	----	----	1.91	----	----
116	----	----	4.90	----	----
117	----	----	----	----	15.95
118	----	----	----	----	----
119	----	----	9.37	8.14	----
120	----	----	----	4.44	----
121	----	5.18	----	----	----
122	----	13.43	----	----	8.84
123	----	3.58	----	1.96	9.14
124	----	----	----	----	----
125	----	----	----	----	6.17
126	----	----	7.63	----	10.74
127	----	----	----	----	----
128	----	----	----	----	----
129	10.60	----	21.35	19.89	25.79
130	4.79	----	16.48	4.44	29.46
131	3.33	----	10.10	4.44	18.17

132	4.14	----	13.20	3.54	----
133	5.11	9.39	----	----	46.40
134	4.79	4.70	----	4.44	18.09
135	3.33	4.70	----	----	----
136	4.14	4.70	11.24	0.81	----
137	----	----	----	----	----
138	----	----	----	----	22.74
139	----	----	----	----	----
140	----	----	----	----	8.73
141	----	----	----	----	----
142	----	----	----	----	10.34
143	----	----	----	----	4.19
144	2.16	----	----	----	----
145	8.13	----	----	----	18.00
146	8.13	----	----	----	18.00
147	6.14	----	----	----	5.59
148	6.14	----	----	----	5.59
149	5.49	----	----	----	5.59
150	4.84	----	----	----	5.59
151	3.54	----	----	----	5.59
152	26.01	----	----	19.89	21.96
153	----	----	----	19.89	----
154	6.18	----	----	13.61	11.99
155	3.76	----	----	5.44	----
156	----	----	----	----	----
157	6.18	----	----	8.14	----
158	2.93	----	----	----	----
159	2.34	----	7.29	3.58	7.60

Key

CI: Cote d'Ivoire - average earnings

Ni: Nigeria - average earnings

Bu: Burundi - average basic wage

Ca: Cameroun - average basic wage

Ke: Kenya - average basic wage

(Source: ILO (op. cit.))

TABLE 9.6: SECTORAL AVERAGE MEAN WAGE RATIOS

Sector	Cl	Ni	Bu	Ca	Ke
Agric	1.60	4.15	1.39	2.43	3.21
Mining	----	23.48	----	28.42	4.03
Food ind	2.38	2.21	3.43	3.66	7.40
Light ind	2.81	3.93	4.77	3.58	6.52
Chem ind	3.65	----	4.37	5.56	16.81
Heavy ind	3.84	3.23	6.66	5.14	11.01
Building	2.84	5.47	3.14	3.10	6.93
Trade	3.41	3.34	6.64	3.91	6.25
Tr & Com	2.94	7.40	6.63	5.18	9.74
Commerce	5.03	5.87	14.47	6.26	27.58
Govt	2.16	----	----	----	11.50
Education	6.48	----	----	----	9.73
Health	8.10	----	----	13.39	16.98

(Source: Table 9.5)

TABLE 9.7: NOMINAL MINIMUM WAGE, PRICE AND CONSUMPTION GROWTH OVER TIME

ILO class	CI	Ng	Rw	SL	Za
1	----	1.47	----	----	4.62
2	----	1.51	----	----	4.76
3	----	----	----	----	----
4	----	----	----	----	----
5	----	1.24	1.00	----	----
6	----	1.51	1.00	----	----
7	----	----	1.00	3.56	----
8	----	----	1.00	3.56	----
9	----	----	----	3.06	----
10	----	----	----	3.06	----
11	----	2.22	----	----	3.51
12	----	1.04	----	----	7.80
13	----	1.10	----	----	----
14	----	----	----	----	----
15	----	----	----	----	----
16	----	----	----	----	----
17	----	----	----	----	----
18	----	----	1.00	3.02	2.93
19	----	----	1.00	2.05	3.87
20	0.93	----	1.00	----	----
21	0.96	----	1.00	----	----
22	----	----	1.00	----	1.96
23	0.85	----	1.00	----	7.45
24	0.93	0.73	1.00	3.41	2.89
25	0.83	0.73	1.00	----	1.67
26	0.76	0.76	1.00	----	1.45
27	0.77	0.85	1.00	----	1.64
28	0.85	1.07	0.67	----	1.72
29	0.85	----	1.00	3.41	3.06

30	0.85	----	1.00	3.41	3.06
31	----	0.57	1.00	3.41	----
32	----	----	1.00	3.41	----
33	0.92	----	1.00	3.41	5.39
34	0.92	----	1.00	3.41	3.16
35	0.92	----	1.00	3.41	3.86
36	0.92	----	1.00	3.41	4.04
37	0.85	----	1.00	3.41	3.92
38	0.76	----	1.00	3.41	3.92
39	0.72	----	1.00	3.41	----
40	0.72	----	1.00	3.41	----
41	0.71	----	1.00	3.41	----
42	----	----	1.00	----	----
43	----	----	1.00	----	----
44	----	1.43	1.00	3.53	----
45	0.94	1.00	1.00	----	----
46	0.99	----	1.00	----	----
47	1.00	2.16	1.00	----	----
48	0.84	----	1.00	----	----
49	0.90	----	1.00	----	----
50	0.90	----	1.00	----	----
51	1.18	1.52	1.00	----	----
52	2.35	2.11	1.00	----	----
53	1.44	2.01	----	2.34	----
54	0.92	2.14	1.00	4.93	----
55	1.17	----	1.00	3.48	----
56	1.00	1.19	1.00	3.85	----
57	1.30	----	1.00	3.48	----
58	1.22	----	1.00	----	----
59	1.00	----	1.00	3.85	----
60	----	----	----	----	----
61	----	----	----	----	----
62	----	----	----	----	----
63	----	----	----	----	----

64	----	----	----	----	----
65	----	----	----	----	----
66	1.48	----	1.00	----	2.19
67	1.48	----	1.00	----	2.19
68	----	----	----	----	----
69	1.86	----	----	----	----
70	1.00	----	----	----	----
71	----	----	----	----	----
72	----	----	----	----	----
73	----	----	----	----	----
74	----	----	----	----	----
75	----	----	----	----	----
76	0.82	2.01	1.00	2.96	3.04
77	1.19	4.79	1.00	4.74	2.50
78	1.48	2.21	1.00	4.61	5.00
79	1.60	1.35	1.00	4.07	----
80	1.00	1.28	1.00	3.33	----
81	0.91	----	1.00	2.04	3.33
82	0.91	----	1.00	2.07	3.33
83	0.81	----	1.00	2.04	3.04
84	0.98	----	1.00	2.05	3.36
85	0.91	----	1.00	2.07	3.33
86	0.91	----	1.00	2.04	3.33
87	0.91	----	1.00	2.10	3.33
88	0.91	----	1.00	2.05	3.33
89	0.96	----	1.00	2.10	3.33
90	1.13	----	1.00	2.16	3.09
91	0.92	----	1.00	3.12	2.39
92	0.92	----	1.00	3.21	1.93
93	1.31	----	1.00	3.41	1.83
94	1.08	----	1.00	3.33	----
95	0.89	----	1.00	3.31	----
96	1.08	----	1.00	3.33	----
97	0.96	1.57	1.00	3.08	----

98	0.67	1.82	1.00	3.20	----
99	0.92	2.42	1.00	3.40	----
100	0.90	1.32	1.00	3.75	----
101	----	----	----	----	----
102	----	----	----	----	----
103	----	----	----	----	----
104	----	----	----	----	----
105	----	----	----	----	----
106	----	----	----	----	----
107	----	----	----	----	----
108	----	2.96	1.00	3.01	----
109	----	1.36	1.00	3.18	----
110	0.85	1.14	1.00	3.14	----
111	1.67	0.97	1.00	3.12	----
112	1.56	----	1.00	3.16	----
113	1.63	----	1.00	3.12	----
114	----	----	----	----	----
115	----	----	----	----	----
116	----	----	----	----	----
117	----	----	----	----	----
118	----	----	1.00	----	3.03
119	----	----	1.00	----	3.65
120	----	----	1.00	----	----
121	----	----	1.00	----	----
122	----	----	1.00	----	3.71
123	----	----	1.00	----	7.20
124	----	----	1.00	2.90	3.56
125	----	----	1.00	3.81	2.42
126	----	----	1.00	3.87	----
127	----	----	1.00	3.94	----
128	----	----	1.00	3.87	----
129	0.53	----	1.00	2.65	2.95
130	0.93	0.75	1.00	2.64	3.09
131	0.87	9.45	1.00	2.64	3.87

132	0.70	1.09	1.00	2.64	2.59
133	1.09	----	1.00	----	2.05
134	0.93	----	1.00	----	2.14
135	0.87	----	1.38	----	2.26
136	0.70	----	1.00	----	2.14
137	----	----	1.00	2.20	3.20
138	----	----	1.00	----	3.27
139	----	----	----	----	----
140	----	----	1.00	3.42	3.86
141	----	----	1.00	----	3.04
142	----	----	1.00	3.99	4.70
143	----	----	1.00	3.78	2.67
144	1.26	----	1.00	2.29	4.63
145	2.21	----	1.00	----	2.14
146	2.21	----	1.00	----	2.14
147	2.94	----	1.00	----	3.78
148	2.94	----	1.00	----	3.78
149	3.31	----	1.00	----	3.78
150	2.24	----	1.00	----	4.09
151	3.13	----	1.00	----	----
152	1.27	----	1.00	2.88	3.47
153	----	----	1.00	2.88	3.20
154	1.46	----	1.00	3.35	3.60
155	1.85	----	1.00	3.41	3.90
156	----	----	1.00	----	3.76
157	1.46	----	1.00	----	3.76
158	1.26	----	1.00	----	4.40
159	0.76	----	1.00	2.89	----
pcc	0.90	0.81	0.86	3.06	6.15
real pcc	0.77	0.88	0.81	0.83	1.41
cpi	1.16	0.92	1.07	3.70	4.37

Key

CI: Cote d'Ivoire - 1990/1985

Ng: Niger - 1988/1986

Rw: Rwanda - 1989/1985

SL: Sierra Leone - 1988/1986

Za: Zambia - 1989/1986

pcc: nominal per caput consumption

real pcc: real per caput consumption

cpi: consumer price index

(Source: ILO (op. cit., 1990))

TABLE 9.7 (CONT'D): NOMINAL MINIMUM WAGE, PRICE AND CONSUMPTION GROWTH OVER TIME

ILO class	Ca
1	0.80
2	1.58
3	0.80
4	1.58
5	1.18
6	1.58
7	----
8	----
9	----
10	----
11	----
12	----
13	----
14	----
15	----
16	----
17	----
18	----
19	----
20	0.35
21	0.73
22	----
23	----
24	----
25	----
26	----
27	----
28	----
29	0.82
30	0.82

31	----
32	----
33	1.42
34	----
35	----
36	0.47
37	----
38	1.04
39	0.60
40	0.82
41	0.38
42	----
43	----
44	----
45	----
46	----
47	----
48	----
49	0.92
50	0.92
51	1.87
52	----
53	----
54	----
55	----
56	----
57	----
58	----
59	----
60	----
61	----
62	----
63	----
64	----

65	----
66	----
67	----
68	----
69	----
70	----
71	----
72	----
73	----
74	----
75	----
76	----
77	----
78	----
79	----
80	----
81	0.60
82	1.04
83	0.60
84	0.75
85	0.75
86	0.75
87	0.60
88	0.82
89	----
90	----
91	0.95
92	0.14
93	0.14
94	0.11
95	0.17
96	0.17
97	0.08
98	----

99	0.25
100	0.19
101	----
102	----
103	----
104	----
105	----
106	----
107	----
108	----
109	----
110	----
111	----
112	----
113	----
114	----
115	----
116	----
117	----
118	----
119	----
120	----
121	----
122	----
123	----
124	----
125	----
126	----
127	----
128	----
129	----
130	----
131	----
312	----

133	----
134	0.10
135	0.08
136	0.09
137	----
138	----
139	----
140	----
141	----
142	----
143	----
144	----
145	----
146	----
147	----
148	----
149	----
150	----
151	----
152	----
153	----
154	----
155	----
156	----
157	----
158	----
159	----
pcc	0.88
real pcc	0.70
cpi	1.25

TABLE 9.8: MEAN AND MEDIAN WAGES IN GHANA AND COTE D'IVOIRE

Sector	Cote d'Ivoire (1986)		Ghana (1988)	
	mean	median	mean	median
Government	1.82	1.17	6.40	0.58
Nontradables	2.23	1.13	0.70	0.53
Tradables	1.64	1.15	1.20	0.42
Informal	0.39	0.24	0.77	0.61

Wages are expressed as a fraction of per caput consumption

(Source: World Bank (1987, 1989))

APPENDIX: ILO OCCUPATIONAL CATEGORIES

1	farm supervisor	2	farm worker
3	plantation supervisor	4	plantation worker
5	forestry supervisor	6	forestry worker
7	logger	8	lumberjack
9	deep-sea fisherman	10	inshore fisherman
11	coalmining engineer	12	coal miner
13	underground coal loader	14	petroleum/gas engineer
15	petroleum/gas technician	16	petroleum/gas foreman
17	derrickman	18	miner (not coal)
19	quarryman	20	butcher
21	meat packer	22	dairy product processor
23	miller	24	baker
25	thread & yarn spinner	26	tackler
27	weaver	28	textile labourer
29	garment cutter	30	sewing machinist
31	tanner	32	leather goods maker
33	clicker cutter	34	laster
35	cobbler	36	sawyer
37	veneer cutter	38	plywood press operator
39	furniture upholsterer	40	cabinet maker
41	furniture finisher	42	wood grinder
43	papermaking machinist	44	journalist
45	printing office typist	46	printing office clerk
47	hand compositor	48	machine compositor
49	printing press operator	50	bookbinder
51	printing industry labourer	52	chemical engineer
53	chemical technician	54	chemical foreman
55	chemical mixing machinist	56	chemical industry labourer
57	chemical product machinist	58	chemical product packer
59	chemical product labourer	60	oil refinery controlman
61	occupational health nurse	62	blast furnace operator

63	hot-roller	64	metal melter
65	ferrous industry labourer	66	metalworking machinist
67	welder	68	bench moulder
69	machinery fitter	70	machinery industry labourer
71	electrical draughtsman	72	electronics technician
73	electronics fitter	74	electronics assembler
75	ship plater	76	power distribution engineer
77	power distribution clerk	78	electric power lineman
79	power generating machinist	80	power generating labourer
81	building electrician	82	plumber
83	constructional steel erector	84	building painter
85	bricklayer	86	reinforced concreter
87	cement finisher	88	carpenter
89	plasterer	90	construction labourer
91	wholesale trade typist	92	wholesale stock clerk
93	wholesale salesperson	94	retail book-keeper
95	retail cashier	96	retail salesperson
97	hotel receptionist	98	cook
99	waiter	100	hotel room attendant
101	railway ticket seller	102	railway services supervisor
103	railway guard	104	railway truck loader
105	railway engine driver	106	railway engine fireman
107	railway signalman	108	road transport supervisor
109	bus conductor	110	bus mechanic
111	bus driver	112	urban lorry driver
113	long distance lorry driver	114	ship's chief engineer
115	ship's steward	116	able seaman
117	docker	118	aircraft pilot
119	flight operations officer	120	airline receptionist
121	aircraft cabin attendant	122	aircraft engineer
123	aircraft loader	124	air traffic controller
125	aircraft accident firefighter	126	post office clerk
127	postman	128	telephonist
129	accountant	130	bank typist

131	bank teller	132	bank book keeper
133	insurance computer programmer	134	insurance typist
135	insurance card puncher	136	insurance agent
137	architectural clerk of works	138	government comp programmer
139	government official	140	government typist
141	government card puncher	142	government office clerk
143	firefighter	144	dustman
145	third level maths teacher	146	third level arts teacher
147	second level arts teacher	148	second level maths teacher
149	technical education teacher	150	first level teacher
151	nursery teacher	152	doctor
153	dentist	154	nurse
155	auxiliary nurse	156	physiotherapist
157	radiographer	158	ambulance driver
159	car mechanic		

FIGURE 9.1 - THE EFFECT OF A MINIMUM BASIC WAGE

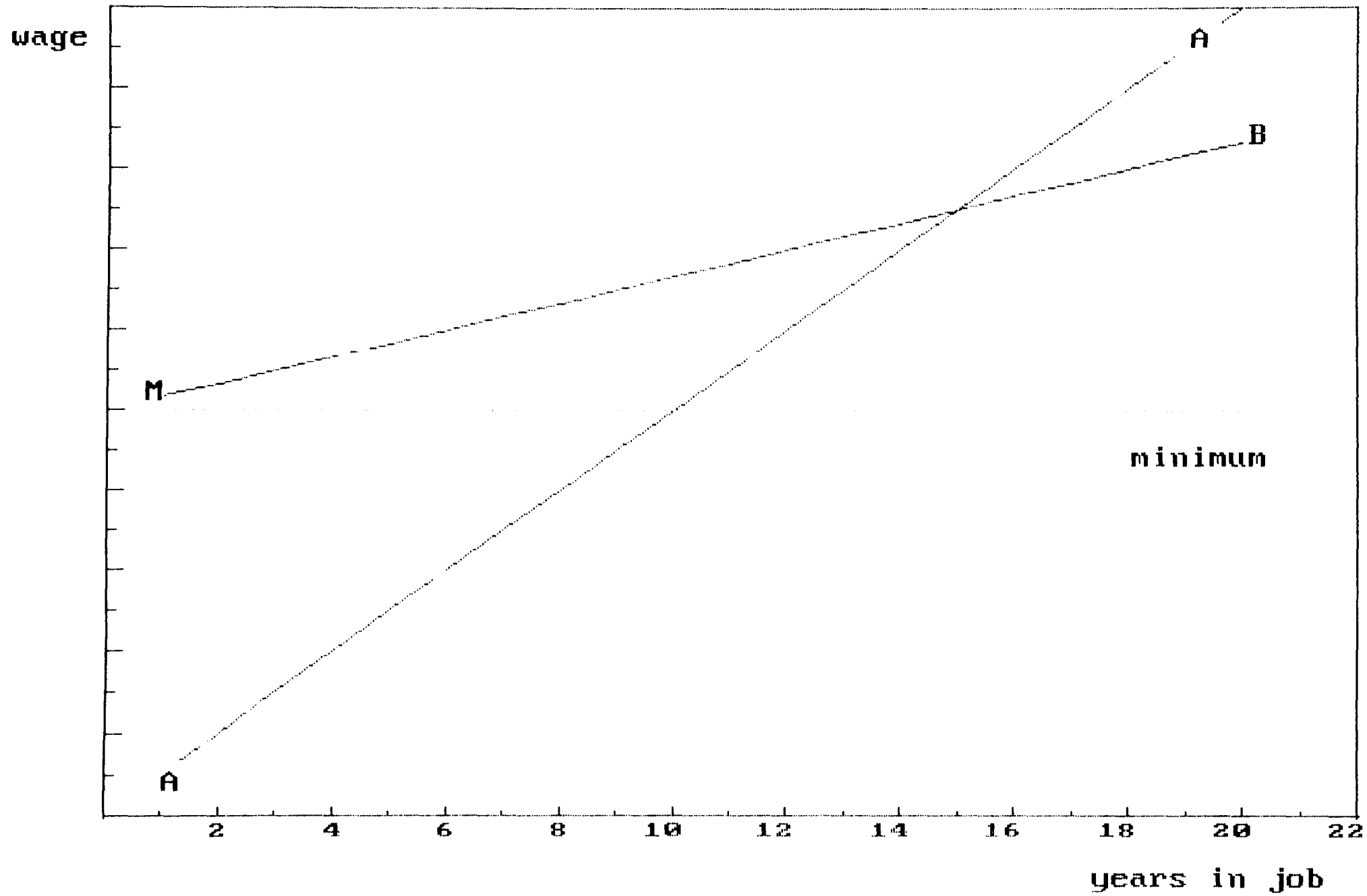


FIGURE 9.2 - REAL WAGE AND PER CAPUT CONSUMPTION
SENEGAL

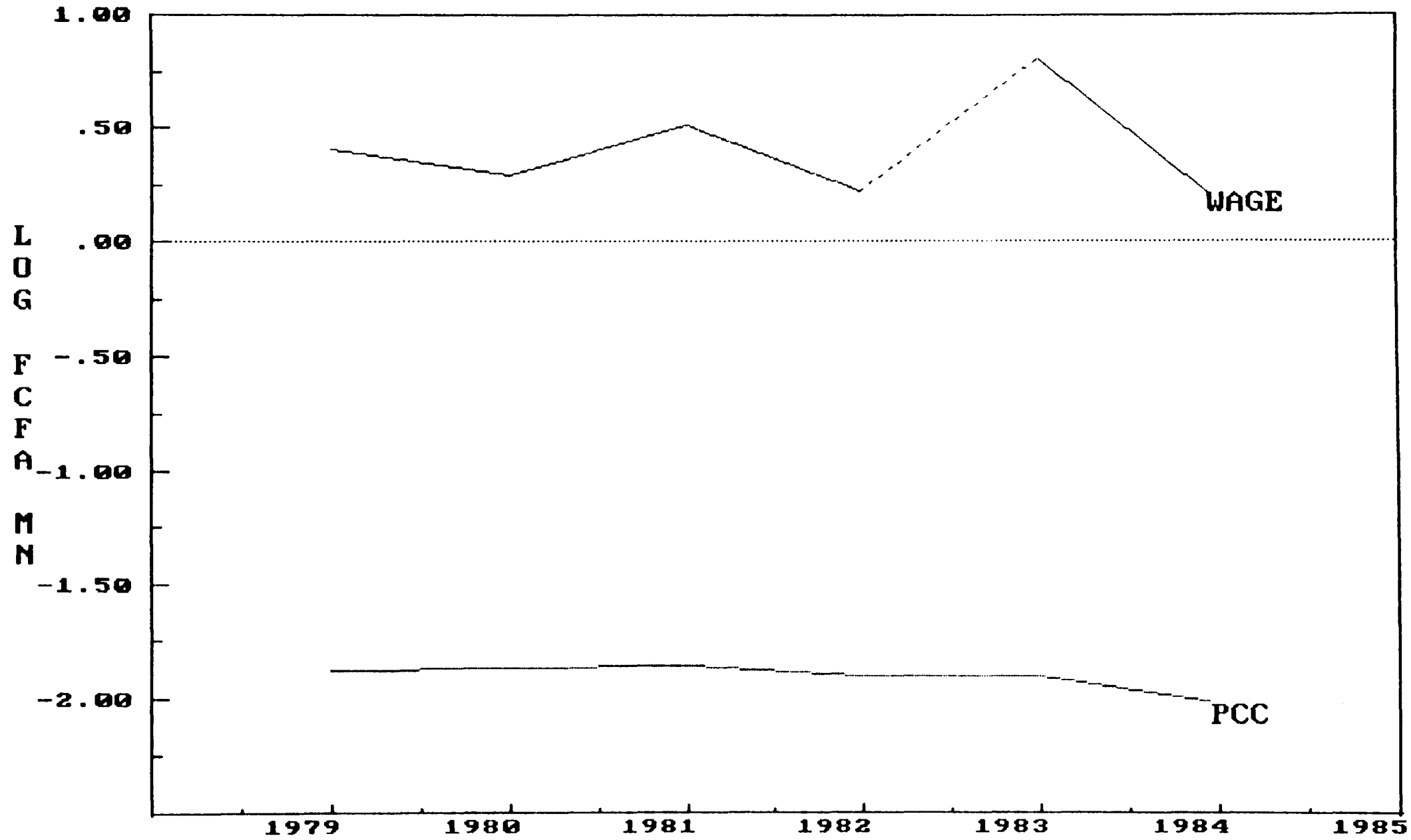


FIGURE 9. 3 - REAL WAGE AND PER CAPUT CONSUMPTION
COTE D'IVOIRE - AST DATA

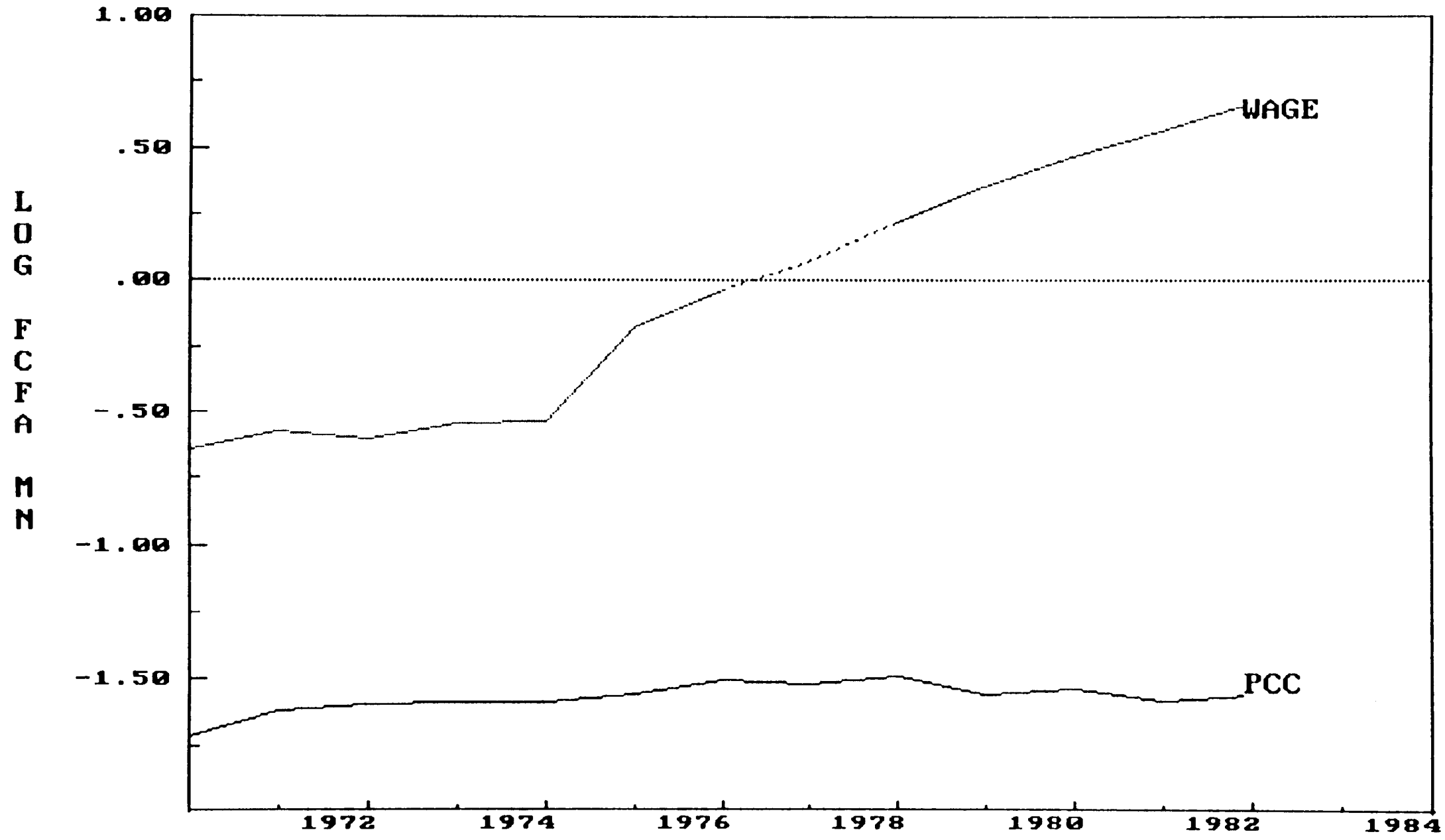


FIGURE 9.4 - REAL WAGE AND PER CAPUT CONSUMPTION - CAMEROUN
(1975 = 100)



FIGURE 9.5 - CROSSPLOT - REAL WAGE & EMPLOYMENT - COTE D'IVOIRE

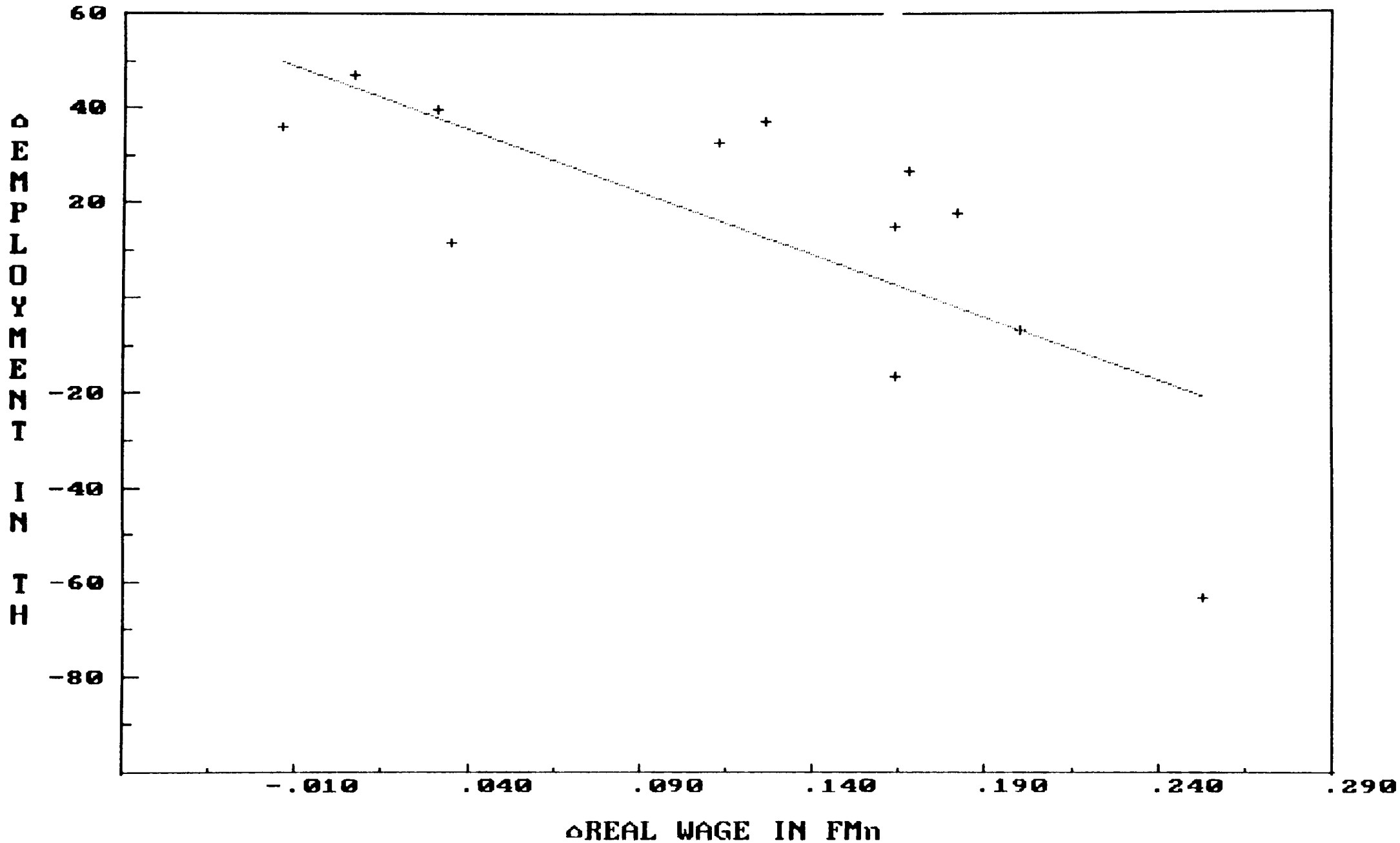


FIGURE 9.6 - CROSSPLOT - REAL WAGE & EMPLOYMENT - SENEGAL 1980-84

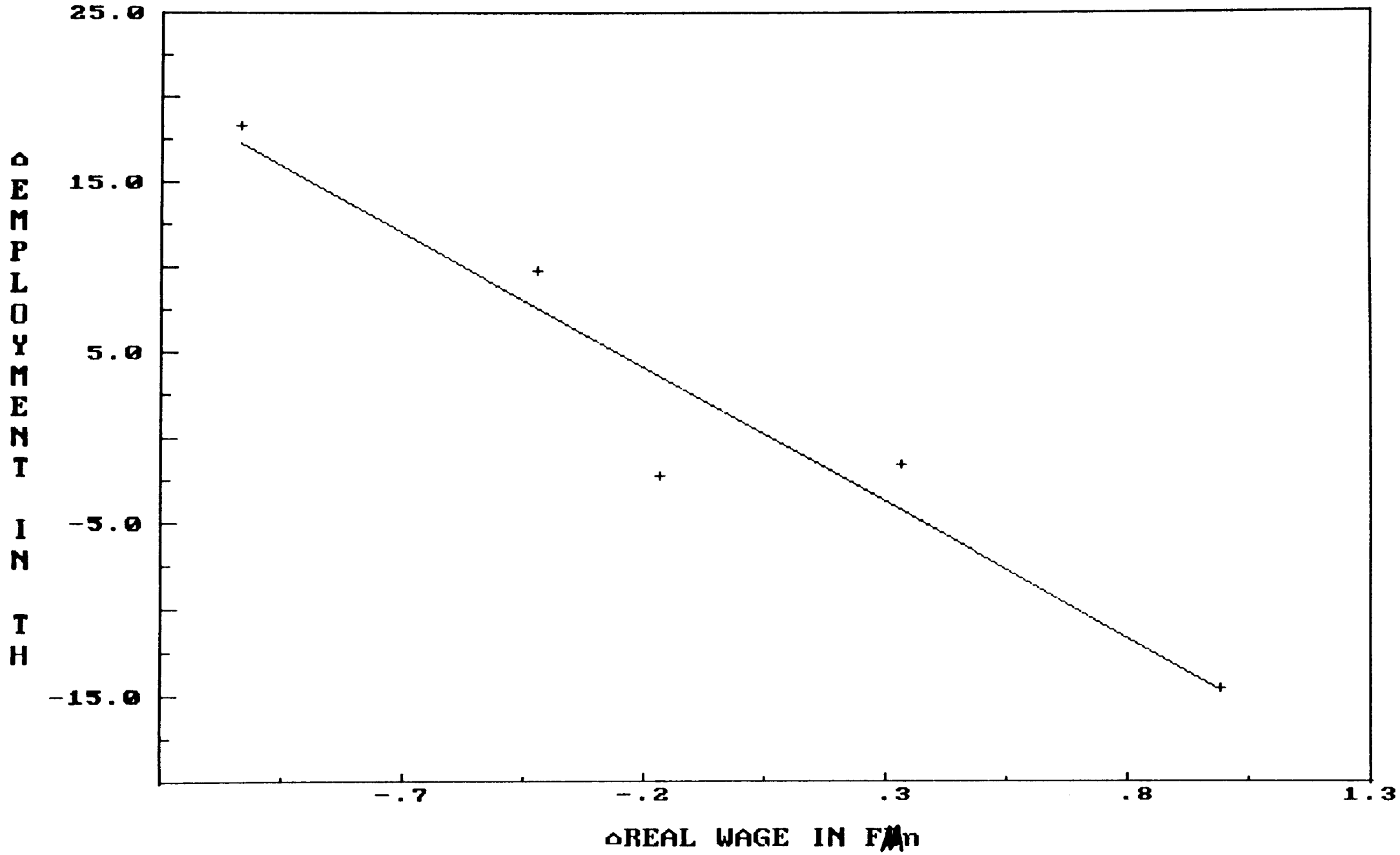


FIGURE 9.7 - SMIG AND PER CAPUT CONSUMPTION - SENEGAL

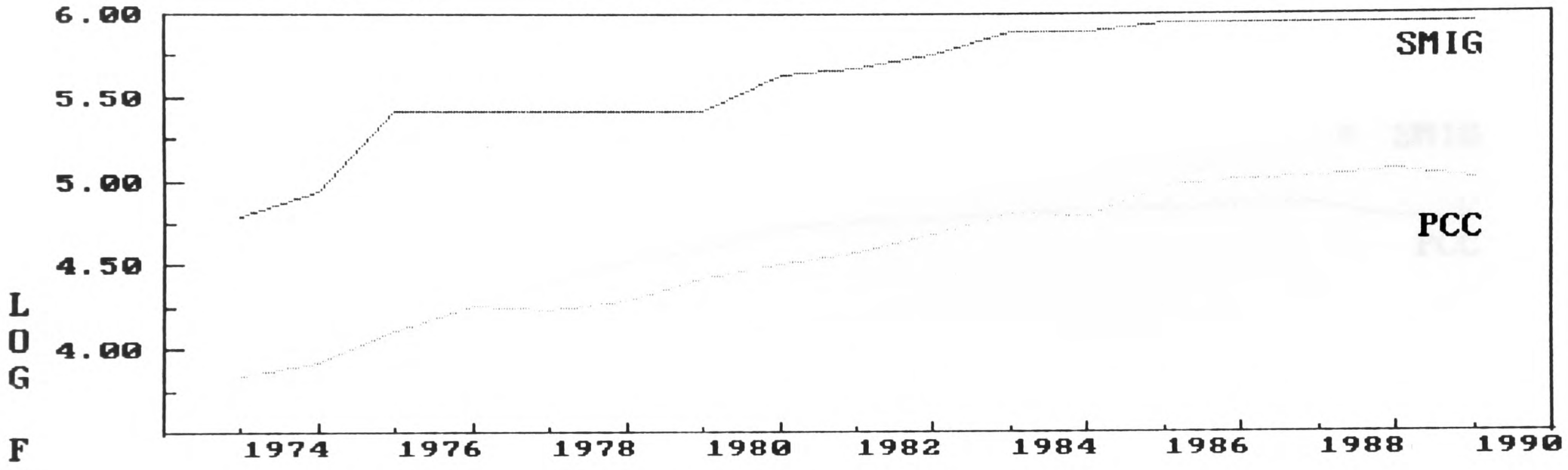


FIGURE 9.8 - SMIG AND PER CAPUT CONSUMPTION - TOGO

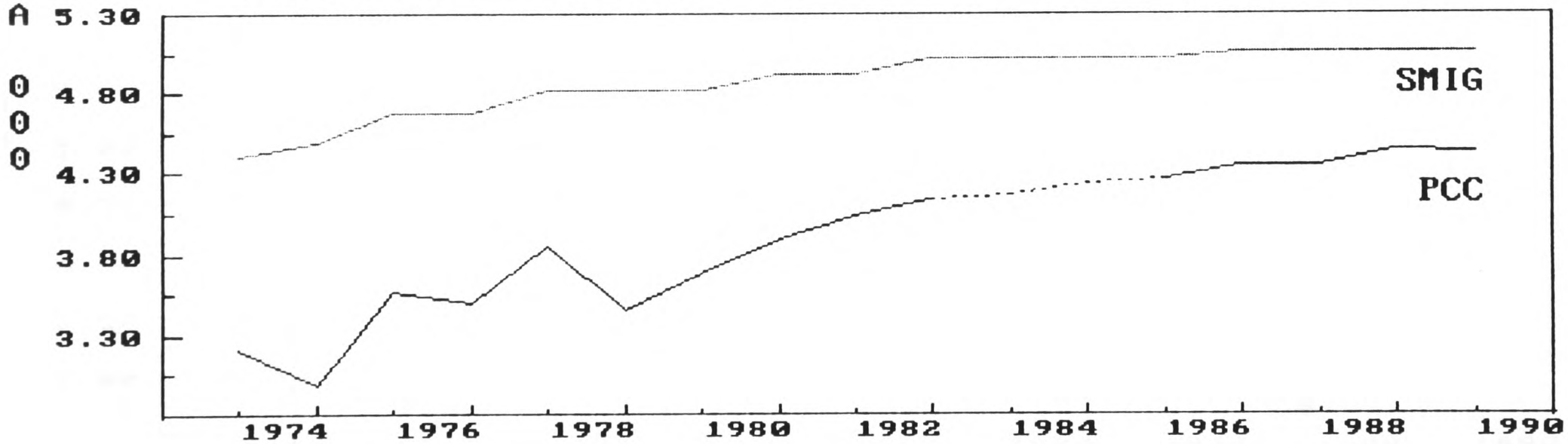


FIGURE 9.9 - SMIG AND PER CAPUT CONSUMPTION - COTE D'IVOIRE

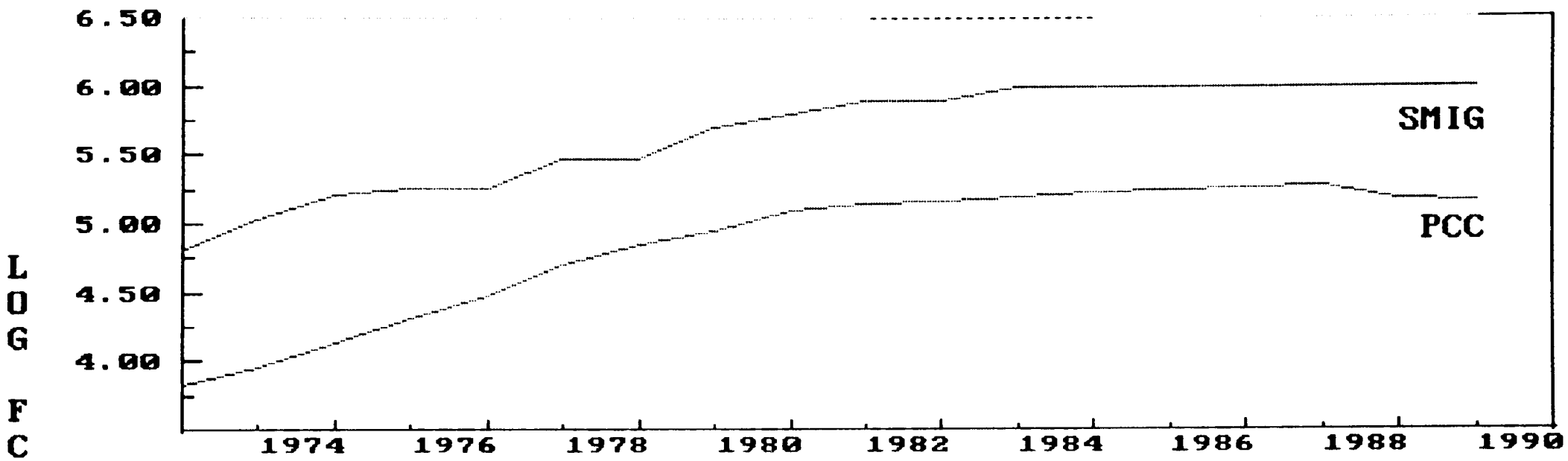


FIGURE 9.10 - SMIG AND PER CAPUT CONSUMPTION - BURKINA FASO

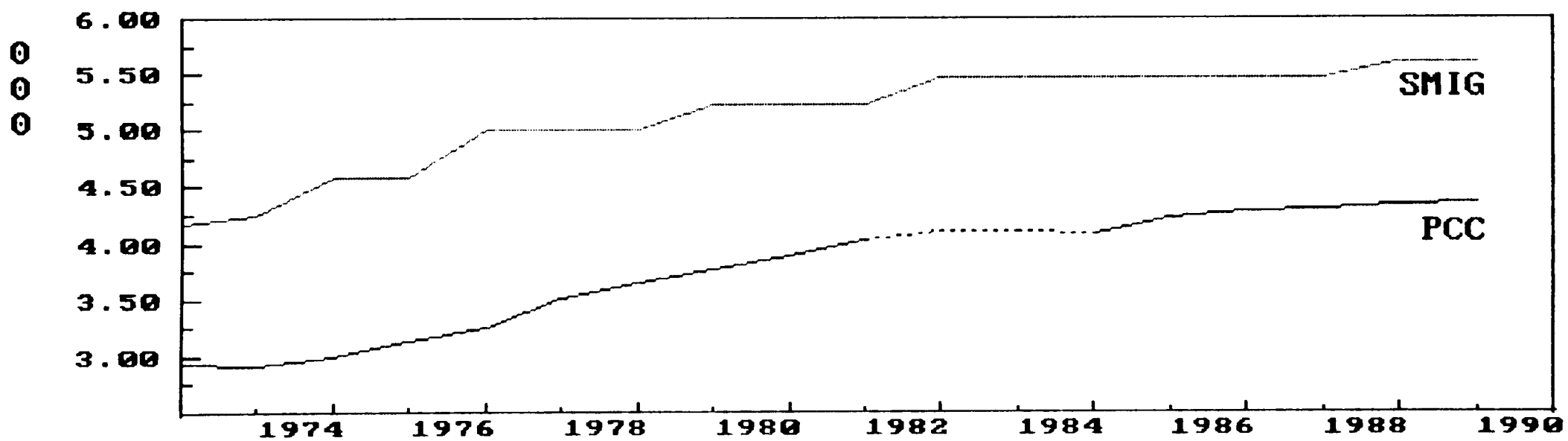


FIGURE 9.11 - SMIG AND PER CAPUT CONSUMPTION - BENIN

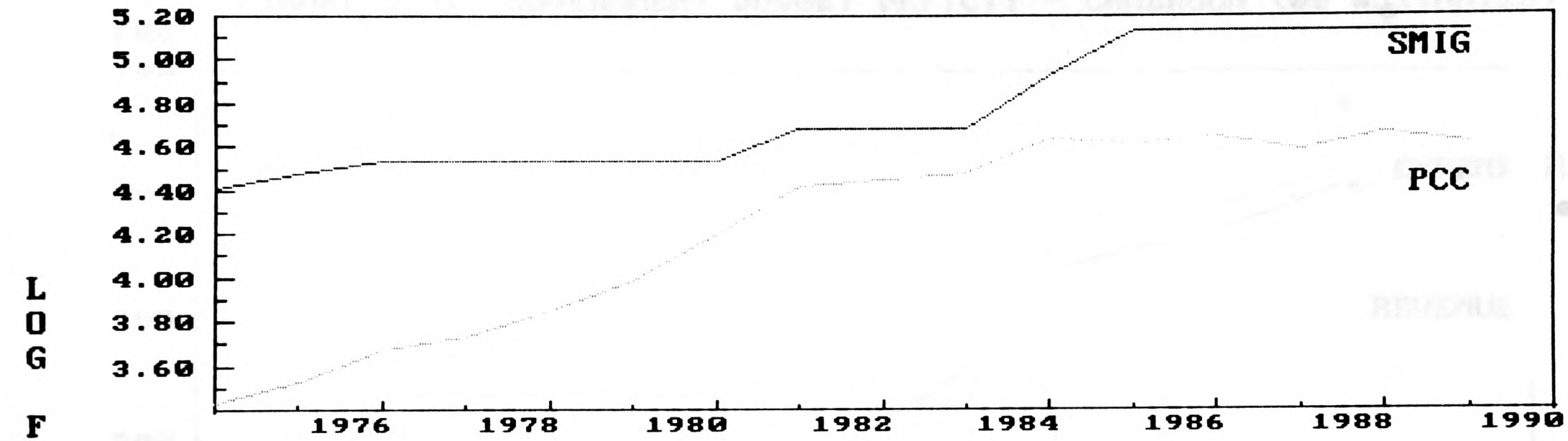


FIGURE 9.12 - SMIG AND PER CAPUT CONSUMPTION - NIGER

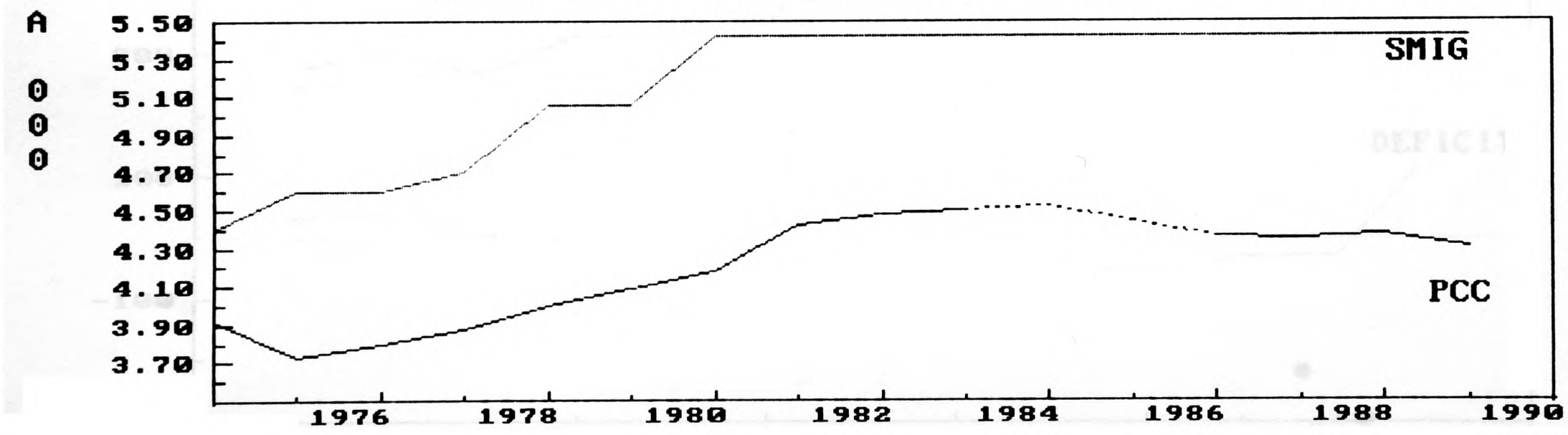


FIGURE 9.13- GOVERNMENT BUDGET DEFICIT - CAMEROUN (WB WSTIMATES)

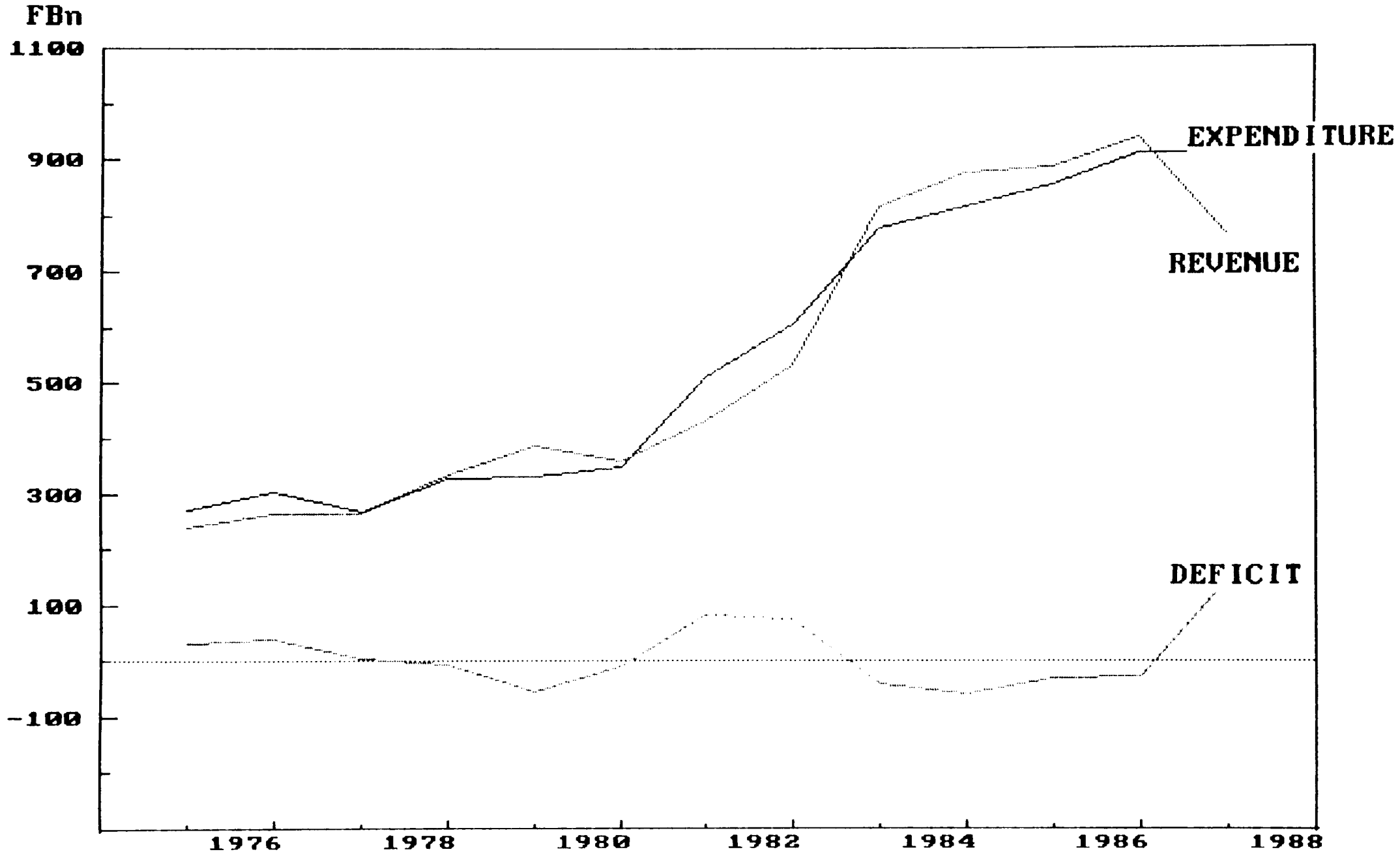
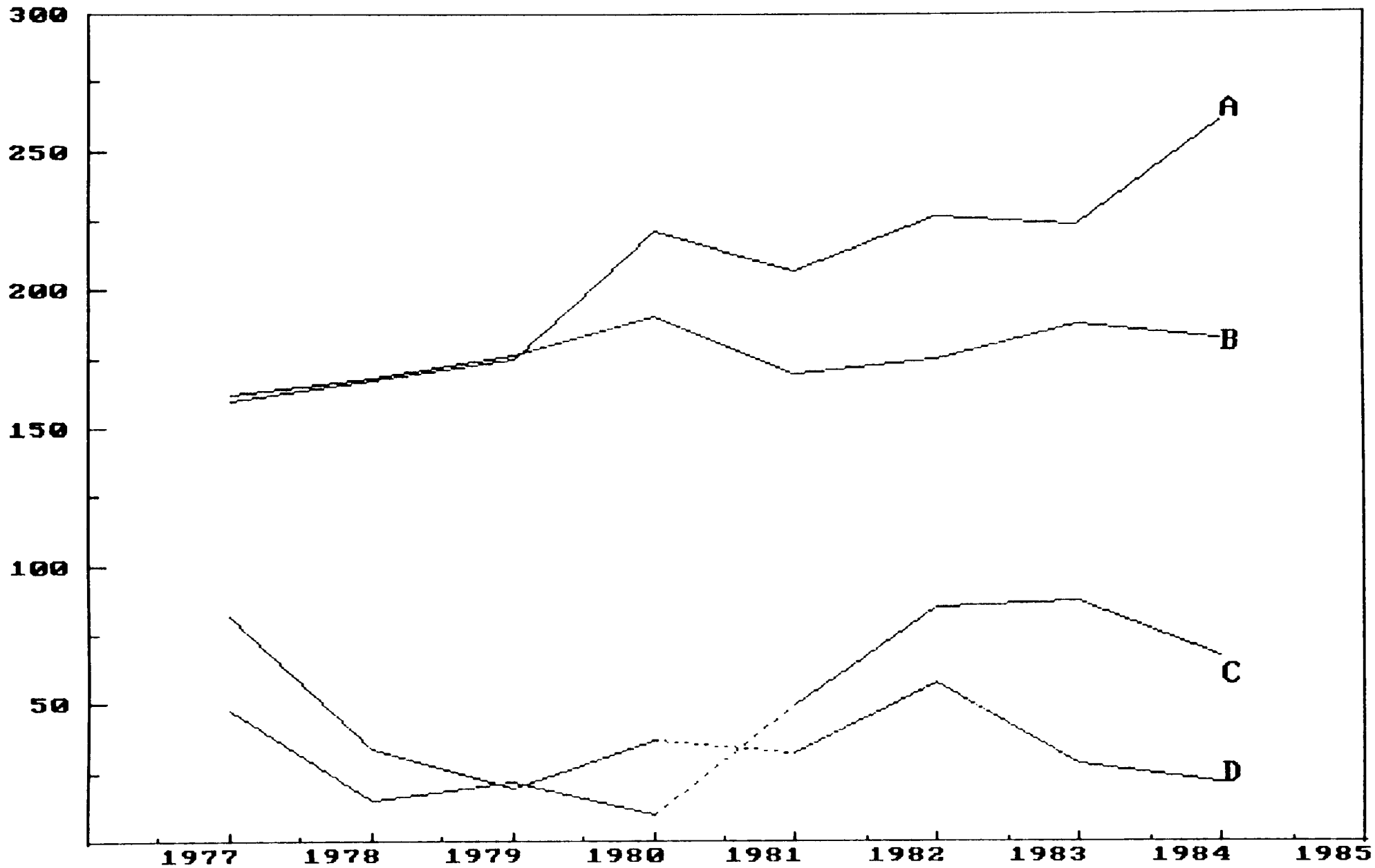


FIGURE 9.14- CURRENT AND CAPITAL EXPENDITURE FIGURES - SENEGAL
WORLD BANK AND UN ESTIMATES



A: CUR EXP (WB), B: CUR EXP (UN), C: CAP EXP (WB), D: CAP EXP (UN)

FIGURE 9.15 - COMPONENTS OF GOVERNMENT CURRENT EXPENDITURE - SENEGAL (UN ESTIMATES)

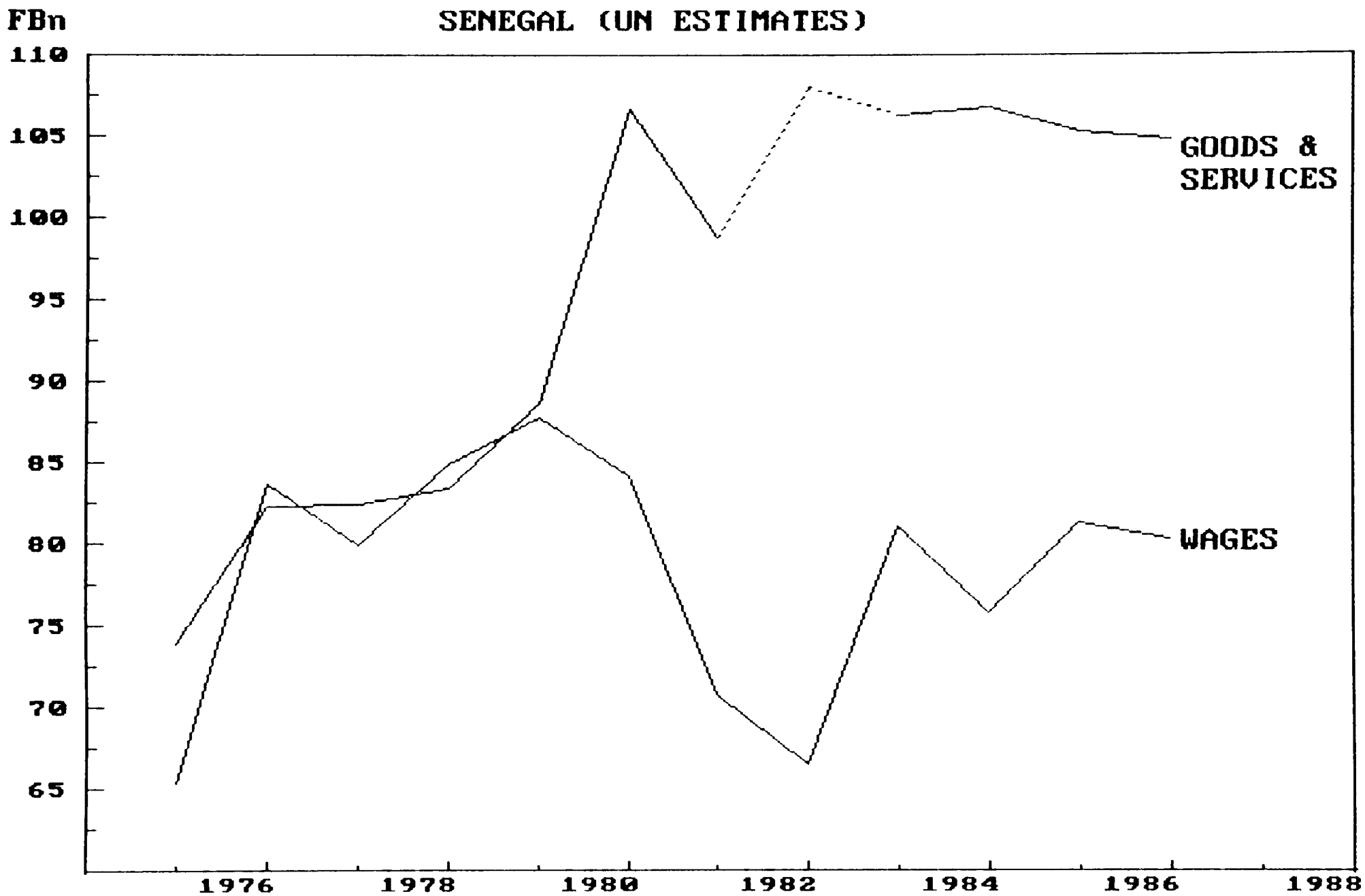


FIGURE 9.16 - GOVERNMENT BUDGET DEFICIT - SENEGAL (UN ESTIMATES)

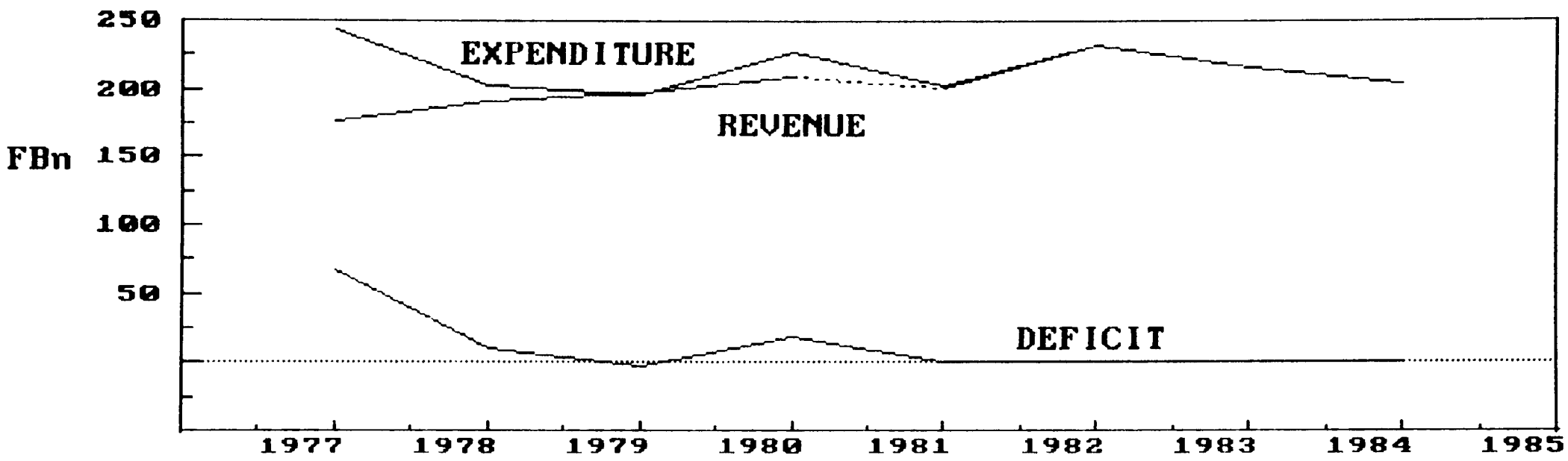


FIGURE 9.16a - GOVERNMENT BUDGET DEFICIT - SENEGAL (WB ESTIMATES)

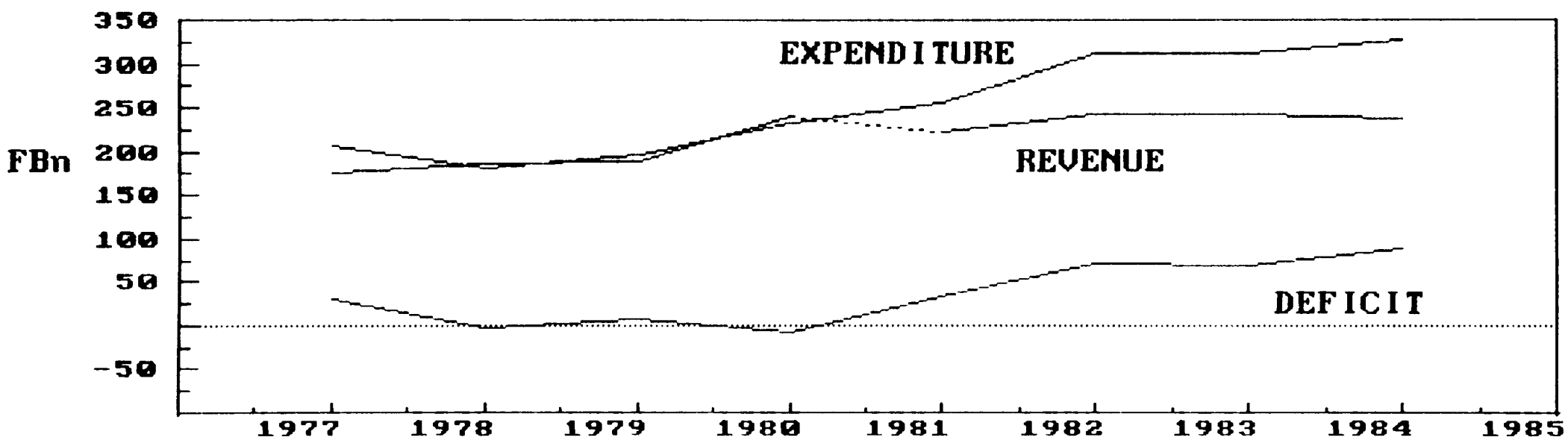
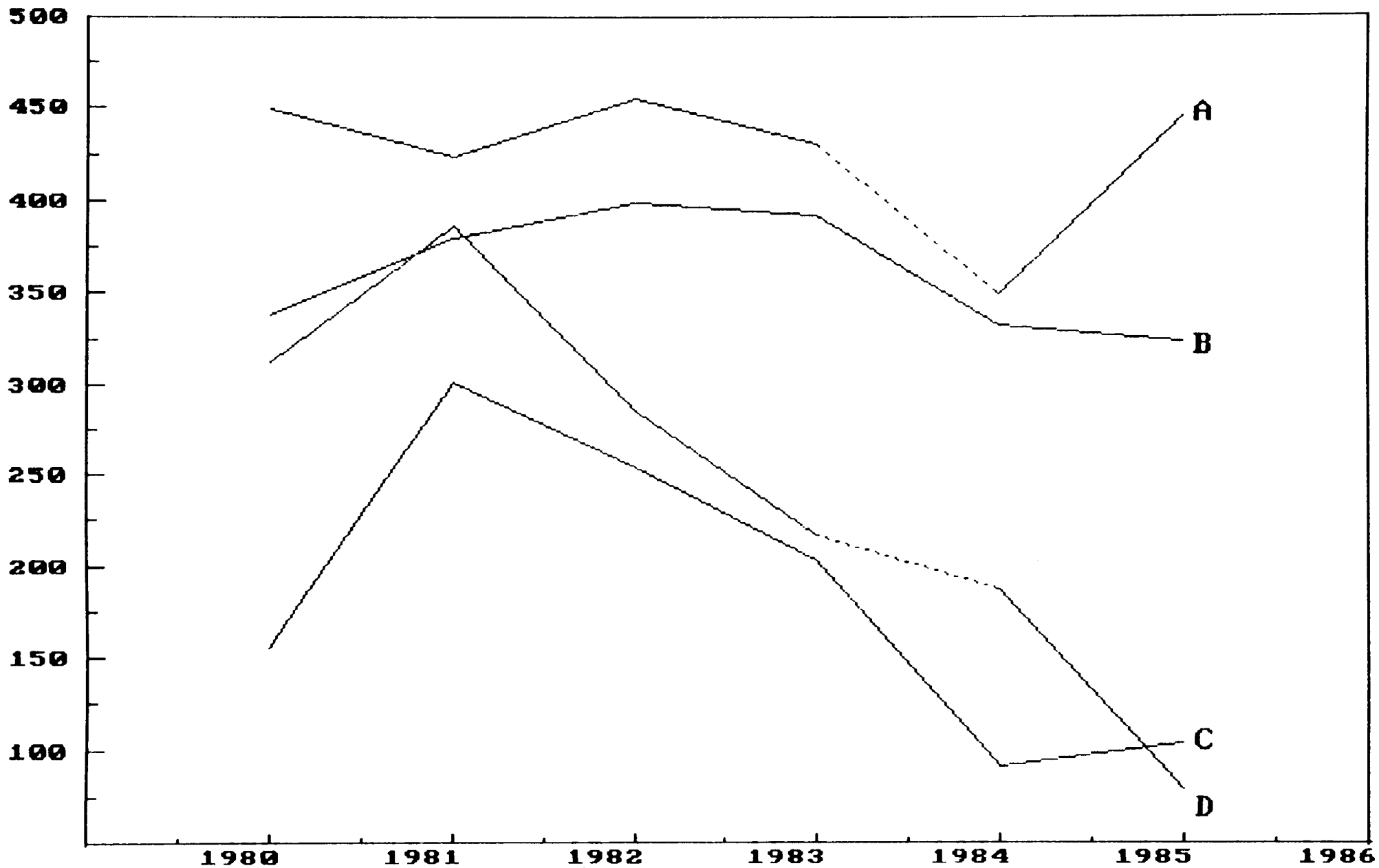


FIGURE 9.17 - CURRENT AND CAPITAL EXPENDITURE FIGURES - COTE D'IVOIRE (WORLD BANK AND UN ESTIMATES)



A: CUR EXP (WB), B: CUR EXP (UN), C: CAP EXP (WB), D: CAP EXP (UN)

FIGURE 9 18- COMPONENTS OF GOVERNMENT CURRENT EXPENDITURE - COTE D'IVOIRE (UN ESTIMATES)

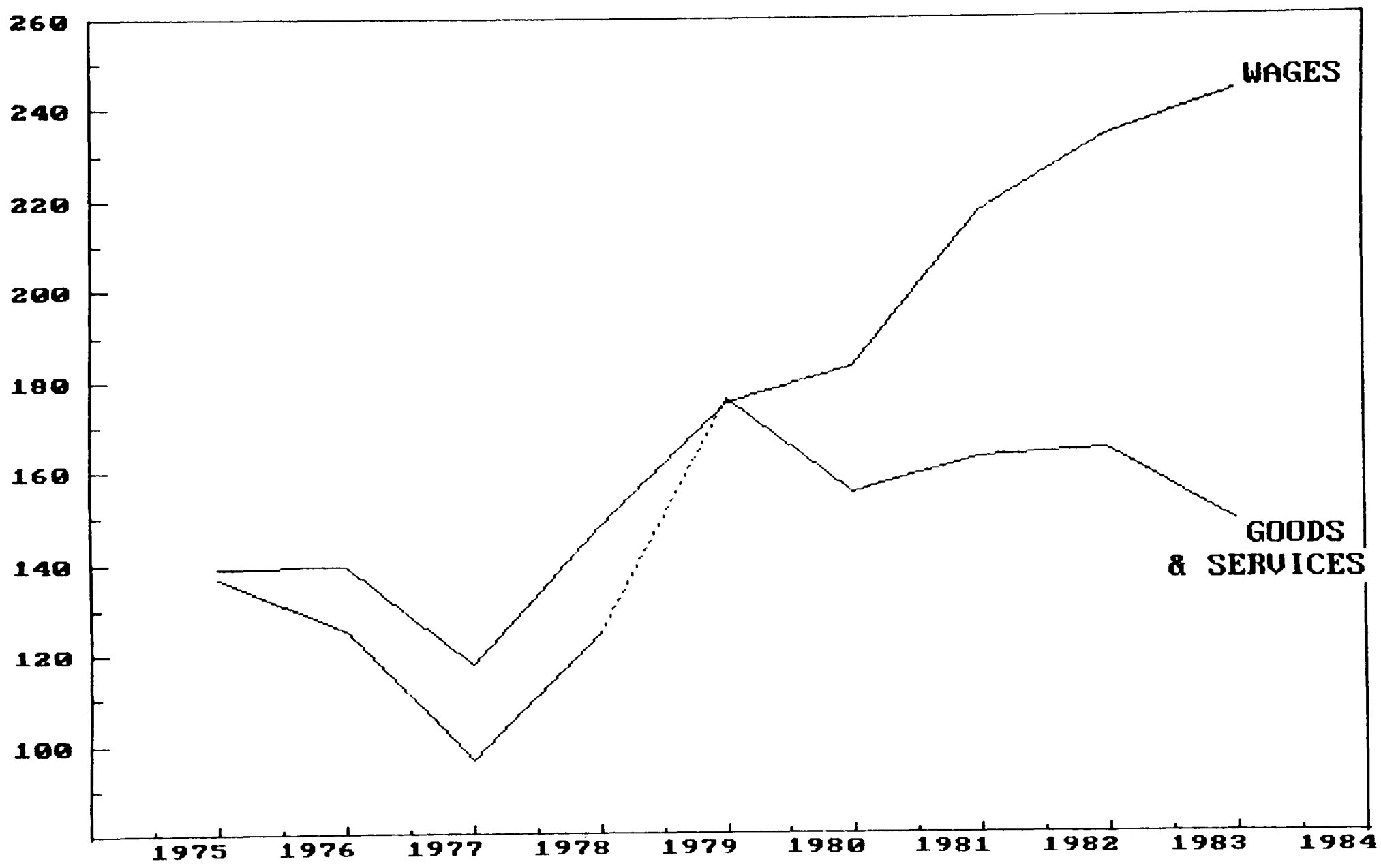


FIGURE 9.19 - GOVERNMENT BUDGET DEFICIT - COTE D'IVOIRE (WB ESTIMATES)



CHAPTER 10

MONETARY ADJUSTMENT IN THE CFA

MONETARY ADJUSTMENT IN THE CFA

As has already been pointed out in chapter 1, a potentially serious problem for the Franc Zone is that a fixed exchange rate will exacerbate problems of short term monetary adjustment. The pessimistic case is based on the assertion that the appropriate response to a change in world prices important to the domestic economy (for example, coffee, cocoa or oil) is to adjust the domestic exchange rate. Otherwise, the change in the terms of trade will lead to external imbalances. The persistent imbalances of some CFA members in the 1980s are seen as a result of their inability to adjust the CFA exchange rate.[1]

In the framework of a simple fixed exchange rate macroeconomic model, of the kind which evolved for the analysis of Western economies during the Bretton Woods era, there might seem to be no cause for worry on this score. A deficit on the balance of payments will lead to a monetary contraction, as there is an outflow of assets, so aggregate demand - including demand for imports - will fall, and balance of payments equilibrium will be re-established.[2]

However, this simple exposition relies on a certain model of the relationship between income, consumption and money demand, and on the assumption that the government's domestic credit expansion does not offset the contractionary effect of a trade deficit. It remains to be seen whether the model applies to Franc Zone members. In this chapter, we will look at the evolution of monetary aggregates in Franc Zone countries, to see to what extent the Monetary Approach to the Balance of Payments (MABP) is applicable here. In particular, we will be interested in the extent to which the CFA rules designed to restrict domestic credit expansion (for example, the 20% rule) are effective in ensuring traditional monetary adjustment.

We also recall from chapter 1 that the institutions of the CFA have the potential to facilitate more efficient adjustment than would be feasible for a financially independent economy. Since the Operations Account is allowed to go into debit, at least in the short-

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[1] See for example van de Walle (1991).

[2] See for example Frenkel and Johnson (1976).

medium run, the effects of a large negative trade shock on domestic consumption can be delayed for several years. It may be the case that the effects of a gradual decline in consumption are less deleterious than those of a sudden fall. Is the Operations Account being used efficiently?

A second issue is whether, in the absence of flexible exchange rates and of efficient monetary adjustment, there are any alternative policy instruments which could be used to correct external imbalances. In Cote d'Ivoire, for example, there has been an attempt to mimic a devaluation by altering import and export taxes. Is such a policy likely to be successful? The success of such a policy will depend on the way in which asset flows interact with prices, consumption and output. Although it is possible to construct an empirical model of asset flows (as in previous chapters), modelling the whole economy is impossible, given the limited data. An instructive alternative is to construct a general equilibrium model for a stylised Franc Zone economy, to see how exchange rate adjustment is likely to compare with the proposed alternatives.

1. Monetary aggregates and external balance

(i) theoretical background

The external imbalance of an economy is manifested in the deterioration of the country's net foreign asset position. As noted in the introduction, a central issue is how the stock of net foreign assets interacts with other monetary aggregates. If the evolution of aggregates over time fits in with the MABP paradigm (allowing for short run consumption smoothing facilitated by the Operations Account), then there is a case for arguing that the fixed exchange rate is not a barrier to efficient external adjustment. If their time paths do not fit this paradigm, then there is more cause for worry. In this section, we will examine figures for reported series of monetary aggregates in order to investigate this issue.

First of all, we recall from chapter 1 that any interaction must conform with the accounting identity on the banking sector's balance sheet:

$$M \equiv NFA_{CB} + NFA_{PB} + NDG_{CB} + NDG_{PB} + CTE$$

where NFA_{CB} represents net foreign assets of the central bank apportioned to the country, at least 65% of which is held in the Operations Account, NFA_{PB} net foreign assets of private agents (largely private banking institutions), NDG_{CB} net endebtedness of government to the central bank, NDG_{PB} net endebtedness of government to private financial institutions and CTE credit allocated by banks to private agents. M represents the liabilities of the banking sector, which in the Franc Zone are made up almost entirely of currency and private bank deposits, the stock of more illiquid liabilities being very small. The balance sheet corresponds to the identity,

$$NFA \equiv (M - CTE) - NDG$$

which states that a country's net foreign asset position is the sum of the net financial position of the private sector and the net financial position of the public sector. The evolution of net foreign assets over time will depend on the evolution of government debt, private borrowing and private asset holding. In the Franc Zone, private asset holding is

made up almost entirely of currency and bank deposits.

In a simple MABP model, CTE and NDG are constant, so $\Delta M = \Delta NFA$. Moreover, any balance of payments disequilibria are short lived, since private agents have an optimal level of M, M*.[3] In equilibrium, where plans are fulfilled and $M = M^*$, $\Delta M = 0$, so $\Delta NFA = 0$. There may however be transitory balance of payments disequilibria as M adjusts towards M*. For example, a deterioration in the terms of trade, given output and consumption levels, will lead to an outflow of foreign assets: $\Delta NFA = \Delta M < 0$. The trade shock is likely to have reduced M*, so after one period, M* may be above or below M. In any case, consumption will be adjusted so that M converges on and remains at the new value of M*. When convergence has been achieved, there will be no further change in M, and so no further change in NFA: the balance of payments will be zero.

However, NDG and CTE are not in fact constant. In the Franc Zone, the Operations Account may facilitate the running down of net foreign assets and the expansion of government debt. A corollary of the model above is that, if M* (and M) are evolving over time, the balance of payments will be zero over the long run just if $\Delta M - \Delta CTE = \Delta NGD$; if $\Delta M - \Delta CTE < \Delta NGD$, because for example the government is expanding NGD very rapidly, then the balance of payments will be persistently negative, and foreign debt will rise.

Why would a government do this? Avoiding the straightforward reply that governments might not be attempting to maximise social welfare, there are a number of possible explanations:

(i) There is no explicit credit limit on the Operations Account, either for a country or for UMOA or the BEAC region as a whole. If a government wants to find out what its lower bound is, the only way may be to reduce net foreign assets until the limit is reached.

(ii) The (implicit) credit limit which would be imposed by the French treasury may be for the UMOA or the BEAC region as a whole. In this case, the possibility of a

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[3] The assumption that people have an optimal level of M (and not just an optimal level of saving, $\triangle M$) each period might be questioned: the M relevant to our analysis is a wide monetary aggregate, holding of which needs to be motivated by more than just transactions demand. However, we saw in chapter 8, in modelling asset demand in Cameroun and Cote d'Ivoire (the CFA members where financial deepening is greatest) that it is appropriate to think of the stock of assets held as a function of income.

prisoner's dilemma in national monetary and fiscal policy arises, since a government which does not increase spending and reduce its net foreign assets whilst other governments are doing will lose out when the limit is reached. No extra credit, even for short run consumption smoothing, will then be available for any country.

If long run endebtedness is to be avoided, then it is necessary that in the long run $\Delta M - \Delta CTE \geq \Delta NGD$. The institutional rules of the Franc Zone seek to control ΔNGD and ΔCTE to ensure that this is the case. If in the long run this inequality does not hold, then there has been a failure of the institutional constraints.

However, efficient short run adjustment does not entail that it is always the case that $\Delta M - \Delta CTE \geq \Delta NGD$. In the short run, following a negative trade shock, it may be optimal to allow the decline in NFA to take the form of a decline in the country's net position in the Operations Account. Specifically, in the BCEAO/BEAC national balance sheet, an increase in liabilities "in foreign currency" -i.e., French Francs - will be indicated. However, this does not entail any decline in the money stock, and ceteris paribus the increase in liabilities will correspond to an increase in central bank assets in the form of credit to the government (NDG) or to the private sector (CTE).

Assuming that there is an upper bound on the Operations Account deficit for a particular country, it will not be optimal for the country to remain at this upper bound indefinitely, since it will then forego the opportunity to use the consumption smoothing facility in the wake of future negative shocks. After a period of decline in the net national position in the Operations Account, there will be a period of net foreign asset recovery, as the domestic money stock is reduced and consumption falls. The length of the recovery period will depend inter alia on the probability of there being another negative shock in the next n periods. (If the probability is high, then the country will wish to regain its original position in the Operations Account more rapidly, to avoid a sharp fall in consumption in the future.) Moreover, if there is an upper bound for UMOA or the BEAC region as a whole, then the optimal policy for the region is to follow the same type of path. It remains to be seen whether this type of path is actually followed by CFA members.

(ii) observed trends in monetary aggregates

Aggregate UMOA and BEAC figures for the 1980s give the impression that the time paths of foreign assets are compatible with efficient adjustment. Figures 10.1 and 10.2 illustrate the paths of the components of net foreign assets for each zone: (i) the Operations Account, (ii) other components of net foreign assets of the central bank (the largest and most variable component of which is debt to the IMF) and (iii) net foreign assets of private banking institutions.[4] The last of these is subject to a number of institutional restrictions (see chapter 1), and does not exhibit much variability. The first two are consistent with efficient use, not only of the Operations Account, but also of IMF and other credit. In the UMOA region, which is composed of oil importers, the negative oil price shock of 1979 induced a reduction of net foreign assets in both (i) and (ii). The net financial position of the zone in the Operations account became negative in 1980, and in the next three years, countries began to borrow from the IMF. This decline continued until 1983-4, at which point there was a recovery in both aggregates up to the last observation in 1990. This path has the same shape as the hypothetical optimal path discussed above. In the BEAC region, which is dominated by oil exporters, the negative shock came in 1986, as the oil price fell. Again, there was a temporary fall in net foreign assets, consistent with the use of foreign credit for consumption smoothing purposes. Over the long run, there has been a very slight decline in net foreign assets in real terms. Between independence in 1962 and 1990, net foreign assets of UMOA declined from 5.6% of GDP to -6.0%. (The stock of assets as a fraction of GDP fell by less than 12 percentage points in 18 years- approximately 2/3% per annum, whilst the average *annual* net overseas development assistance inflow over the same period was approximately 12% of GDP.[5]) The fall in the BEAC zone was from 4.4% of GDP to -6.0%.

However, this pattern does not correspond to the pattern for all of the individual countries. Figures 10.3-10.6 show the real net foreign asset positions of member countries.[6] These exhibit a wide variety of time paths. Of the eleven countries for which data are available, four experienced positive and increasing net foreign assets over the sample period: Burkina, Togo, Centrafrique and Tchad. Three experienced a temporary

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[4] The assets are shown in 1985 French Francs, deflated by the French GDP deflator.

[5] See OECD (1969-88).

[6] For individual countries, assets are shown in 1985 FCFA using national GDP deflators.

decline in NFA after the major negative trade shock of the period: Niger (1981: rising oil prices and falling uranium prices), and Congo and Gabon (1986: falling oil prices). Four experienced a permanent decline in NFA after a major trade shock: Benin, Cote d'Ivoire and Senegal (1979-80: rising oil prices and Cameroun (1986: falling oil prices). In the case of Cameroun, however, the figures are unreliable, as a large proportion of government-held foreign assets are unreported (see chapter 6).

In the case of the BEAC zone, changes in overall net foreign assets are dominated by the oil exporters - Cameroun, Congo and Gabon - whose net foreign asset positions determine the position of the whole zone. However, in the UMOA region, there is a discrepancy to account for: the time path of net foreign assets of only one UMOA member (Niger) corresponds to the overall UMOA time path. For this reason, it is important to look more closely at the financial aggregates of member states.

Table 10.1 shows a breakdown of the major components of BCEAO net foreign assets - net financial position in the Operations Account and net financial position in the IMF - by member state for 1984 (the trough of the region's overall NFA position) and 1990 (the last observation of the sample, by which time substantial recovery of the region's NFA position had occurred). It shows that two of the three countries with a persistently negative NFA position - Cote d'Ivoire and Senegal - have been persistently in debit on the Operations Account. The third, Benin, was in debit until 1990, but is now in credit. All the other countries have been consistently in credit in the Operations Account. In 1990, with the overall net Operations Account position of the zone close to zero, the large debit of the two largest economies was offset by the credit of the five smaller members. Correspondingly, the countries exhibiting large falls in net foreign assets in the long run are Senegal and Cote d'Ivoire. Between 1962 and 1990, net foreign assets in Cote d'Ivoire fell from 3.7% of GDP to -18.8%. In Senegal, the decline was from 9.0% to -10.2%.

It is instructive to compare the evolution of the Operations account position of the largest debtor, Cote d'Ivoire, with that of the rest of the zone. This is also shown in Table 10.1. In real terms, the Ivorian deficit has been steadily increasing, whilst the overall UMOA deficit rose in real terms to 1984, then fell back to zero. The position of UMOA less Cote d'Ivoire (the difference between the two deficits) also exhibits a rise and fall, but with an upward trend; moreover, the position is always one of credit. Correspondingly, the net foreign asset position of UMOA less Cote d'Ivoire and Senegal has risen the long run, from

4.5% of GDP in 1962 to 11.7% in 1990.

This state of affairs is sub-optimal in two ways. First of all, the five smaller countries now have a substantial credit in the Operations Account (up to 25% of GDP), and substantial debts with the IMF (up to 7½% of GDP). Given the costs entailed by these debts, not only in interest payments but also in enforced structural adjustment, these countries are worse off than with zero IMF debt and less credit in the Operations account. Secondly, assuming that Cote d'Ivoire and Senegal are approaching their respective credit limits, these countries will not be able to use the Operations Account for consumption smoothing purposes in the future. Of course, an alternative interpretation of the figures is that there is no country-specific credit limit, and long run deficits in Cote d'Ivoire and Senegal are sustainable if they are supported by the credits of the other members of UMOA. In this case, it is rational for the former to become increasingly endebted in the Operations Account, at negligible cost, and improve their net foreign asset position on international credit markets, where interest rates are much higher. In the light of these figures, it is not surprising that CFA membership appears to have had a negative impact on growth in the late 1980s, as the discrepancy in the financial positions of large and small countries in the union increased.

It is informative to look at the components of the money stock in Senegal and Cote d'Ivoire over the 1970s and 80s, to see what is the source of the persistently negative net Operations Account position and overall net foreign asset position. Figures 10.7 and 10.8 show (-) NDG and (M - CTE), the net financial positions of, respectively, the public and private sectors. In the wake of the second oil price shock, the net financial positions of both public and private sectors deteriorate in the two countries. In the case of (M - CTE), this is a temporary phenomenon, but in the case of NDG, there is a permanent decline. That is, the persistently negative net foreign asset position of the two countries is the result of an increase in net government indebtedness whilst the long run net financial position of the private sector is constant.

Given the way in which the Operations Account is constructed, it is not surprising that such a state of affairs has arisen. The Operations Account is in the name of the BCEAO as a whole, and the account itself is not disaggregated by country. The net positions of each country are estimated by the BCEAO on the basis of economic and financial data, but do not correspond to any existing account. Member states estimated

to be in credit do not have any property rights with respect to their hypothetical assets. The only way for a government to "liquidate" its assets is to expand its money supply, which ought to lead to a deterioration in its net foreign asset position. However, government control over the money supply may be weak, not so much because of UMOA rules restricting money creation (as we shall see below, these are not typically binding), but because there is limited control over private financial institutions' credit creation, or because domestic government institutions are not well organised enough.

It is noteworthy that it is the two largest economies of the region, with the most sophisticated financial systems and government institutions, which are in debit in the Operations Account. Table 10.2 shows indicators of social development and political stability in UMOA. Senegal and Cote d'Ivoire stand out as the two countries with relatively high income, stable governments and literate, urban populations. In particular, they are the two countries which have been free of violent regime changes - Senegalese governments have changed by a more or less democratic process, and Houphouet-Boigny has ruled Cote d'Ivoire since independence. It may be that the greater stability allows the governments of these two countries to take advantage of the Operations Account in a way which is impossible for the other five countries (which also explains why persistent deficits are a result of changes in government debt rather than in the net financial position of the private sector), or possibly it gives them a strategic advantage in a monetary expansion game.

The experience of Cote d'Ivoire and Senegal shows that the monetary rules of the CFA do not always prevent the deterioration in the net foreign asset position of member states. Domestic credit expansion combines with a reduction in money holdings after negative trade shocks to worsen the balance of payments deficit. Even if this is optimal for Senegal and Cote d'Ivoire, it is certainly not optimal for UMOA as a whole.

This failure has been recognised by the CFA authorities. The focus of attention in official documents[7] concerning the control of monetary aggregates has been on the growth of CTE, and the failure of policy instruments to stem this growth. This has led to the introduction of progressively tighter legislation concerning the quantity of CTE allocated to each economy (see chapter 1). However, this emphasis ignores the other component of the money supply, NDG. How effective have Franc Zone rules been in

[7] See for example Secretariat du Comite Monetaire de la Zone Franc (1990).

containing the different components of M?

The main tool for controlling NDG is the 20% rule: the increase in government debt held by the central bank (ΔDCB)[8] can be no larger than 20% of past fiscal receipts (FR). Table 10.3 shows the average ratio of ΔDCB to FR for those countries for which data are available. In all countries, the average value of ΔDCB/FR is far less than 20%, and in only one country (Senegal) has there been a serious incursion of the rule. This happened in just one year. ΔDCB/FR is typically around 5%. The 20% rule is seldom binding. In particular, it has seldom bound those countries (Benin, Cote d'Ivoire and Senegal) whose net foreign asset position has been persistently negative.

However, the aggregate which needs to be controlled is not DCB but NDG. There is no control over ΔNDG_{PB}, and so no overall constraint on NDG. Table 10.4 shows levels of ΔNDG/FR for the same countries as Table 10.3. The table shows that this has at some time risen above 20% in every country apart from Cameroun, although the average value of ΔNDG/FR is lower than that of ΔDCB/FR, apart from in Congo and Gabon.

Two conclusions can be drawn from these figures:

(i) If the fiscal rule is to constrain governments at all, and in particular if large increases in NDG from one year to the next are to be avoided, then the rule must apply to the whole of NDG, and not just DCB.

(ii) If fiscal rules are to constrain the long run growth of government debt, the upper limit needs to be substantially more restrictive than 20% of past fiscal receipts. In particular, it is not surprising that the present fiscal rule, constraining the first difference of government debt, does not prevent the long run deterioration of net foreign assets. Remember that demand for a large component of the monetary aggregate, even when money is defined as widely as M, is demand for a stock: when income rises, it is the stock of money held that rises.[9] In this case, constraining Δ(government debt) to be a fraction of fiscal receipts, which are likely to be co-integrated with income, will not prevent (M - government debt) falling, and so, for a given amount of credit to the private sector, falling

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[8] DCB is NGD_{CB} plus government deposits at the central bank.

[9] See chapter 8 and footnote 3 above.

net foreign assets. In the next section, we will investigate this issue in more detail, looking at the effectiveness of fiscal rules when part of asset demand is demand for a stock (the level of assets being proportional to income), and part is demand for a flow (asset accumulation being proportional to income).

The other tool central to the control of credit expansion has been the rediscount ceiling. The volume of CTE to be rediscounted each year is fixed by the central bank. Lowering the rediscount ceiling is meant to reduce the volume of CTE which private banks are prepared to offer, since a fall in the quantity of credit rediscounted reduces a bank's liquidity (see chapter 1). However, as Table 10.5 shows, there is no constant relationship between rediscounted and total credit in the CFA. The variability in the ratio of rediscounted to total credit is high. Moreover, private banks seldom use up their quota of rediscounted credit. In the BEAC region in 1990, banks used up only 69% of their quota.[10]

Thus there is no effective control over the sources of domestic credit expansion in the CFA: in particular, the 20% rule is not a binding constraint on government borrowing, and as a result certain countries have a persistently negative net foreign asset position.

If there is no effective control over government credit expansion and monetary creation, there remains a phenomenon to be explained: the low inflation of the Franc Zone. We know from Plane (1988b) that inflation in the CFA is significantly lower than elsewhere in Sub-Saharan Africa, and moreover very homogenous. Table 10.6 provides a clue to the explanation. The table shows budget deficits for UMOA members over the 1980s (as a percentage of GDP), along with the average for Sub-Saharan Africa. The UMOA average is always much lower than the SSA average: this is likely to be at least part of the explanation for the lower inflation. However, the budget deficits exhibit a great deal of cross-country variation. In particular, the Ivorian deficit in the early 1980s was much larger than the average for both UMOA and SSA. This did not lead to high inflation because of an inflow of foreign funds to finance the deficit, including the inflow implicit in the deterioration of the Ivorian position in the Operations Account. Thus, Cote d'Ivoire benefitted from the fiscal prudence of its neighbours. This prudence did not result from the imposition of the CFA monetary rules, which were not binding, but may have been the

[10] See Secretariat du Comite Monetaire de la Zone Franc (op. cit).

result of domestic institutional constraints, the possible causes of which have been discussed above.

2. Alternative adjustment mechanisms

The external imbalances of the CFA in the 1980s correspond to an absence of institutional constraints on certain components of the money stock, most notably, net government indebtedness. The one main constitutional control on government debt, the 20% rule for government debt held by the central bank, was singularly ineffective. It is important to know whether any rules or policies could feasibly be introduced which would prevent the imbalances which arose in the 1980s. We will remain agnostic as to whether it is in the interests of individual debtor countries to pursue such policies: Cote d'Ivoire and Senegal may be quite happy with a persistent Operations Account deficit. However, the reduction of these countries' deficits is desirable for UMOA as a whole, and for the organisations imposing structural adjustment conditions.

We will need to compare exchange rate adjustment (the policy device to which CFA members do not have access) with possible alternative ways of correcting an external imbalance. To the extent that the alternatives are likely to work less well than exchange rate adjustment, the fixed exchange rate handicaps CFA members. The effect of a policy tool will depend on its impact on both real variables (output and consumption) and monetary variables. We therefore need to look at the interaction of these variables in a macroeconomic model. Identification and estimation of a whole model would require far more data than is available for any member of the Franc Zone, so an alternative form of analysis must be found. The approach taken below is to construct a simple short run general equilibrium model of a stylised Franc Zone economy, and use it to compare the impact of different policy measures over a sensible range of parameter values. In this way, we can form a picture of the likely effects of the different policies.

There are three groups of economic agent in the model: producers, consumers and the government. The basic form of the model is as follows.

(i) *Producers* Production in the domestic economy comprises three sectors: X (agricultural exports), M (manufactured import-competing goods) and N (internationally nontraded goods). Typically in West Africa, X will represent coffee and cocoa. Food may be a nontraded commodity, in which case it is aggregated with N, or a traded commodity,

in which case it is aggregated with X. There are three short-run production functions of the form:

(1) $Q_i = a_i L_i^{bi}$, i = X,M,N

where Q_i is value added in the i^{th} sector, and L_i is labour input.[11] Labour supply is fixed at L, with a labour market clearing condition:

(2) $L = L_X + L_M + L_N + L_G$

where L_G is the labour which the government uses to produce public goods. The price of nontraded goods (P_N) is determined by domestic supply and demand, with a market clearing condition:

(3) $Q_N = C_N + G_N$

where C_N is private consumption and G_N government consumption. The domestic border prices of X and M depend on international prices:

(4) $P_i = eP_i^*$, i = X,M

where e is the (given) domestic price of forex and P_i^* is the international price of i. There is a tax on the export of X (t_X) and the import of M (t_M). Domestic producers earn the resulting rent on production of import-competing goods. In practice, the tax on exports is likely to be implicit, with a statutory domestic producer price ($P_X\#$) lower than the border price, eP_X^*. The effective tax rate is $t_X = 1 - P_X\#/eP_X^*$. The wage in the import-competing sector (which for simplicity is also the wage paid to government workers) is fixed at w, above its market clearing level. This reflects the findings of chapter 9. The profit-maximising firms in this sector employ labour to the point where the wage equals the marginal product of labour:

(5) $w = (1 + t_M)P_M a_M b_M / L_M^{(1-bM)}$

[11] For simplicity, private investment is set at zero. This does not substantially alter the results of interest presented below.

Wages in the other two sectors are flexible, and labour is allocated so as to maximise its return, so that the marginal products in X and N are equalised:

$$(6)\ P_N a_N b_N / L_N^{(1-bN)} = (1-t_X) P_X a_X b_X / L_X^{(1-bX)}$$

If food is aggregated with nontraded goods, then it is sensible to limit private consumption in the model to N and M. This restriction is imposed below, although treating food as a traded good and allowing domestic consumption of X does not substantially alter the results below.

(ii) *Consumers* Consumers' choices are based on expenditure of their disposable income, the income of the private sector, which is:

$$(7)\ Y = (1-t_Y)((1-t_X)P_X Q_X + (1+t_M)P_M Q_M + P_N Q_N + wL_G) + TR$$

where t_Y is an income tax, t_N a tax on N and TR represents transfers from the government to the private sector. This income is allocated to saving, consumption of N (C_N) and consumption of M (C_M).

In previous chapters, we have modelled the asset holding decisions of consumers; most of the explanatory variables in these models (such as interest rates and the variability of the return to assets) are held constant in the model here. Nevertheless, we can still draw on them to provide income-savings equations. In chapters 4-5, we saw that aggregate saving - the change in total net assets - was cointegrated with income. In chapter 8, we saw that the level of liquid asset holding was cointegrated with income. In this case, the change net illiquid asset holding (aggregate saving less the change in liquid asset holding) must be cointegrated with income. Adopting the error correction form of chapters 4-5, the change in net illiquid asset holding (S) can be described by a function of the following form:

$$(8)\ S = nS_{-1}^{\tau}(Y^{\pi}Y_{-1}^{1-\pi})^{1-\tau}$$

which corresponds to the error correction model:

$$\Delta \ln S = (1-\tau)\pi\Delta \ln Y - (1-\tau)(\ln S_{-1} - \ln Y_{-1} - \ln n/(1-\tau))$$

Similarly, liquid asset holding is described, as in chapter 8, by an error correction model:

$$(9)\ Z = kZ_{-1}^{\alpha}(Y^{\beta}Y_{-1}^{1-\beta})^{1-\alpha}$$

The rest of disposable income is spent on present consumption. Consumption decisions have not been modelled in previous chapters, but it is not controversial to stylise the allocation of expenditure on N and M as the result of maximising present utility. The maximisation can be represented as:

$$\max U(C_N, C_M) \text{ subject to } (1+t_N)P_N C_N + (1+t_M)P_M C_M = Y - S - \Delta Z$$

Solving this maximisation problem, we can express C_M/C_N as a function of $(1+t_N)P_N/(1+t_M)P_M$. Different forms of U() result in different consumption functions. However, a wide range of utility functions, including functions of the form $U = AC_M^{a}C_N^{b}$ and $U = AC_M^{a} + BC_N^{a}$, correspond to:

$$(10)\ C_M/C_N = h((1+t_N)P_N/(1+t_M)P_M)^{\sigma}$$

(With the first utility function, $h = a/b$ and $\sigma = 1$; with the second, $h = (A/B)^{1/(1-a)}$ and $\sigma = 1/(1-a)$.) Finally for the private sector, there is the budget constraint: expenditure equals income:

$$(11)\ (1+t_M)P_M C_M + (1+t_N)P_N C_N + S + \Delta Z = Y$$

(iii) *Government* The government budget constraint is given by

$$(12)\ \Delta GD = TR + wL_G + ING + P_M G_M + (1+t_N)P_N G_N - t_y(P_N Q_N + (1+t_M)P_M Q_M + (1-t_X)P_X Q_X) - t_M(C_M - Q_M) - tx P_X Q_X$$

where G_M represents government imports of M, ING government investment and ΔGD is government borrowing. The government policy variables, t_i, G_i, TR, ING and L_G, are taken as parameters.

The model is closed by the balance sheet of the banking sector (aggregating the local department of the central bank and private banks), which is:

(13) $\Delta NFA = \Delta Z + S - \Delta GD$

Private assets correspond to liabilities of the rest of the World and of government, whose borrowing finances current and capital expenditure. Z can be thought of as including at least some bank deposits, with the supply of Z being infinitely elastic (bank deposits, which are ex hypothesi perfect substitutes for M_0, are demand-determined). In terms of the variables in section 1, $NFA = NFA_{CB} + NFA_{PB}$, $GD = NDG_{CB} + NDG_{PB}$, and $S + \Delta Z = \Delta M - \Delta CTE$. In the simplest form of the model, government borrowing is unconstrained, and any difference between net borrowing by government and net saving by the private sector is made up by a reduction in net foreign assets.

Assuming that the components of government expenditure (G_i, L_G, TR and ING) and tax rates (t_i) are given, and knowing the past levels of Z, S and Y (so $\Delta Z = Z - Z_{-1}$), we can solve the 16 equations for the 16 unknowns: Q_X, Q_M, Q_N, L_X, L_M, L_N, C_M, C_N, P_X, P_M, P_N, S, Z, ΔGD, ΔNFA and Y with the parameters L, a_i, b_i, h, σ, e, P_i^*, w, n, τ, π, k, α and ß. Note that in this model, there is no external constraint on ΔNFA: the Operations Account will accommodate any change in net foreign assets.

To begin with, consider the economy portrayed in Table 10.7. In this stylised economy, half of GDP is made up by the nontraded goods sector, and a quarter each by the export and import-competing sectors.[12] 40% of current government expenditure is on wages, and 20% is spent on imports, nontraded goods and transfers. There is a 5% income tax, and a 5% tax on nontraded goods. Import duties and export taxes are much higher, at 33%. Half of private expenditure is on nontraded goods and half on traded goods. With no investment, the current account will be equilibrium, with no change in net foreign assets: current government expenditure net of tax revenue equals private saving. If the government has a large capital expenditure programme, then this will be financed

[12] This stylisation is more appropriate for an oil-importing economy than for an oil exporter; there is no mining sector in the model. However, the structure of a model with resource extraction will not be very different from the one here: since the oil industry is highly capital intensive, production can reasonably be treated as exogenous in the short run, and the oil revenues amount to an exogenous source of government revenue.

by borrowing from abroad, and the current account will be negative. For simplicity, the tables below take investment to be zero. Introducing a positive ING will simply reduce the value of ΔNFA by the value of ING. The stylised economy in Table 10.7 may be compared with the summary statistics of various CFA members listed in Table 10.8.

Table 10.7 represents a baseline case, embodying two models, one with low elasticities of output with respect to labour input and low cross-price elasticities of demand ($b_i = 0.25$, $\sigma = 0.5$), and one with high elasticities ($b_i = 0.75$, $\sigma = 2.0$). In each case, the economy is in equilibrium, with the money stock at is stationary level. Note that the manufacturing wage is set at unity. This means that the marginal product of labour in manufacturing, which is $w/(1+t_M)$, equals 0.6. The importance of this figure is in its size relative to marginal product in other sectors of the economy. In both scenarios, industrial marginal product is greater than the marginal product in agriculture, equal to 0.08 in the low elasticity case and 0.26 in the high elasticity case. The fixed industrial wage results in low industrial employment, and very high levels of employment in agriculture, forcing down the agricultural marginal product. The former case can be interpreted as describing an economy in which there is "disguised" agricultural unemployment, with a marginal agricultural product close to zero.[13] The latter is a less extreme case, where the marginal product of labour in agriculture is about half of the marginal product in industry. In both cases, there is resource misallocation, and underproduction in manufacturing.

Table 10.9 shows the impact of a 25% fall in the international price of exports: with no constraint on government borrowing, the equilibrium current account deficit increases by about 5% of GDP in the low elasticity case, and by about 7% of GDP in the high elasticity case.[14] (With high elasticities, the reduction in the return to exports induces a larger reallocation of factors into nontraded goods, worsening the current account.) Note that the impact effect of the fall in P_X is greater than the long run equilibrium effect. Part of the impact effect is due to a reduction in real money balances on the part of private agents, as domestic income falls ($\Delta Z < 0$). This counts as dissaving, and worsens the current account. When people have rid themselves of the excess money, the current account improves somewhat. Hence there is an "overshooting" effect.

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[13] For an example of labour market analysis with zero marginal agricultural product of labour, see Sen (1960).

[14] Since the implicit export tax is $1 - P_X\#/eP_X^*$, a change in P_X^* would change the rate of export taxation, if $P_X\#$ were left unchanged. For simplicity, we assume that $P_X\#$ is adjusted so that the rate of taxation does not change. In practice, the response of $P_X\#$ to P_X^* will be much more sluggish (see chapter 9).

We observe that the adjustment of financial assets in the wake of a negative trade shock follows the pattern described in section 1. There is a large increase in ΔGD and a fall in S, corresponding to the increases in government borrowing and credit to the economy which were observed to accompany a fall in net foreign assets in section 1.

This contrasts with the case of fiscal prudence depicted in Table 10.10, where the government restricts its borrowing to private saving (ΔGD = S), and government expenditure on imports is adjusted to balance the budget. Here, in the long run, there is no deterioration in the current account balance as a result of the fall in the export price. (There is, however, a short run effect, as people reduce their real money balances.) In the absence of such prudence, what alternative means of adjustment are available?

Now if the government could adjust the nominal exchange rate, e, devaluation would be the obvious response to the worsening of the current account. As Table 10.11 shows, a 37.5% devaluation in the low elasticity case and a 35% devaluation in the high elasticity case, imposed after the economy has reached equilibrium following the fall in P_X, would reduce the current account deficit to zero.

Is it possible to achieve the same result by other means? In the absence of voluntary fiscal prudence, there are two main alternatives to devaluation. First (the policy advocated by the World Bank for Cote d'Ivoire), import and export taxes could be adjusted to mimic a devaluation. Secondly, a fiscal rule similar to (but possibly more effective than) the 20% rule could be imposed on the government by the monetary authorities.

Tables 10.12 and 10.13 show the change in the import tariff needed to compensate for the fall in the export price in two cases: in the first, export taxes are left unchanged, and in the second, export taxes are reduced to zero. The tables show that in the absence of a change in the export tax, the import tax would have to be raised to 0.7 in the low elasticity case, and to 0.865 in the high elasticity case, in order to achieve an equilibrium current account balance of zero.

The tables also show the ambiguous effect of changes in the export tax on the current account deficit. In the low elasticity case, a reduction in t_x worsens the current account. This is because output does not respond substantially to the increase in the producer price, so government revenue falls (and borrowing increases) whilst private

savings do not increase substantially. With $t_X = 0$, t_M would have to be *higher* in the low elasticity case, at 0.865. By contrast, the larger supply response in the high elasticity case means that a reduction in t_X improves the current account balance. Here, with $t_X = 0$, t_M need be raised only to 0.75 to correct the deficit.

To summarise: the effect of changes in export taxes is uncertain - a reduction in t_X may improve or worsen the current account balance. The effect of changing import tariffs is unambiguous, but the magnitude of the increase in t_M required to correct for a negative trade shock is greater than the magnitude of the trade shock itself. For a 25% fall in the export price, tariffs need to be raised by more than 100 percentage points. In the absence of manufacturing wage rigidity, this magnitude would be even greater, since there would be no gain from improvement in resource allocation as labour moved into import-competing good production. If t_M were used to correct for a sequence of negative trade shocks, it would be likely to reach a value of several hundred percent. That is, substantial de-liberalization would be required. It is doubtful whether this is either politically feasible for a country endebted to the World Bank or optimal in the long run. If wage flexibility is achieved in the long run, then an import tariff several orders of magnitude greater than any other tax will entail a serious misallocation of resources, and dismantling illiberal trade regimes is a difficult and costly process.[15]

The alternative to trade policy is to impose a fiscal rule on the government. The present 20% rule is clearly inadequate, since it covers only a part of government debt. If such a rule is to be effective at all, it must cover the whole of GD. One possibility is to stipulate a rule limiting ΔGD to a certain fraction (r) of fiscal receipts. The effect of imposing such a rule on a country with a current account deficit is shown in Table 10.14. We assume that compliance with the rule will be effected by restricting expenditure, first of all of G_M, and then, when G_M reaches zero, of L_G. Other ways of complying with the rule produce similar results. We will consider two scenarios. In the first, the economy is in the equilibrium following the 25% fall in P_X discussed above. In the second, it is in the equilibrium resulting from a 50% fall in P_X.

The table shows the value of r required in each case to bring the economy back to an equilibrium with a current account equal to zero. In the low elasticity case, a 25% fall

[15] See for example Bevan (1992).

in P_x would be corrected by a value of r equal to 1.05, whilst a 50% fall in P_x would be corrected by a value of r equal to 1.22. Note that the constraint on government spending is more lax, the *larger* the trade shock. This is because the fall in P_x reduces fiscal receipts, so the larger the shock, the more restrictive any given value of r. In the high elasticity case, the respective values of r are 1.23 and 1.74.

These results suggest that it would be very difficult to construct a workable rule for correcting current account deficits. Different shocks require different rules, and a rule which works for one shock may not work for others. For example, setting $r \geq 1.74$ in the high elasticity case for a 25% fall in P_x would be completely ineffective, since an unconstrained government would borrow less than 1.74 times its fiscal receipts after the shock anyway. On the other hand, imposing $r \geq 1.23$ in a high elasticity case would lead to a large current account surplus, with a massive reduction in government expenditure.

The results show that linking government borrowing to fiscal receipts is a poor substitute for linking it to private savings. It is the evolution of ΔGD relative to S and ΔZ which will be crucial in determining the size of the current account deficit: if $\Delta GD - (S + \Delta Z)$ is rising, then the current account deficit will be expanding. The results above reinforce the discussion of the 20% rule in the previous section: part of saving (ΔZ) is proportionate to ΔY. To the extent that savings are in this form, linking ΔGD to a variable roughly proportionate to Y (and not ΔY) will not keep ΔGD in line with ΔZ: no fiscal rule of the Franc Zone type will be effective. When a savings component (S) which is proportionate Y is included in the model, an appropriate rule can be found for a given trade shock. However, different rules are required for different shocks, and a single, invariant rule will be ineffective. There is no easy way of introducing institutional rules which proxy a government budget deficit which is linked directly to private savings.

3. Conclusion

The evidence of the 1980s suggests that there is no adequate mechanism in the Franc Zone for correcting current account deficits. With a fixed exchange rate, automatic adjustment requires a fiscal prudence on the part of the government which will be manifested in a strong relationship between, on the one hand, net government borrowing and net private saving, and on the other, changes in net foreign assets and the money stock. Without such prudence, monetary adjustment is impossible, and the "monetary approach to the balance of payments" inapplicable. In the CFA, the an absence of prudence, at least amongst the larger countries, is common, despite the 20% rule. As a result, there is an absence of any link between net foreign assets and the money stock. A growing imbalance in the CFA between large, debtor countries and small, creditor ones may well account for the poor performance of the zone as a whole in the late 1980s.

The immediately obvious alternatives to devaluation are (i) an adjustment of trade taxes and (ii) a tighter fiscal rule. However, both of these approaches bring with them serious problems. Relying on trade taxes is likely to lead in the long run, after a series of trade shocks, to unrealistically high tariff barriers, whilst a single rule linking government borrowing to tax receipts is too crude a tool to be of use in correcting efficiently for external imbalances.

Where does this leave the Franc Zone? It is possible to argue that the 1980s were anomalous in the economic history of Africa. It is unlikely that so many shocks will buffet West Africa in quick succession in the near future. If this is true, then there is a case for using trade taxes to mimic a devaluation. The change in taxes will not be a frequent phenomenon, and in the absence of such large shocks in the future, tariff barriers need not drift upwards. However, it appears that large changes in tariffs are needed even for quite small changes in international prices, and it is unlikely that Africa will be completely immune from shocks in the future. Moreover, if the 1980s were anomalous, then there is a strong case for devaluation of the CFA Franc. If the 1980s are perceived to be unique, then a devaluation will be perceived to be similarly unique, and the CFA will not lose out from an increase in actual or expected exchange rate instability.

A more secure position would be to introduce rules which ensured fiscal prudence

on the part of member states. There is no substitute for imposing rules directly on the net financial position of the economy, and enforcing a link between private saving and public borrowing. As noted in the previous section, these rules should be tighter in the long run than in the short run. In theory, there is no reason why this should pose particular problems. Given the complex nature of government accounts, private savings data are no more difficult to collect than government budget data. If the rule were effective, it would also discourage national governments from misinforming the central authorities about government accounts. For example, the secreting of public saving in offshore accounts would be less attractive if it meant that the government would be able to borrow less, having under-reported its asset acquisitions. There may however be political pressure to delay changes in the CFA constitutions which made effective the rules governing government behaviour.[16]

[16] In the light of chapter 6, it would also be necessary to make a distinction between different types of credit in the institutional rules. It is important to secure efficient regulation of short run credit for consumption without harming medium and long run credit for investment.

TABLE 10.1

COMPONENTS OF BCEAO OFFICIAL NET FOREIGN ASSETS 1984-1990

1. Operations Account

Country	*Net position in OA (FCFA bn) (% of GDP)*[17]			
	1990		1984	
Benin	15.88	(3.0)	-20.00	(-5.1)
Burkina Faso	72.37	(13.1)	45.00	(10.8)
Cote d'Ivoire	-327.68	(-14.3)	-179.00	(-8.4)
Mali	45.57	(8.3)	8.00	(1.8)
Niger	53.85	(8.6)	37.00	(6.0)
Senegal	-41.69	(-2.9)	-53.00	(-5.2)
Togo	90.45	(25.2)	96.00	(36.0)

2. IMF

Country	*Net position with respect to IMF (% of GDP)*			
	1990		1984	
Benin	-5.18	(-1.0)	0.90	(0.0)
Burkina Faso	-3.33	(-0.6)	3.50	(0.9)
Cote d'Ivoire	-125.13	(-5.4)	-157.40	(-7.4)
Mali	-20.39	(-3.7)	-25.70	(-5.9)
Niger	-22.18	(-3.5)	-16.20	(-2.6)
Senegal	-88.76	(-6.0)	-95.80	(-9.4)
Togo	-26.32	(-7.4)	-22.60	(-8.5)

[17] Imputed Operations Account credits and debits by country are reported as "avoirs (engagements) en devises" in BCEAO statistics (BCEAO (1980-1990)). The sum of national net positions in the Operations Account is not equal to the BCEAO net position (- FCFA 7.31bn), since some assets consolidated in the Operations Account are not imputed to any country. See text and Lelart (1986), Appendix 1.

REAL IVORIAN AND UMOA OPERATIONS ACCOUNTS DEFICITS[18]

	Ivorian deficit	UMOA deficit	Difference
1980	3682	1646	2036
1982	3698	1918	1780
1984	4148	2562	1586
1988	4640	1316	3324
1990	5566	124	5442

Source: BCEAO Notes d'Information et Statistiques

[18] Real figures are calculated in millions of French Francs using the French GDP deflator.

TABLE 10.2: INDICATORS OF SOCIAL AND POLITICAL DEVELOPMENT IN UMOA

	PCY	SC	AC	SR	LR	UP	PP	PR
Benin	340	3	0	3	23	39	3	76
Burkina Faso	230	6	0	1	28	8	4	25
Cote d'Ivoire	740	0	0	5	54	42	80	128
Mali	230	2	1	2	32	21	--	38
Niger	310	1	2	3	28	16	10	63
Senegal	630	0	0	5	38	42	80	111
Togo	370	2	2	4	43	20	30	179

Key

PCY: $ per caput income (1988)

SC: successful coups d'etat since independence

UC: unsuccessful coups d'etats since independence

SR: political stability rating in Hodd (1991) - 1 = poor, 5 = good

LR: literacy rate (%) (1988)

UP: urban population (% of total) (1985)

PP: daily newspapers sold (per 10,000 people) (1987)

UP: radio receivers (per 1,000 people) (1987)

(Source: Hodd (1991); International Institute for Economic Development (1987), UNESCO (1990))

TABLE 10.3: FISCAL RECEIPTS AND GOVERNMENT DEBT #1[19]

	ΔDCB/FR (%)		
	maximum	mean	time period
Benin	16	4	1978-89
Burkina Faso	10	3	1978-90
Cote d'Ivoire	23	5	1974-90
Niger	19	5	1978-90
Senegal	50	10	1976-90
Togo	21	6	1975-90
Cameroun	16	4	1974-90
Congo	18	4	1977-88
Gabon	14	0	1974-88

Source: IMF International Financial Statistics and UN African Statistical Yearbook.

[19] See text for definitions; the time periods are for the longest available continuous series.

TABLE 10.4: FISCAL RECEIPTS AND GOVERNMENT DEBT #2[20]

	ΔNGD/FR (%)		
	maximum	mean	time period
Benin	30	-2	1978-89
Burkina Faso	32	-3	1978-90
Cote d'Ivoire	36	2	1974-90
Niger	33	-1	1978-90
Senegal	41	7	1976-90
Togo	35	0	1975-90
Cameroun	33	-3	1974-90
Congo	27	5	1977-88
Gabon	28	3	1977-88

Source: as Table 10.2.

[20] See text for definitions.

TABLE 10.5: CREDIT TO THE PRIVATE SECTOR[21]

rediscounted credit / CTE (%) - 1973-90

	maximum	minimum	mean	standard dev
Benin	50.8	8.3	29.4	11.1
Burkina Faso	24.4	2.7	11.9	6.6
Cote d'Ivoire	45.0	25.2	35.1	6.5
Niger	32.3	1.3	19.7	9.3
Senegal	44.9	14.4	27.6	14.4
Togo	20.3	3.7	9.3	4.9
Cameroun	33.7	14.8	22.0	5.6
Centrafrique	58.9	23.2	45.4	10.5
Congo	28.5	7.3	19.8	6.0
Gabon	13.8	3.2	7.3	3.4
Tchad	62.7	43.2	54.5	6.3

Source: IMF International Financial Statistics

[21] See text for definitions.

TABLE 10.6: BUDGET DEFICITS AS A PERCENTAGE OF GDP[22]

	1980	1981	1982	1983	1984	1985	1986	1987
Benin	6.0	0.4	4.9	5.4	4.7	-2.3	2.2	----
Burkina Faso	-0.3	1.5	1.7	-0.1	0.8	-1.7	-1.3	1.0
Cote d'Ivoire	10.5	11.7	14.0	10.3	2.9	3.4	----	----
Mali	4.6	3.9	7.8	8.4	7.6	9.8	8.2	3.8
Niger	4.7	10.8	7.0	7.1	7.1	5.6	3.6	4.0
Senegal	-0.9	3.4	6.2	5.9	6.6	4.3	3.1	3.0
Togo	2.0	5.7	1.8	2.0	2.7	1.9	4.9	4.3
CFA average	3.8	5.8	6.2	5.6	4.6	3.0	3.0	2.3
SSA average	6.3	8.1	8.4	7.3	6.4	7.3	7.9	7.2

(Source: UNDP/World Bank (1990))

[22] Surpluses are shown as negative numbers.

TABLE 10.7: PARAMETERS OF THE CGE MODEL

(1) low elasticity case

L	a_X	a_N	a_M	b_X	b_N	b_M
10.0	0.607	0.923	1.059	0.25	0.25	0.25
h	σ	n	k	e	P_X*	P_M*
0.888	0.50	0.20	0.15	1.00	1.00	1.00
t_X	t_M	t_N	t_Y	L_G	G_M	G_N
0.333	0.333	0.05	0.05	0.50	0.25	0.25
Z_{-1}	ING	w	TR	α,τ	ß,π	
0.43	0.00	1.00	0.25	0.10	0.90	

Dependant variable values -

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.75	1.50	0.75	1.00	0.00	0.60	0.60
Z						
0.43						

(2) high elasticity case

L	a_X	a_N	a_M	b_X	b_N	b_M
10.0	0.416	0.365	0.930	0.75	0.75	0.75
h	σ	n	k	e	P_X*	P_M
0.620	2.00	0.20	0.15	1.00	1.00	1.00
t_X	t_M	t_N	t_Y	L_G	G_M	G_N
0.333	0.333	0.05	0.05	0.50	0.25	0.25
Z_{-1}	ING	w	TR	α,τ	ß,π	
0.43	0.00	1.00	0.25	0.10	0.90	

Dependant variable values -

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.75	1.50	0.75	1.00	0.00	0.60	0.60

Z

0.43

Table 10.8: SUMMARY STATISTICS OF CFA MEMBERS (1983)

Country	Q_X	Q_N	Q_M	CA_1	CA_2	GFR	GWB	GEG	n	k
Cote d'Ivoire	634	958	488	164	-364	441	270	70	19	11
Senegal	236	499	138	-119	-170	145	86	51	2	22
Togo	101	129	63	-7	-43	37	26	10	14	33
Cameroun	656	1043	1086	236	-50	296	142	141	29	14
Congo	61	304	434	158	-169	153	---	---	45	11
Gabon	81	494	769	485	25	360	---	---	54	12

Q_X: agricultural value added to GDP in billion FCFA ; Q_N: services value added; Q_M: industrial value added; CA_1: balance of trade; CA_2: current account; GFR: government fiscal revenue; GWB: government wage bill; GEG: government expenditure on goods and services; n: ratio of gross domestic saving to GDP (%); k: ratio of M_1 to GDP (%).

Source: UN African Statistical Yearbook (1986) for government budget data, World Bank World Tables (1989-90) for other data.

TABLE 10.9: EFFECTS OF A FALL IN EXPORT PRICES[23]

(1) low elasticity case, initial impact

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.72	1.52	0.75	0.88	-0.15	0.56	0.68

Z

0.41

(2) low elasticity case, long run impact

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.72	1.52	0.75	0.86	-0.14	0.55	0.68

Z

0.40

(3) high elasticity case, initial impact

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.50	1.65	0.75	0.89	-0.23	0.56	0.76

Z

0.41

(4) high elasticity case, long run impact

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.51	1.65	0.75	1.88	-0.21	0.55	0.76

Z

0.40

[23] See text for explanation

TABLE 10.10: EFFECTS OF A FALL IN EXPORT PRICES, MODIFIED MODEL

(1) low elasticity case, initial impact

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.72	1.52	0.75	0.88	-0.03	0.56	0.56

Z

0.41

(2) low elasticity case, long run impact

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.72	1.52	0.75	0.87	0.00	0.55	0.55

Z

0.40

(3) high elasticity case, initial impact

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.50	1.65	0.75	0.89	-0.03	0.56	0.56

Z

0.41

(4) high elasticity case, long run impact

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.51	1.65	0.75	0.88	0.00	0.55	0.55

Z

0.40

TABLE 10.11: EFFECTS OF A DEVALUATION[24]

(1) low elasticity case, initial impact, e = 1.375

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.74	1.50	0.83	1.08	0.05	0.67	0.71
Z						
0.49						

(2) low elasticity case, long run impact, e = 1.375

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.73	1.50	0.83	1.11	0.00	0.71	0.71
Z						
0.52						

(3) high elasticity case, initial impact, e = 1.35

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.21	1.51	1.84	1.55	0.12	0.92	1.07
Z						
0.67						

(4) high elasticity case, long run impact, e = 1.35

Q_X	Q_N	Q_N	P_N	ΔNFA	S	ΔGD
0.20	1.51	1.84	1.58	0.00	1.05	1.05
Z						
0.76						

[24] With P_X = 0.75; see text for explanation

TABLE 10.12 EFFECTS OF A CHANGE IN TAX RATES[25]

(1) low elasticity case, initial impact, $t_M = 0.7$ and $t_X = 0.33$

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.71	1.52	0.81	0.92	0.02	0.60	0.63
Z						
0.44						

(2) low elasticity case, long run impact, $t_M = 0.7$ and $t_X = 0.33$

Q_X	Q_N	Q_M	P_N	ΔNFA	S	GD
0.70	1.52	0.81	0.94	0.00	0.62	0.62
Z						
0.45						

(3) low elasticity case, initial impact, $t_M = 0.865$ and $t_X = 0$

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.75	1.49	0.84	1.13	0.03	0.69	0.76
Z						
0.50						

(4) low elasticity case, long run impact, $t_M = 0.865$ and $t_X = 0$

Q_X	Q_N	Q_M	P_N	ΔNFA	S	GD
0.74	1.50	0.84	1.17	0.00	0.74	0.74
Z						
0.54						

[25] With $P_X = 0.75$; see text for explanation

TABLE 10.13: EFFECTS OF A CHANGE IN TAX RATES[26]

(1) high elasticity case, initial impact, $t_M = 0.865$ and $t_X = 0.33$

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.07	1.49	2.05	1.66	0.09	0.98	1.21

Z

0.72

(2) high elasticity case, long run impact, $t_X = 0.865$ and $t_X = 0.33$

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.06	1.50	2.05	1.70	0.00	1.14	1.14

Z

0.83

(3) high elasticity case, initial impact, $t_M = 0.75$ and $t_X = 0$

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.32	1.50	1.69	1.49	0.08	0.88	1.05

Z

0.64

(4) high elasticity case, long run impact, $t_M = 0.75$ and $t_X = 0$

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.31	1.51	1.69	1.52	0.00	0.99	0.99

Z

0.72

[26] With $P_X = 0.75$; see text for explanations

TABLE 10.14: DEPENDANT VARIABLE VALUES CONSISTENT WITH THE FISCAL RULES REQUIRED FOR CURRENT ACCOUNT BALANCE[27]

(1) low elasticity case, P_X = 0.75 and r = 1.05

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.72	1.52	0.75	0.86	0.00	0.54	054
Z	G_M	L_G				
0.40	0.11	0.50				

(2) low elasticity case, P_X = 0.5 and r = 1.22

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.68	1.54	0.75	0.72	0.00	0.49	049
Z	G_M	L_G				
0.35	0.00	0.47				

(3) high elasticity case, P_X = 0.75 and r = 1.23

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.51	1.65	0.75	0.88	0.00	0.55	055
Z	G_M	L_G				
0.40	0.04	0.50				

(4) high elasticity case, P_X = 0.5 and r = 1.74

Q_X	Q_N	Q_M	P_N	ΔNFA	S	ΔGD
0.26	1.80	0.75	0.75	0.00	0.48	048
Z	G_M	L_G				
0.35	0.00	0.33				

[27] See text for explanation

FIGURE 10.1 - COMPONENTS OF NET FOREIGN ASSETS IN UMOA

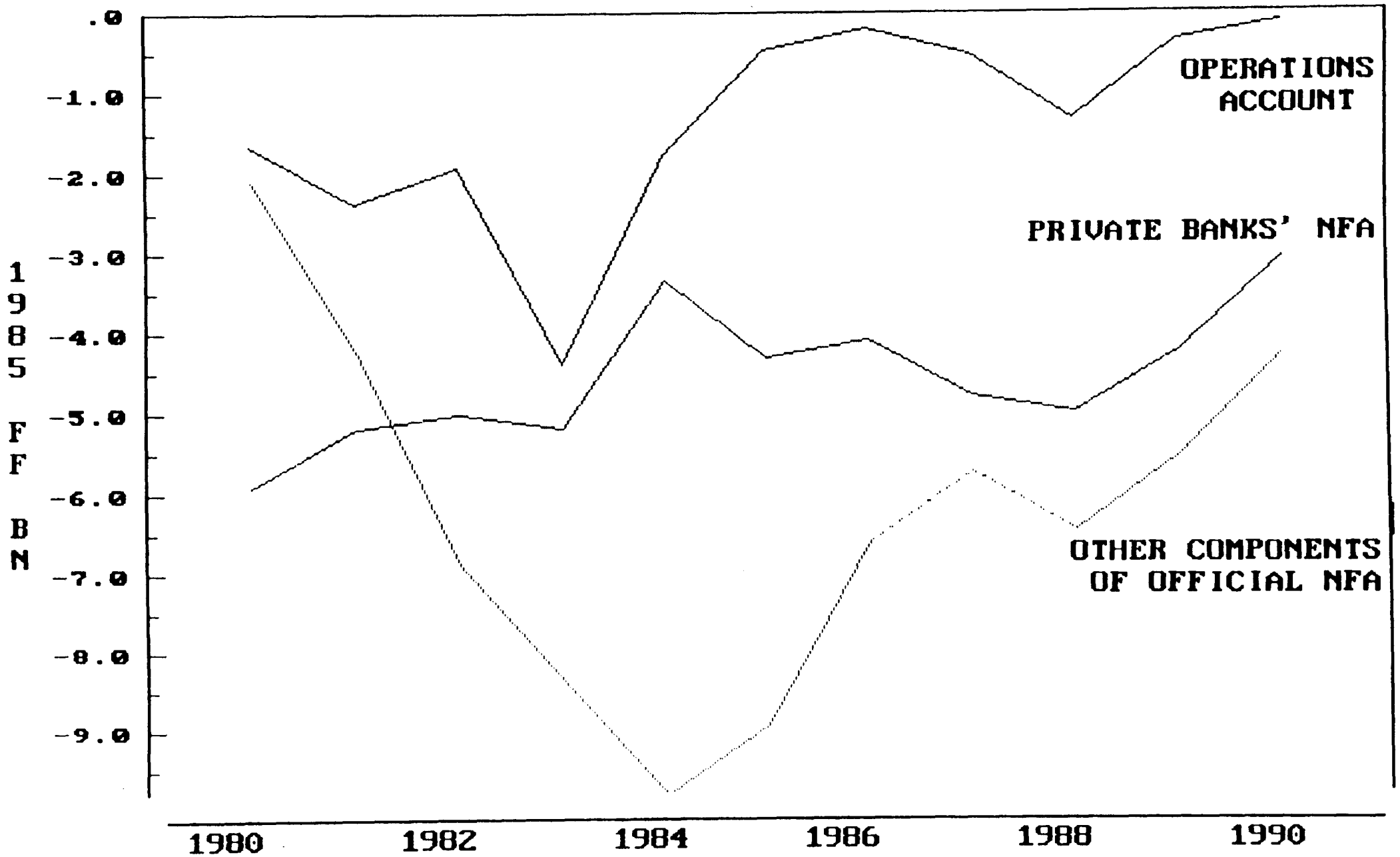


FIGURE 10.2 - COMPONENTS OF NET FOREIGN ASSETS IN THE BEAC REGION

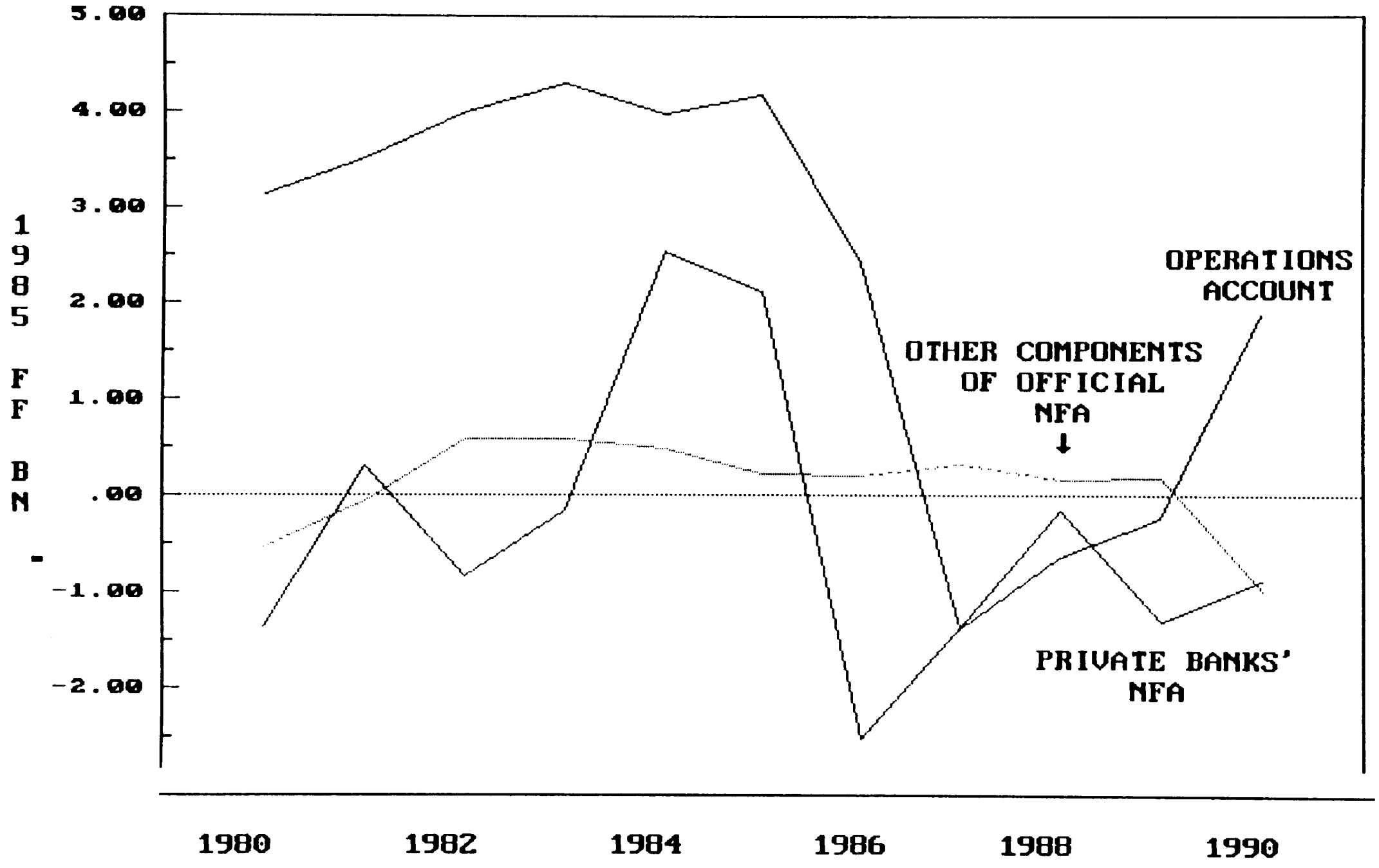


FIGURE 10.3 - NET FOREIGN ASSETS

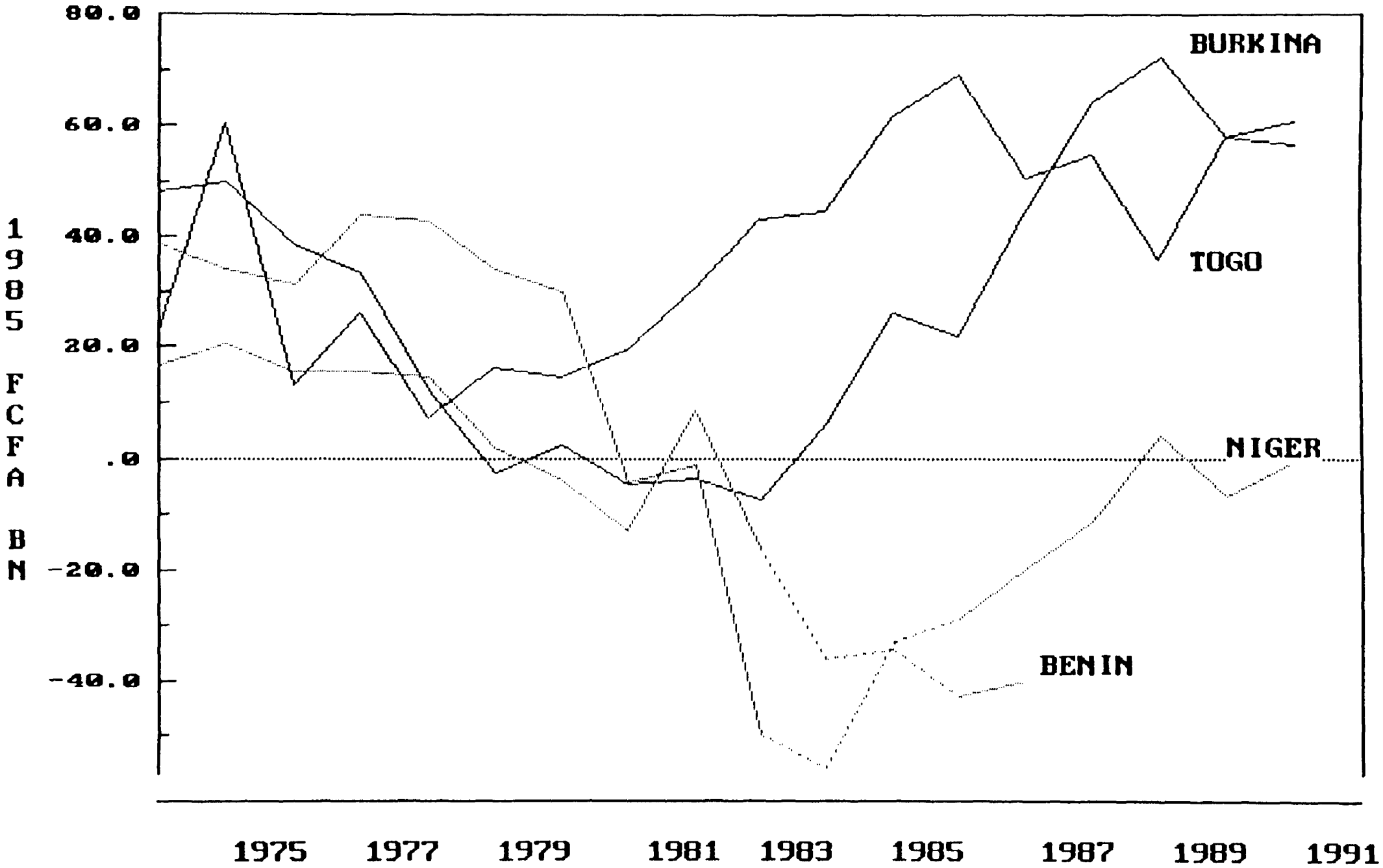


FIGURE 10.4 - NET FOREIGN ASSETS

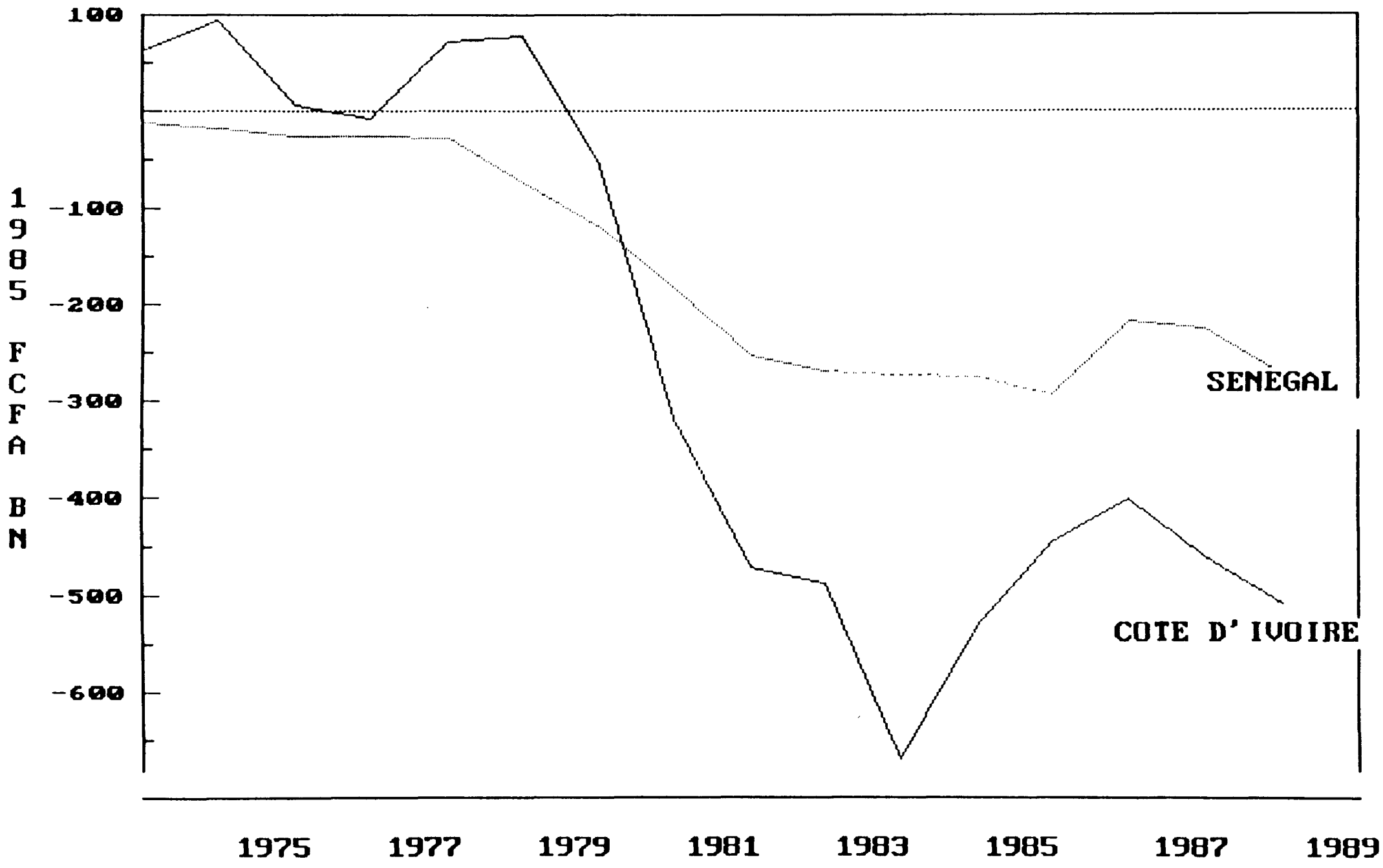


FIGURE 10.5 - NET FOREIGN ASSETS

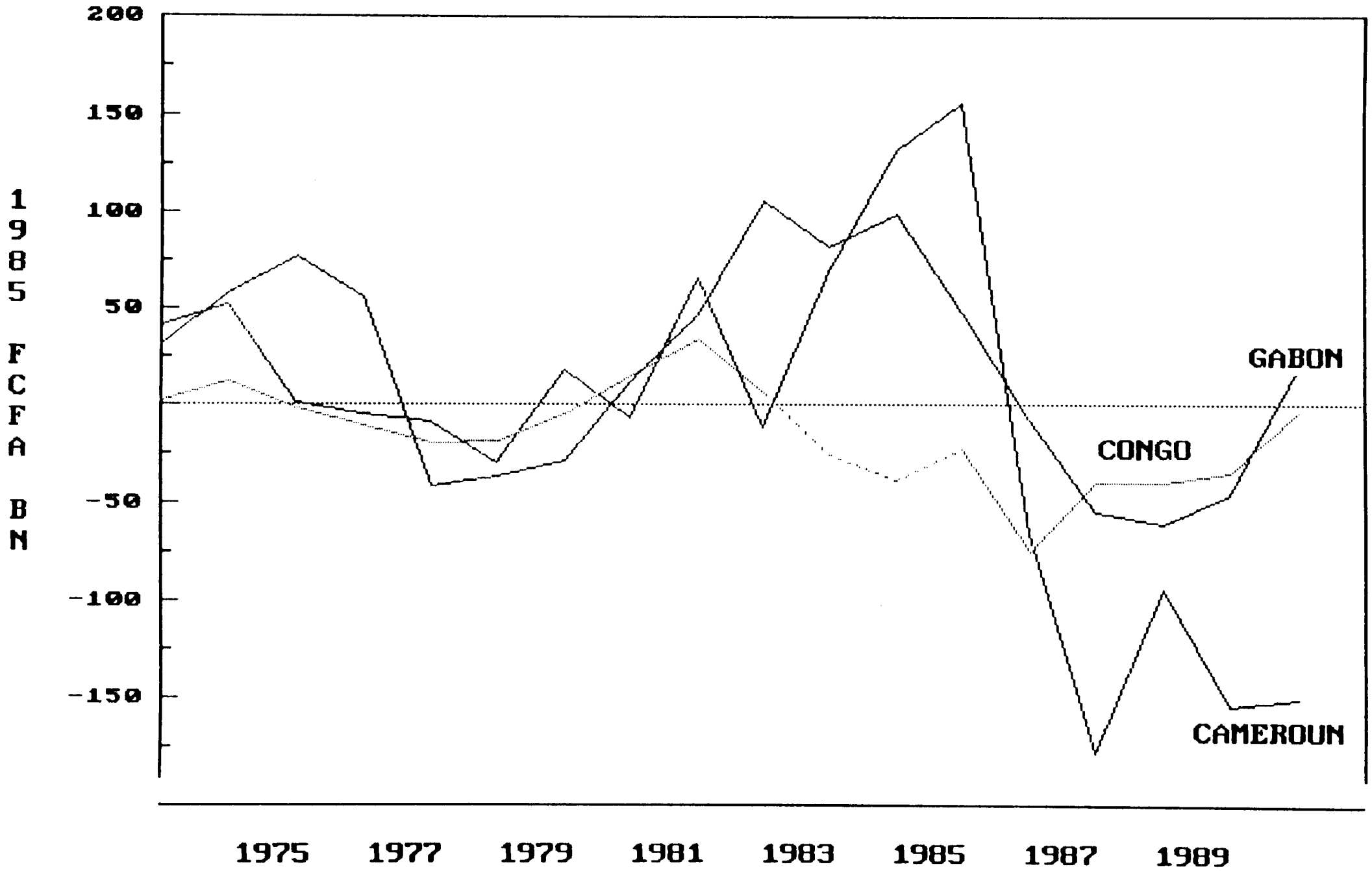


FIGURE 10.6 - NET FOREIGN ASSETS

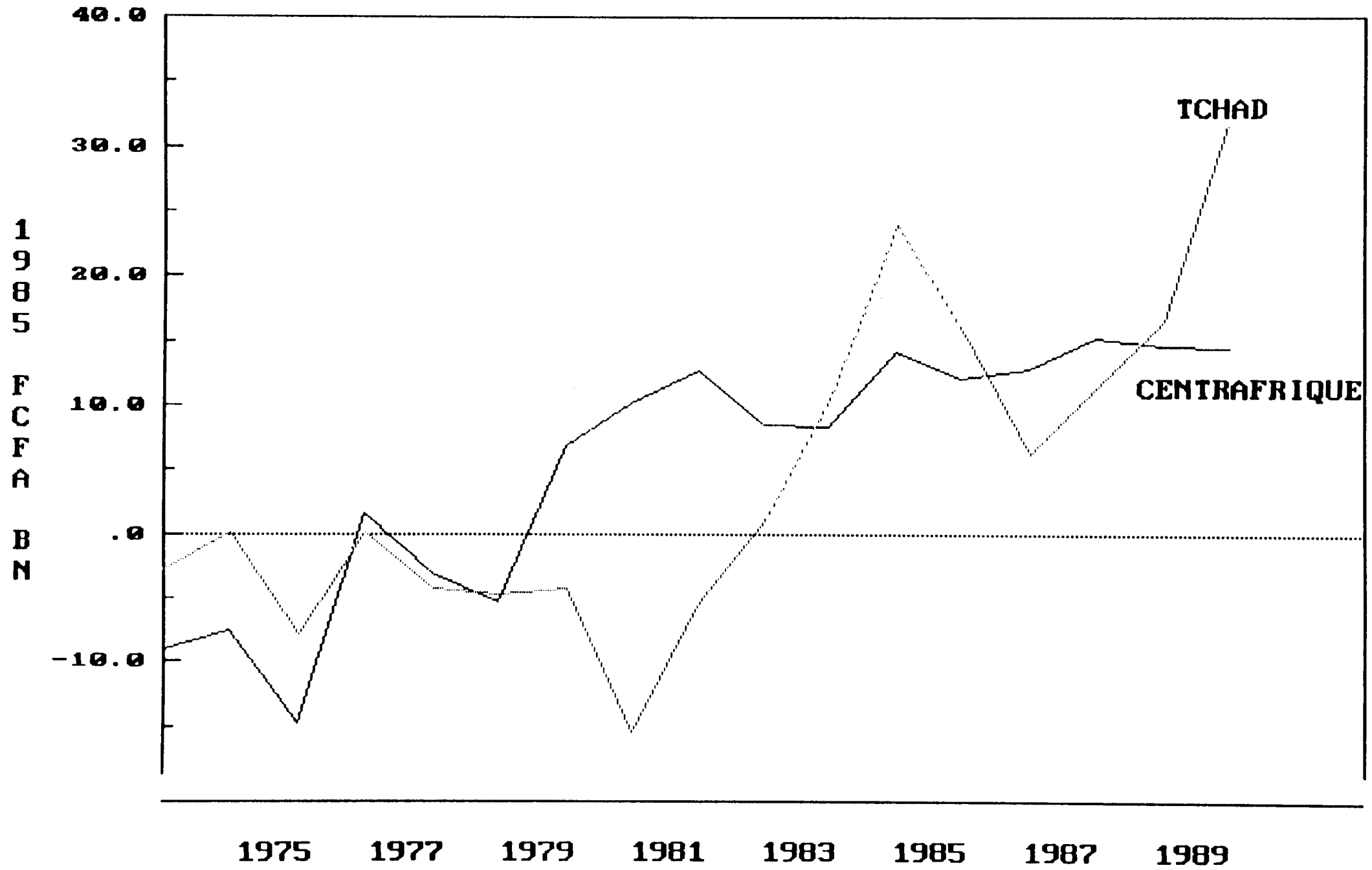


FIGURE 10.7 - IVORIAN MONETARY AGGREGATES

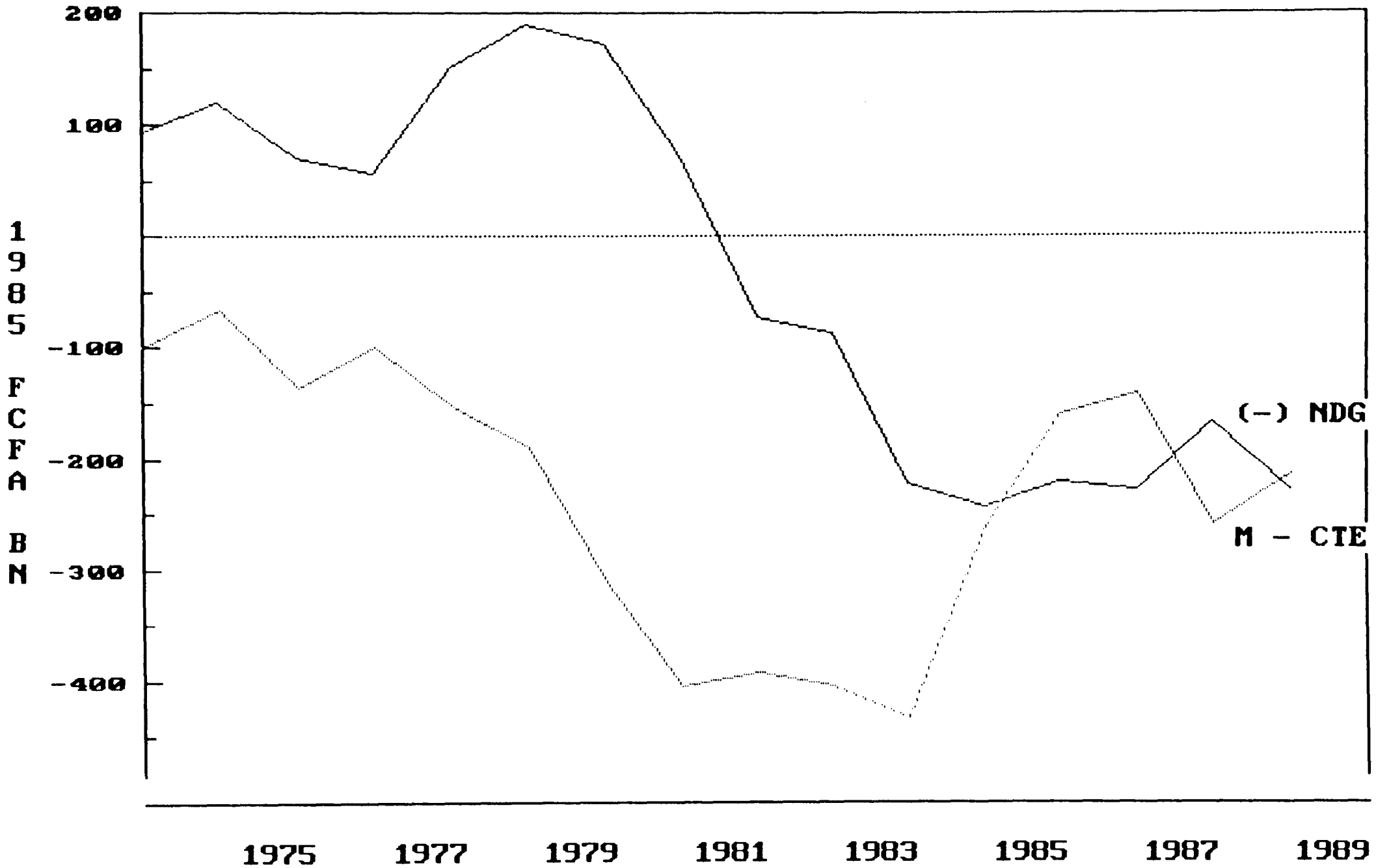
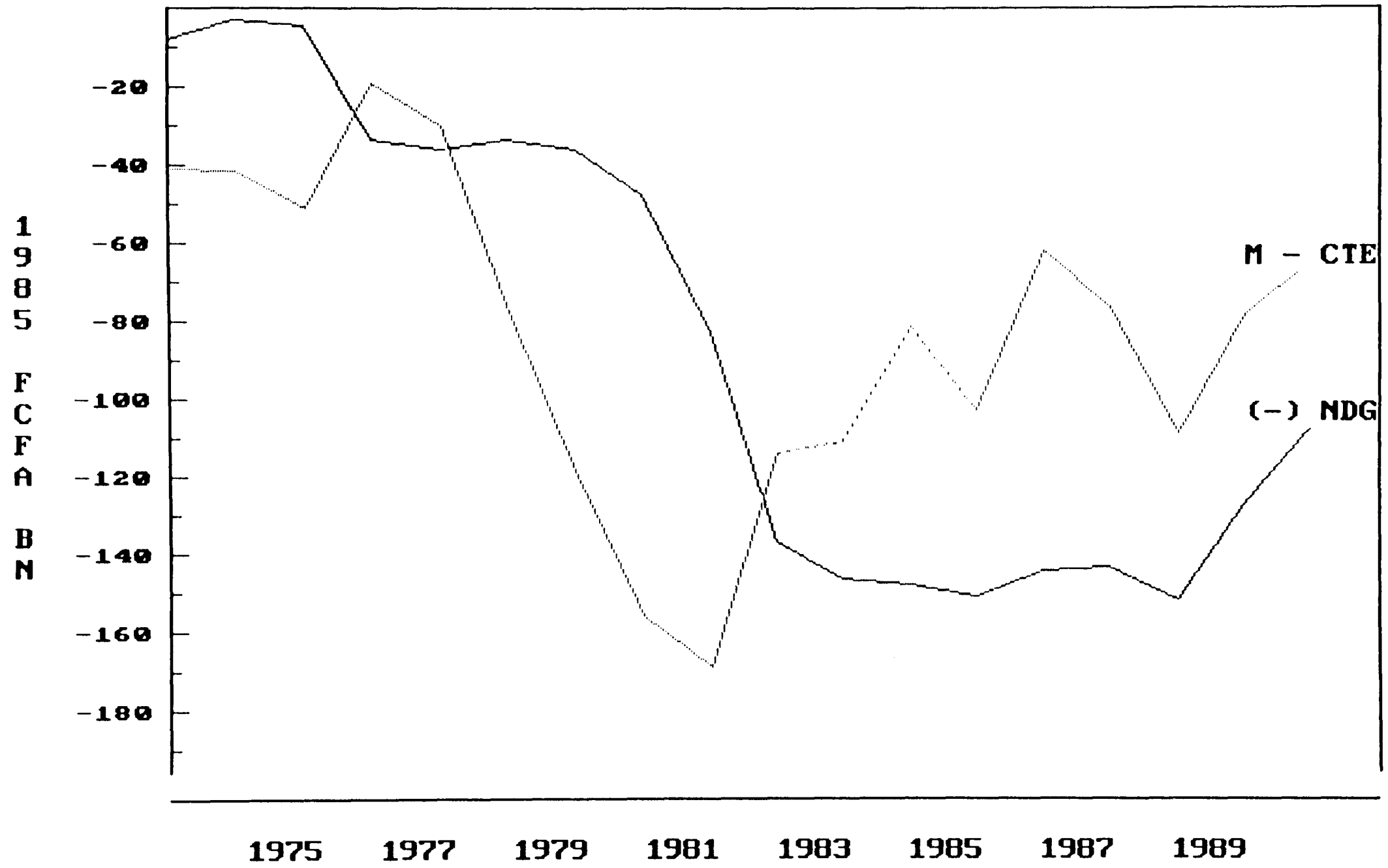


FIGURE 10.8 - SENEGALESE MONETARY AGGREGATES



CHAPTER 11

CONCLUSION AND SUGGESTIONS FOR FURTHER STUDY

CONCLUSION AND SUGGESTIONS FOR FURTHER STUDY

The arguments for and against CFA membership can be conveniently separated into the long term and short term arguments. In this thesis, we have analyzed aspects of both. The most striking results have come out of the study of the impact of the Franc Zone on long term investment and thus growth.

1. The long term growth arguments

The consensus of opinion is that if the CFA has had any impact at all on long term growth, then it is a positive one. The key issues are price and currency *stability*, currency *convertibility* and financial market *integration*. It has been hypothesised that these factors may be important in determining domestic investment and thus growth, and that with respect to these factors there is a significant difference between Franc Zone members and other countries.

The most striking results are those concerning price stability. Investment in two Franc Zone countries (Cameroun and Cote d'Ivoire) and in Kenya has been shown to depend on the stability of domestic capital goods prices relative to foreign capital goods prices, which can be taken as a measure of the stability of the return to domestic investment relative to the return to foreign investment (chapters 4-6). Moreover, cross country data suggest that high investment across Sub-Saharan Africa over the last twenty years is correlated with stable prices (chapter 7).

Further, the indicators of stability used to explain differences in investment between countries and over time show a markedly higher degree of stability amongst Franc Zone members, as compared with their neighbours. The reasons for this are not obvious. Franc Zone members enjoy a fixed FCFA-FF exchange rate, and, since France is such an important trading partner, a more stable trade-weighted exchange rate. However, there is no a priori reason why this should lead to greater relative price stability, i.e., stability of

P_I/eP_I^*.

Nevertheless, there does appear to be a link between a low rate of exchange rate depreciation / low rate of inflation and greater relative price stability. In some countries outside the Franc Zone, expansion of the money supply and hyperinflation have been accommodated by exchange rate depreciation. Cross-country evidence indicates that in this case, where both P_I and e are moving much faster, P_I/eP_I^* is likely to be more variable. Small differences in the rates of growth of e and p, which will occur unless arbitrage in all relevant markets is perfect, will lead to large movements in P_I/eP_I^*.

However, this is not the whole story. Since P_I is only one of many prices in the economy, e adjustment will never guarantee absolute stability of P_I/eP_I^*: when the exchange rate is flexible, it is likely to be determined by many relative prices. Of course, exchange rate flexibility is the exception rather than the rule in Africa: most often, there is exchange rate pegging, usually within a forex rationing regime. Only with a flexible P_I in an open capital goods market will relative price variability be minimised. To the extent that the currency unions promote freer trade (and the available data suggests that they do), they will facilitate relative price stability.

A second way in which Franc Zone membership may confer advantages is domestic currency convertibility. The investment model in chapter 5 shows that even in an anglophone country such as Kenya, where the degree of foreign exchange rationing is relatively mild, the absence of currency convertibility and the shortage of foreign exchange have seriously damaged investment. In the Franc Zone, whose members use a currency whose convertibility with the French Franc is guaranteed, there is no such obstacle to investment.

It has been claimed that the Franc Zone enjoys a greater degree of financial integration with the West than do other African economies. This may be partly because of better performance with respect to stability and convertibility, and partly because of the financial institutions of the Franc Zone (for example, those accounts of the BEAC / BCEAO designed to facilitate private transactions between Africa and the Metropolis). However, these institutions often retard international financial transactions rather than facilitating them (see chapter 2).

Moreover, there is little econometric evidence of a greater degree of integration. Real interest rates in the CFA, as calculated using the Obstfeld model (chapter 3) diverge just as much from French rates as do interest rates in other African countries, and a comparison of Kenya with Cote d'Ivoire shows that domestic investment in both is dependant on domestic saving, although the structure of the relationship differs between the two countries.

It is important to point out that savings still matter. As previous work[1] has shown, the Franc Zone has not performed noticeably better than the rest of Africa in terms of gross domestic saving. Overall, it seems that price variability reduces the demand for financial assets (chapter 8). People in the Franc Zone appear to have saved more than they would otherwise because of the low price variability of the CFA. This emphasises the advantage of low variability in terms of high investment: if people save more, then investment is higher, too. Why then do Franc Zone savings appear to have been ceteris paribus lower than in other African countries? One possible reason is that the weakness of the domestic banking system in many countries (see chapter 2) has led to greater uncertainty about the return to saving - not because the interest rate itself is variable, but because banks may not always be able to meet their financial obligations - and that this has led to lower saving. In chapters 5-6 and 8, there is some evidence for this explanation in apparent Stiglitz-Weiss effects in financial markets.

It has been suggested that the benefits of the Franc Zone come from the more prudent monetary policy to which governments are "tricked" into adhering when they agree to membership. This more prudent policy induces economic stability, and in particular, price stability. This implies that the gains from membership for the economy are to do with the restrictions which it imposes rather than the freedoms which it brings. Even if this argument is correct (and, as noted in the next section, there are reasons for doubting its importance), it is not the whole story: the greater stability enjoyed within the Franc Zone is not just a result of external restrictions placed on the member governments. Less extensive trade restrictions, which are not a necessary adjunct to CFA membership, have also helped to promote stability in the Franc Zone (see chapter 7).

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[1] See for example Boissonade and Guillaumont (1987).

2.The short term adjustment arguments

The main issues here relate to possible drawbacks of Franc Zone membership. One argument is that if nominal industrial wages are fixed, then with low inflation and a fixed exchange rate, real wages may exhibit downward immobility in times of general recession. This will not only lead to a misallocation of labour; if government employment is fixed, then its wage bill will be fixed in real terms, leading to increasing budget deficits if revenues are falling. Labour market data for CFA members are limited, so it is not possible to draw out conclusive results. However, it seems that in the 1980s, where real wages in CFA countries were higher then elsewhere (for example, in Niger), this was because of real wage pressure rather than nominal wage inertia. This inertia may have contributed to government budgetary problems, although it seems that the main cause of budget deficits was typically the high level of public investment, rather than excessive current expenditure. Moreover, labour market maladjustment under *real* wage pressure cannot be blamed on the institutions of the Franc Zone, since it will occur even with higher inflation and flexible exchange rates.

Another issue, however, is the problem of correcting a *current account deficit*. Straightforward devaluation is not an option. If alternative tools for adjustment are not found, then CFA countries could find themselves with ever-increasing foreign debt. A critical issue for a country with a fixed exchange rate will be how the money supply adjusts to the deficit, which in turn depends on the government's budgetary response. Government borrowing is a major source of monetary expansion, and the persistence of current account deficits is more likely if the money supply is expanding rapidly (see chapter 10).

The evolution of monetary aggregates over the 1980s suggests that there is no effective mechanism for controlling government borrowing in the Franc Zone. Certainly, the 20% rule is ineffective in curbing public sources of monetary creation. With an absence of fiscal discipline, larger CFA members have become increasingly endebted, with persistent current account deficits. Overall, the Franc Zone enjoys small deficits and low inflation. However, this disguises the fact that, at least in the UMOA region, some countries are exceptionally prudent, and others, benefitting from the resulting buoyancy of the pooled net foreign asset position of the BCEAO, are not at all prudent. Neither group

is constrained by CFA monetary rules. For the Franc Zone to be viable in the long term, government control of budget deficits must be tightened. It might be argued that it is politically unrealistic to expect governments to reduce expenditure by the magnitude necessary for complete adjustment to large negative trade shocks (that is, for attaining a zero current account). In this case, there is no effective alternative to devaluation. What may be more realistic is to enforce enough fiscal discipline for adequate adjustment to smaller shocks, and maintain devaluation as a last resort for cases where the shock is particularly large.

By the end of 1989, eleven of the fourteen members of the CFA were engaged in Structural Adjustment Programmes with loans from the IMF. Most had renegotiated their external debt with the Paris and London Clubs. The Operations Account in Paris proved unsuccessful in facilitating painless adjustment. Indeed, one may argue that its existence only worsens the problem. In the case of the large debtor countries, it simply delays the date when governments have to face their problem. In the case of the small countries which are Operations Account creditors, the pooling of foreign assets in a system over which they have little influence can be disastrous, especially if the positive net foreign asset in the pool correspond to an equal quantity of IMF debt. Of course, the members of the CFA are only typical of African economies in being indebted to the IMF. However, it is difficult to see how the problem of structural adjustment can be fully tackled without reviewing Franc Zone rules with respect to monetary creation and devaluation.

3. Options for change

Meeting in Dakar in 1989, the ministers of the Franc Zone stated that:

"Examination of the conditions of their respective economies once again underlined the dependence of African countries on the World economy."[2]

Ministers were concerned with two main issues: the facilitating of long term growth and the managing of immediate problems relating to large debt burdens. They also "reaffirmed their attachment to the monetary stability which the Franc Zone has brought". Such attachment is well placed: there is strong evidence that this stability is a major factor in promoting long term investment and growth. However, the institutions guaranteeing this stability need to be flexible enough to avoid the problems which have necessitated dealings with the IMF. Changes in the World economy must be met by domestic adjustment. How can such adjustment take place without jeopardising monetary stability?

First of all, it is appropriate to draw attention to the diversity present amongst Franc Zone economies. Member governments are becoming increasingly aware of the tensions which result from such diversity:

"The Franc Zone encompasses both countries amongst the least developed in the World and those termed 'middle income'. Ministers were anxious to see the situation of the latter taken into account....."[4]

The CFA already comprises two separate monetary unions, plus Comoros. These unions can instigate different monetary policies, including, if necessary, devaluation. The value of the Comorian Franc has been changed in the past, though not that of the BEAC / BCEAO currency. This potential flexibility has not been exploited to the full, because both unions comprise a wide variety of economies. Regrouping the CFA countries along (i) economic lines (so all members are likely to be subject to the same external shocks) and/or (ii) the basis of size (which would prevent the a large country hijacking the Operations Account) would introduce more flexibility into the system, allowing monetary policy which

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[2] Secretariat du Comite Monetaire de la Zone Franc, Rapport 1989 (my translation).

was appropriate for a particular type of economy.

Devaluation of the BEAC/BCEAO Franc has not (yet) occurred, but there have been rumours of devaluations. From time to time, the French treasury stops trading CFA Francs, presumably fearing large sales of the African currency, when rumours are rife. It is unlikely that an actual, once-and-for-all, devaluation would impair convertibility of the CFA Franc more than such speculation has already done. It has been shown that what matters to investors is relative price stability, which is likely to be guaranteed only by efficient long term management of the exchange rate *and* the money supply. If devaluations are widely spaced (say, once every ten or twenty years), they are unlikely to impair this stability. With adequate control of monetary expansion, which depends on the application of and adherence to stricter fiscal rules for national governments, more frequent devaluations will be unnecessary. However, no tightening of rules has yet been mooted, and devaluation is still apparently taboo.

4. Suggestions for further study

The priority here is the collection of more and more detailed data. There is room for improvement particularly in the following areas:

(i) Modelling investment - Increasing the number of observations in the investment model discussed in chapters 4-6 would allow for a more sophisticated approach. In particular, the introduction of more lags would facilitate the construction of a more sophisticated dynamic structure. However, the most serious drawback of the model as it exists at the moment is the absence of labour market variables on the RHS of the equation, which means that there is no account taken of factor substitution between labour and capital.

Collection of sectoral data would facilitate examination of the determinants of investment in each industry. It would be interesting to see, for example, if some sectors had easier access to international capital markets, and so were less dependant on domestic savings. Are the favoured industries the ones with the highest marginal social product?

(ii) Modelling labour markets - It is not as yet possible to test formally the hypothesis that wage rigidity makes adjustment more difficult for countries with a fixed exchange rate. Much energy has been put into cross-sectional studies of labour markets, particularly in Cote d'Ivoire. This is partly due to the fact that governments are much more enthusiastic about collecting cross-sectional data than they are about producing reliable time series. But when it comes to examining the behaviour of labour markets over time, and in particular in periods when the economy is experiencing rapid adjustment, cross-sectional studies will always be a second best.

(iii) Modelling the macroeconomy - the most rewarding study of all would be an econometric application of the chapter 10 model. This would however be the most data-demanding exercise. Devarajan and de Melo (op. cit.) attempt some econometric estimation at the end of a paper presenting a general equilibrium model with fixed exchange rates, but the econometric model is a much simplified version of the model described in the previous chapter, and it omits many relevant explanatory variables. In the modelling of short term adjustment, it would be a major advance to move from theoretical

speculation to detailed quantitative evidence.

This study should also incorporate an investigation of the role of government policy, and how this interacts with the policies of other governments, and with the Franc Zone monetary rules. It appears that the explicit rules do not bind, and the wide discrepancies in budget and current account deficits between countries suggests the absence of an implicit rule binding all members of the monetary union. It may be the case that there are implicit rules specific to individual countries, which are the result of a bargaining process which yields a solution favouring the larger member states. A comprehensive economic analysis on the Franc Zone will necessarily incorporate a political analysis.

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DATA APPENDIX

1. Chapters 5-6 - savings and investment model

Cote d'Ivoire

TOT	S	I_p	GDP	TOTADJ	r
97.50	201.74	34.66	776.90	-14.40	3.50
105.00	327.03	113.66	893.30	-18.80	3.50
106.20	336.81	124.82	938.40	-18.30	3.50
105.50	360.92	132.14	998.32	-26.20	3.50
87.50	354.29	143.54	1157.10	-79.80	3.50
88.60	374.37	147.12	1231.30	-120.40	3.50
95.90	396.96	194.63	1278.50	-53.20	5.50
93.40	481.78	198.08	1376.20	-44.00	5.50
79.80	408.89	191.59	1568.60	-124.00	8.00
114.80	545.19	260.13	1506.10	16.70	8.00
145.20	642.18	203.94	1379.40	265.90	8.00
120.80	627.96	293.03	1708.60	188.90	8.00
118.00	557.42	296.51	1794.60	99.60	8.00
100.00	492.10	313.90	1792.20	0.00	10.50
84.20	436.30	267.89	1904.60	-104.80	10.50
86.30	478.03	210.22	1936.50	-122.80	12.50
91.40	440.00	212.28	1936.30	-101.60	10.50
99.20	498.45	44.37	1799.00	-9.20	10.50
95.80	626.16	197.93	2085.10	-20.80	10.50
104.50	580.14	125.01	2161.70	22.20	8.50
87.50	454.52	170.05	2077.00	-89.70	8.50

VAR′	VAR	π	p	P_I	P_O
7.99	23.14	1.07	164.06	119.71	21.70
43.71	21.19	3.50	166.23	121.56	21.00
34.14	12.99	3.71	165.04	119.99	21.30
1.71	39.04	5.86	155.93	124.76	21.50
13.95	52.87	-3.08	156.26	131.53	30.00
2.46	57.12	0.32	155.67	139.27	29.50
41.37	65.33	14.56	159.15	130.46	32.70
92.14	5.20	24.31	145.75	131.14	80.50
10.42	138.52	2.44	152.42	150.63	73.70
72.89	198.26	26.25	135.13	123.54	70.60
31.97	176.14	38.49	111.22	103.59	59.20
17.43	67.62	1.61	117.38	110.83	51.70
10.65	40.23	6.11	118.06	115.38	68.00
158.48	143.08	15.07	100.00	100.00	100.00
84.24	76.02	-1.10	96.62	107.90	141.20
4.23	119.05	6.77	125.37	121.54	146.80
68.78	1.86	5.11	128.30	121.76	137.60
140.87	66.47	16.31	112.06	130.13	133.60
186.06	182.33	0.08	144.67	108.44	131.10
91.17	134.70	-0.23	146.60	124.08	51.90
3.40	32.53	-2.95	150.28	128.18	59.90

Kenya

I_p	S	TOT	GDP	TOTADJ	r
4.90	4.43	1.08	19.94	3.25	3.50
5.06	4.38	1.02	20.71	2.95	3.50
6.82	4.92	1.01	22.23	3.15	3.50
6.86	5.49	0.95	23.93	3.14	3.50
9.69	5.92	0.91	22.61	4.23	3.50
9.31	5.33	0.81	27.36	3.12	3.50
8.26	7.24	0.97	31.73	3.86	3.50
10.46	9.29	1.04	33.10	3.04	3.50
10.16	7.26	1.06	33.46	1.50	4.32
6.35	5.35	0.96	34.82	-0.14	5.13
7.04	8.51	1.14	35.65	1.69	5.13
10.52	12.01	1.36	38.79	5.80	5.13
13.24	9.49	1.06	41.19	2.71	5.13
9.30	8.31	1.06	42.97	1.31	5.13
12.93	9.81	1.00	44.65	0.00	5.75
12.53	10.72	0.91	47.60	-2.11	8.85
9.81	10.29	0.89	49.63	-2.75	12.20
8.52	11.68	0.93	50.76	-3.38	13.27
9.41	12.73	1.02	51.16	-1.94	11.77
11.02	15.16	0.92	54.63	-3.05	11.25
10.02	14.11	1.11	57.62	-2.54	11.25
11.21	13.58	0.81	60.36	-3.94	10.31
11.65	16.21	0.91	63.47	-2.85	10.33

P_I	p	P_O	VAR′	VAR	π
0.77	1.24	0.18	-----	-----	-----
0.80	1.30	0.18	0.034	0.050	0.023
0.61	1.25	0.17	0.078	0.275	0.020
0.62	1.28	0.17	0.124	0.018	-0.003
0.54	1.29	0.15	0.082	0.141	0.144
0.64	1.27	0.20	0.063	0.166	-0.094
0.76	1.03	0.21	0.086	0.173	0.012
0.77	1.01	0.27	0.057	0.009	0.100
0.84	1.02	0.69	0.121	0.089	0.153
0.87	1.00	0.53	0.022	0.042	0.107
0.89	0.94	0.54	0.033	0.017	0.173
0.84	0.89	0.52	0.025	0.059	0.156
0.91	0.94	0.46	0.100	0.081	0.032
0.96	0.98	0.65	0.052	0.059	0.053
1.00	1.00	1.00	0.055	0.038	0.093
1.03	0.99	1.23	0.179	0.025	0.095
1.06	0.96	1.18	0.109	0.033	0.115
1.17	0.95	1.12	0.020	0.101	0.115
1.27	0.94	1.08	0.082	0.082	0.092
1.22	0.94	1.14	0.107	0.044	0.072
1.23	0.94	0.50	0.100	0.009	0.091
1.27	0.96	0.60	0.085	0.032	0.061
1.34	1.00	0.42	0.061	0.058	0.094

Cameroun

TOT	S	I_p	GDP	TOTADJ	r
1.09	77.27	67.53	590.20	306.20	4.50
1.20	75.34	69.55	628.30	322.90	4.50
1.25	81.68	66.94	670.20	331.80	4.50
1.19	131.84	90.04	702.10	347.30	4.50
0.98	97.04	108.54	734.40	342.80	4.50
0.97	100.00	114.47	734.60	314.40	4.50
1.14	139.21	120.80	746.80	310.10	4.00
0.93	183.51	108.87	803.30	348.20	5.50
0.78	158.07	129.91	777.50	325.30	5.50
1.17	123.92	115.26	801.50	302.40	6.50
1.47	198.87	149.79	943.60	377.00	6.50
1.19	218.20	233.35	1074.50	320.00	6.50
1.04	196.55	216.17	1266.80	269.40	8.50
1.00	246.80	221.20	1450.70	282.30	8.50
0.98	395.80	342.61	1654.40	270.10	8.50
0.96	420.44	338.06	1759.60	283.00	8.50
0.94	564.32	352.51	1872.00	254.60	8.50
0.96	679.02	304.98	2004.40	262.00	8.50
0.92	692.86	333.68	2235.30	372.80	9.00
0.65	504.98	299.11	2391.50	165.00	8.00
0.66	332.23	207.47	2308.20	18.80	8.00
0.64	313.12	188.58	2136.60	1.00	9.50

VAR′	VAR	π	p	P_I	P_O
212.34	150.16	25.27	128.05	116.61	14.05
71.06	165.99	5.97	116.24	118.47	13.22
127.85	42.81	5.36	114.16	104.74	12.83
155.24	198.58	7.89	113.11	122.40	12.76
163.11	69.28	3.54	111.04	107.55	16.16
59.62	116.79	7.97	113.89	112.78	16.54
36.60	202.78	6.54	114.33	122.91	19.99
18.50	227.03	10.50	113.89	125.92	69.67
41.46	220.58	18.82	113.22	125.11	55.44
81.49	216.10	8.45	113.84	124.55	55.94
17.76	185.65	11.13	100.72	120.82	60.16
215.83	20.54	10.01	90.11	98.31	53.28
89.06	98.21	5.57	92.99	110.70	66.65
153.53	3.46	7.76	100.00	100.00	100.00
53.53	47.78	11.80	103.06	105.26	109.46
34.21	1.02	13.33	103.15	100.25	109.39
86.91	46.50	12.15	104.21	105.12	108.62
0.15	11.24	11.05	107.33	101.48	109.33
23.90	28.45	10.01	111.02	97.53	104.60
4.75	37.25	-2.76	99.01	104.16	47.54
69.05	136.01	-2.01	90.70	114.97	48.18
19.19	175.00	1.81	113.59	119.54	34.46

2. Chapter 7 - investment model

	I/Y	IPC	VAR	GNPPC	D/Y	X/Y	M/A
Ben	87.75	29.79	203.44	63.17	104.49	83.27	0.00
BFa	114.71	35.05	49.34	39.20	71.66	49.76	0.00
Cam	98.53	109.03	59.73	159.33	46.53	95.80	108.21
Con	161.28	351.24	35.49	203.32	206.65	164.85	699.18
Cen	66.18	50.69	93.50	65.71	62.63	87.33	0.00
Tch	71.08	33.62	57.14	38.92	21.92	62.96	0.00
CdI	105.39	177.18	62.33	185.27	98.25	148.94	0.00
Nig	75.98	107.73	170.54	74.45	66.01	64.65	47.44
Sen	79.90	81.58	40.69	101.80	99.52	118.81	23.88
Tog	126.47	95.92	59.73	74.73	113.31	134.05	110.25
Mal	85.29	34.59	32.03	43.71	139.92	53.48	15.84
Bot	191.18	259.92	48.48	171.46	90.87	303.97	507.98
Bur	57.84	20.44	180.93	46.81	87.07	39.27	0.00
Gha	42.65	25.18	206.04	93.34	28.00	75.49	9.50
GuB	117.65	42.44	194.78	49.63	214.96	27.08	0.00
Ken	116.67	91.83	36.36	80.09	73.00	98.50	0.00
Lib	99.02	116.76	103.02	129.16	101.51	180.08	206.39
Mad	75.49	60.62	64.06	66.83	103.61	61.95	0.00
Mwi	113.24	43.55	48.48	39.20	106.93	93.43	0.00
Mta	138.24	104.94	180.07	98.14	291.25	158.76	68.72
Nia	85.29	165.30	71.85	182.45	23.37	67.70	267.10
SLe	66.18	41.28	152.36	73.60	52.73	74.13	52.04
Som	141.67	34.46	155.83	39.76	256.48	66.35	0.00
Sud	74.51	44.78	89.17	91.37	96.57	40.62	0.00
Tan	102.94	54.71	96.96	58.94	71.13	54.50	0.00
Zai	70.10	38.10	166.21	76.70	62.96	80.90	254.17
Zam	116.18	241.69	71.85	136.49	113.89	142.17	375.54
Zim	100.49	147.26	83.11	165.25	43.64	96.81	153.02
Mts	113.24	261.61	87.44	256.06	51.19	174.67	0.00

3. Chapter 8 - asset demand model

Cote d'Ivoire

CPI	57.300000	69.000000	70.800000	67.700000
	69.100000	74.900000	76.700000	79.200000
	80.200000	87.300000	92.700000	89.000000
	92.700000	100.600000	101.500000	105.300000
	105.300000	108.300000	109.500000	112.300000
	115.000000	118.990000	116.600000	116.600000
	119.500000	124.900000	125.400000	124.900000
	125.900000	130.400000	130.300000	129.300000
	128.600000	129.600000	132.300000	134.900000
	138.300000	140.300000	140.000000	141.800000
	144.700000	147.900000	148.800000	146.300000
	153.800000	153.300000	152.600000	152.700000
M/P	563.787000	452.347800	411.370100	565.849300
	603.415300	460.680900	435.436800	524.684300
	563.429000	488.407800	450.895400	504.247200
	492.880200	406.958200	386.009900	416.619200
	458.879400	383.287200	353.059400	413.535200
	411.826100	362.215300	351.715300	394.768400
	407.112900	344.115300	331.738500	390.712600
	382.525800	339.954000	348.503500	444.392900
	458.475900	400.308600	374.452000	459.748000
	466.522100	396.079800	383.500000	448.801100
	444.505900	385.395500	329.301100	409.159200
	424.772400	355.968700	325.753600	378.520000

D/P	570.715500	496.260900	481.200600	574.918800
	654.312600	543.791700	494.758800	529.065700
	573.329200	507.044600	477.659100	491.471900
	425.027000	398.707700	364.532000	352.136800
	390.788200	351.246500	343.379000	364.915400
	376.608700	367.509900	357.204100	375.814800
	406.694500	372.698200	365.151500	365.892700
	389.118300	368.865000	383.883400	419.257600
	477.993800	479.783900	442.706000	467.383200
	506.652200	470.420500	441.071400	454.583900
	465.100200	442.393500	404.704300	426.315700
	451.755600	433.398600	411.205700	421.938400
TAD	249.200000	249.200000	249.200000	249.200000
	172.200000	172.200000	172.200000	172.200000
	82.900000	82.900000	82.900000	82.900000
	-16.700000	-16.700000	-16.700000	-16.700000
	-121.50000	-121.50000	-121.50000	-121.50000
	-139.50000	-139.50000	-139.50000	-139.50000
	-84.900000	-84.900000	-84.900000	-84.900000
	-25.900000	-25.900000	-25.900000	-25.900000
	-37.500000	-37.500000	-37.500000	-37.500000
	5.500000	5.500000	5.500000	5.500000
	-106.40000	-106.40000	-106.40000	-106.40000
	-47.100000	-47.100000	-47.100000	-47.100000

GDP	1379.400000	1379.400000	1379.400000	1379.400000
	1708.600000	1708.600000	1708.600000	1708.600000
	1794.600000	1794.600000	1794.600000	1794.600000
	1792.200000	1792.200000	1792.200000	1792.200000
	1904.600000	1904.600000	1904.600000	1904.600000
	1936.500000	1936.500000	1936.500000	1936.500000
	1936.300000	1936.300000	1936.300000	1936.300000
	1799.000000	1799.000000	1799.000000	1799.000000
	2085.100000	2085.100000	2085.100000	2085.100000
	2161.700000	2161.700000	2161.700000	2161.700000
	2077.000000	2077.000000	2077.000000	2077.000000
	1879.600000	1879.600000	1879.600000	1879.600000
r_{DEP}	6.000000	6.000000	6.000000	6.000000
	6.000000	6.000000	6.000000	6.000000
	6.000000	6.000000	6.000000	6.000000
	6.000000	6.250000	6.250000	6.250000
	6.250000	6.250000	6.250000	6.250000
	7.750000	7.750000	7.750000	7.750000
	7.500000	7.500000	7.500000	7.500000
	7.250000	7.250000	7.250000	7.250000
	7.250000	7.250000	7.250000	7.250000
	6.920000	6.250000	5.920000	5.250000
	5.250000	5.250000	5.250000	5.250000
	5.250000	5.250000	7.830000	8.500000

Cameroun

CPI	72.899990	75.500000	77.500000	79.300000
	83.300000	85.100000	86.700000	88.300000
	90.900000	89.300000	90.700000	94.900000
	97.399990	97.399990	101.600000	103.700000
	107.100000	108.800000	110.700000	118.100000
	123.700000	123.900000	125.100000	130.400000
	137.600000	145.300000	147.800000	154.300000
	161.200000	164.600000	159.700000	166.000000
	170.400000	166.600000	158.500000	164.400000
	169.000000	167.000000	169.500000	175.100000
	179.200000	189.800000	186.500000	197.700000
M/P	148.834000	141.192000	137.561300	159.684700
	163.517400	155.076400	149.988500	166.410000
	180.165000	172.060500	167.618500	194.162300
	209.835700	198.932200	183.966500	200.810000
	208.720800	215.257300	205.230400	219.237900
	219.555400	216.642500	215.195800	228.895700
	228.633700	201.672400	236.508800	244.374600
	236.246900	245.388800	244.884200	247.445800
	254.671400	252.028800	263.936900	259.537700
	258.349100	267.269500	252.784700	255.836700
	249.654000	214.736600	210.589800	195.786500

r_{DEP}	6.500000	6.500000	6.500000	6.500000
	6.500000	6.500000	6.500000	6.500000
	6.500000	6.500000	6.500000	6.500000
	7.500000	7.500000	7.500000	7.500000
	7.500000	7.500000	7.500000	7.500000
	7.500000	7.500000	7.500000	7.500000
	7.500000	7.500000	7.500000	7.500000
	7.500000	7.500000	7.500000	7.500000
	7.500000	7.500000	7.500000	7.500000
	7.350000	7.350000	7.350000	7.350000
	7.150000	7.150000	7.150000	7.150000
D/P	65.075450	65.483440	69.819360	71.715000
	75.174060	73.842540	78.062290	74.020390
	71.144110	76.539750	81.069460	79.915700
	91.119090	97.156060	102.687000	103.355800
	104.939300	118.134200	127.064100	124.208300
	140.929700	143.002400	144.092700	141.809800
	135.755800	126.772200	136.400500	152.527500
	143.715900	138.894300	169.730700	196.066300
	236.267600	285.054000	291.735000	266.326000
	232.118300	246.347300	244.601800	218.772100
	198.325900	201.765000	189.286800	147.046000
INC	1139.000000	1139.000000	1139.000000	1139.000000
	1235.300000	1235.300000	1235.300000	1235.300000
	1343.900000	1343.900000	1343.900000	1343.900000
	1568.900000	1568.900000	1568.900000	1568.900000
	1759.300000	1759.300000	1759.300000	1759.300000
	1819.100000	1819.100000	1819.100000	1819.100000
	1931.600000	1931.600000	1931.600000	1931.600000
	2053.500000	2053.500000	2053.500000	2053.500000
	2395.500000	2395.500000	2395.500000	2395.500000
	2359.700000	2359.700000	2359.700000	2359.700000
	2157.500000	2157.500000	2157.500000	2157.500000

NOI	1141.388000	1141.388000	1141.388000	1141.388000
	1203.513000	1203.513000	1203.513000	1203.513000
	1269.020000	1269.020000	1269.020000	1269.020000
	1338.092000	1338.092000	1338.092000	1338.092000
	1410.924000	1410.924000	1410.924000	1410.924000
	1487.720000	1487.720000	1487.720000	1487.720000
	1568.696000	1568.696000	1568.696000	1568.696000
	1654.079000	1654.079000	1654.079000	1654.079000
	1744.111000	1744.111000	1744.111000	1744.111000
	1839.042000	1839.042000	1839.042000	1839.042000
	1939.141000	1939.141000	1939.141000	1939.141000