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ABSTRACT

We develop a simple formal framework to clarify the trade-offs involved in the choice between a fixed and flexible exchange-rate system. We then apply the framework to the CFA Zone countries in Africa, which have maintained a fixed parity with the French Franc since independence. Thanks to the predominance of a few agricultural products and natural resources in their exports, CFA member countries have suffered frequent shocks in their terms of trade. A flexible exchange rate could have possibly alleviated the costs of these external shocks. On the other hand, CFA member countries have managed to maintain lower inflation levels than their neighbors. Our framework provides a way of weighing these costs and benefits.

The inflation differential between CFA and non-CFA African countries has been around 14 percentage points. We attribute this differential to the standard time-consistency problem inherent in discretionary macroeconomic policy. Nonetheless, our highly stylized calculations suggest that fixed exchange rates have been, on the whole, a bad bargain for the CFA member countries. Under "reasonable" output-inflation tradeoffs, the output costs of maintaining a fixed exchange rate have outweighed the benefits of lower inflation.

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DO THE BENEFITS OF FIXED EXCHANGE RATES OUTWEIGH THEIR COSTS?

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A primary reason for structural adjustment in agriculture is the wide fluctuation in the world prices of agricultural commodities, which cause sharp swings in the terms of trade of countries that rely on these commodities for their export earnings. A key instrument in structural adjustment is the exchange rate. How and whether this instrument is used, however, depends on the "rules of the game," that is, the particular exchange-rate regime the country is in. This paper addresses the question of how small, open economies that are subject to sharp swings in their terms of trade should select an appropriate exchange rate regime. We develop a framework to clarify the trade-offs involved, and apply it to the CFA Zone countries in Africa, which have maintained a fixed parity with the French Franc since independence.

Thanks to the predominance of a few agricultural products and natural resources in their exports, CFA member countries have suffered frequent shocks in their terms of trade. A flexible exchange rate could have possibly alleviated the output costs of these external shocks. On the other hand, a fixed exchange rate has enabled these countries to maintain lower inflation levels than their neighbors. Our framework provides a way of weighing these costs and benefits. Using our model as a guide, we investigate whether their choice of a fixed exchange rate was (and remains) a wise one.

I. The Issues

The selection of an appropriate exchange-rate regime has aroused considerable academic interest over the last three decades, and the answers provided have shifted with academic fashions.[1] Throughout much of the 1950s

and 1960s, in line with prevailing wisdom (and practice) in the international monetary system as a whole, developing countries maintained fixed exchange rates. More flexible arrangements started to become commonplace by the late 1960s and 1970s. As the currencies of industrial countries started to float vis-a-vis each other after 1971, flexibility became a necessity: pegging to any of the major currencies implied floating against others. During the 1980s, exchange-rate flexibility continued to gain ground among developing countries. In particular, many governments experimented with market-based exchange rate regimes, such as auction-based systems, interbank markets, or pure floats.

But by the mid-1980s, the tide turned. Floating exchange rates began to lose much of their lustre in the eyes of industrial-country policy makers. The wide gyrations of the dollar during the 1980s and the short-term volatility of the key currencies eroded confidence in markets' ability to foster adjustment with no (or little) tears. The Europeans linked their currencies tighter, and proposals to limit flexibility became widespread. In many parts of the developing world, exchange-rate flexibility became another name for inflation. In Bolivia, Brazil, Argentina, Mexico, Israel and Poland, governments introduced stabilization programs based on fixed exchange rates.

There are basically two ways of looking at exchange rates, with divergent implications for desirable exchange rate regimes. Borrowing Corden's (1990) terminology, we can call these the "real targets" approach and the "nominal anchor" approach. The real targets school views the exchange rate as an indispensable policy instrument in attaining equilibrium in the "real"

economy, such as in domestic activity, the current account, or the rate of growth. This is the view of the exchange rate embedded in the textbook exposition of the dependent economy model with its juxtaposition of expenditure switching (i.e., devaluation) and expenditure changing (i.e., fiscal policy) as the two independent policies needed to achieve the twin goals of internal and external balance. The real targets approach inevitably leads to an activist, discretionary stance. The exchange rate has to be managed flexibly: the authorities need to respond to external shocks (such as terms of trade changes) or domestic price shocks by undertaking the requisite combination of expenditure-switching (i.e., exchange rate) and expenditure-changing policies to reattain macroeconomic equilibrium.

Implicit in the real targets approach are two notions: first, that the macroeconomy cannot be relied on to generate on its own the real exchange rate changes required by shocks to the system; second, that a nominal devaluation will have real effects (i.e., it will lead to a depreciation of the the real exchange rate), at least in the short- to medium-run. These two notions of how the economy works are encapsulated in the textbook model by the assumption that home-good prices are rigid (upward as well as downward). Putting the two together, we obtain the activist role for the exchange rate called for by the real targets approach.

The alternative, nominal anchor approach is based on a rejection of the efficacy of nominal exchange rate adjustments. The case for this approach can be constructed at several levels. At the simplest level, one can deny the effectiveness of nominal devaluations in achieving real depreciations, thereby

denying flexibility of the currency any serious economic purpose. But even if it is granted that nominal exchange rate policy has some power in the short- to medium-run, it is possible to argue that the inflationary costs are high enough to render it a bad bargain. The passthrough from the exchange rate to domestic prices arises from the openness of the economy and/or from the effective indexing of home goods prices to the value of the currency. When the passthrough coefficient is below unity but high, nominal exchange rate changes large enough to be "effective" in the sense of the real targets approach will come at the cost of unacceptable jumps in domestic prices.

A more recent strand of theorizing has added a new twist to the nominal anchor approach. The literature spawned by the discovery of rational expectations has stressed that the policy regime in place will shape the way the private sector sets wages and prices in the economy. In a flexible-rate regime, domestic price setters will take into account the policymakers' incentive to alter the nominal exchange rate in order to achieve some "real" objective, an incentive that typically undercuts the price setters' desire to maintain their relative prices. Moreover, any pronouncement that the authorities' discretion over the exchange rate will not be "abused" is not credible for standard time-inconsistency reasons, as long as the value of the currency can be adjusted at more frequent intervals than wages and domestic prices. Consequently, the economy will settle at a high rate of inflation, with no guarantee that the authorities will end up any closer to their real targets. In this view, then, exchange-rate flexibility has a cost and no benefits. It is better to give up discretion and subscribe to a fixed

exchange rate regime, thereby "anchoring" the domestic price level.[2]

Clearly, both approaches capture some of the reality in developing countries, and neither can be judged right or wrong in the abstract. The weight of arguments on the two sides will depend on the particulars of each case. Here, we will lay out a simple, formal framework which captures the essence of the arguments listed above and provides guidance as to how the weighting of pros and cons can be done explicitly. We will then apply the framework to the African member countries of the CFA Franc Zone. We will ask: knowing what we do about their terms-of-trade history and their (as well as their neighbors') performance over the last three decades, did their decision to join a currency union with France make sense?

II. The CFA Zone

The CFA Franc Zone consists of thirteen African countries which[3] are divided into two currency unions: the Union Monetaire Ouest Africaine and the members of the Banque des Etats de l'Afrique Centrale. Each union issues its own currency. Since both currencies are the CFA Franc, the two unions are referred to jointly as the "CFA Franc Zone."

The Zone is an extension of the monetary authority which governed these former French colonies prior to independence. In the late 1950s, the two currency unions were set up, and the newly-independent Francophone countries of Africa were given the option of joining. All but Guinea, Madagascar and Mauritania did.[4] Membership in the Zone afforded these countries the opportunity to pool their foreign exchange reserves. In addition, the Zone was governed by certain rules which could be interpreted as a means of guiding

monetary policy in these fledgling nation-states.[5] First, government borrowing from the Central Bank could not exceed 20 percent of the previous year's tax receipts. Second, the French government guaranteed the convertibility of the CFA Franc. Member countries had to convert 65 percent of their foreign exchange reserves into French Francs and deposit them with the French Treasury. Third, and most relevant to our study, the exchange rate between the French and CFA Francs was fixed at 50 CFAF = 1 FF, the rate which had prevailed since 1948. Changes in this parity required the unanimous consent of all Zone members, including France. In other words, the rules of the Zone made a nominal devaluation virtually impossible.

While other aspects of the CFA Zone have changed over the last 30 years, these three rules have remained intact. Several studies have asked whether the rules have led to a difference in the economic performance of Zone members vis-a-vis some group of "comparator" countries. Devarajan and de Melo (1987) showed that CFA countries had a slightly higher growth rate of GDP than their sub-Saharan African (hereafter "African") counterparts in the period 1960-82. Guillaumont et al. (1988) obtained a similar conclusion by examining a richer set of indicators. Both sets of authors attributed the differential performance to the monetary and fiscal discipline engendered by membership in the CFA Zone.

However, in updating their study to include the 1980s, and looking at a broader set of indicators, Devarajan and de Melo (1990) arrived at more equivocal results. While CFA countries continued to enjoy a slightly higher GDP growth rate than their African neighbors, this difference was no longer

statistically significant for the 1980s. Furthermore, along some other dimensions, the CFA Zone's performance was noticeably worse. CFA countries had lower export growth and investment levels in the 1980s compared with other African countries. When controlling for the size of the external shocks faced by these groups of countries, Devarajan and de Melo found that CFA countries achieved less current account reduction than their African neighbors. Moreover, they experienced greater variability in growth than non-CFA countries.[6] On one dimension, however, the CFA countries continued to shine: their average inflation rate was roughly half that of other African countries in the 1970s, and one-seventh that of these countries in the 1980s. Furthermore, the degree of inflation-reduction between the 1970s and 1980s, controlling for external shocks, was significantly higher in the CFA Zone than outside it.

In sum, both the rules of the CFA Zone and the performance of its members make it an ideal case with which to study the pros and cons of fixed exchange rates. The Zone has maintained a fixed parity with the French franc throughout its history. The relative performance of Zone members vis-a-vis their African counterparts illustrates the tradeoffs involved. On the one hand, Zone members enjoyed lower inflation thanks to the fixed exchange rate regime. On the other hand, they have apparently been unable to adjust their economies to the large terms of trade shocks of the 1980s and have experienced greater variability in output. One reason, no doubt, is their inability to use nominal devaluations as an instrument of adjustment. Finally, the comparison between CFA and other African countries is especially apt. For the

other African countries share most of the salient features with the CFA Zone except the fixed exchange rate. They obtained independence at similar times and are roughly at the same level of development. All are primary producers, as are the CFA members. Since they produce similar goods, they faced the same external shocks as the CFA countries during this period. In short, the other African countries provide CFA members with a relatively accurate picture of "life outside the Zone". The fact that these two groups of countries are distinguished by exchange rate regime brings us as close to a controlled experiment as economists could hope for.

III. The Framework

The experience of the CFA Zone illustrates the main tradeoff involved in the choice of exchange rate regimes as indicated in section I: By committing themselves to a fixed-rate regime, these countries could anchor their price levels and maintain inflation close to the rate experienced by the country whose currency serves as the peg. However, by doing so they lost the ability to adjust to terms of trade shocks. Had they selected a flexible-rate regime, they would have been able to limit the damage done to the real economy by the ups and down in the world prices of their main imports and exports. That, in turn, would have come at the expense of a higher rate of inflation, as domestic wage and price setters would have lacked the discipline, and domestic monetary authorities the credibility, provided by an irrevocably fixed exchange rate.[7]

Did these countries "do the right thing" by joining a currency union with France? We will set up a simple model here to provide a partial answer to

this question.

Assume that the policymaker is interested in maximizing an objective function in which both a nominal and a real variable play a role. The real variable could be the current account, output, or the growth rate. The nominal variable could be the price level or inflation. Since presumably what matters most to policymakers are growth and inflation, we will cast the model in terms of these two variables. We express the objective function in quadratic-loss form:

$$(1) \quad W = -\left((\pi - \pi^*)^2 + \phi(y - y^*)^2\right),$$

where W denotes welfare, π is inflation, y is the growth rate, ϕ is the weight attached by the authorities to the real target relative to the nominal one, and π^* and y^* are the policy maker's targets for inflation and growth, respectively. (π^* can of course be zero.) A welfare maximum is attained when inflation and growth hit their target levels ($\pi = \pi^*$ and $y = y^*$).[8] The quadratic-loss formulation has well-known problems, chief among which is its symmetric treatment of over- and under-shooting of targets. But for our purposes, such problems are of secondary importance.

The equilibrium level of growth is determined by two variables, the change in the real exchange rate and the terms of trade:

$$(2) \quad y = \bar{y} + \alpha(e - p) + \beta(\tau - \bar{\tau}),$$

where $\bar{y}$ is the (exogenously given) "natural" rate of growth, e and p are (log differences in) the exchange rate and the home-goods price, respectively, τ is

the (log) terms of trade, and $\bar{\tau}$ is the mean level of the (log) terms of trade. The parameters α and β are positive. The terms of trade, τ, is taken to be random, with variance σ^2. Note that (e-p) stands for the percentage change in the real exchange rate. An equation like (2) follows from expressing the level of output as a function of the level of the real exchange rate and the terms of trade.

To complete the model, we have to specify how domestic prices are determined. We assume that domestic price (or wage) setters are rational and forward-looking, but that they can change their prices less frequently than the authorities can adjust the exchange rate. Domestic prices are therefore set taking into account the government's exchange rate policy, but without actually observing the exchange rate that will prevail. This provides policy makers in principle temporary leeway in determining the real exchange rate by altering the nominal exchange rate. Further, we assume that terms of trade shocks are revealed <u>after</u> domestic prices are set. The timing therefore is as follows:

1. p is set;
2. τ is revealed;
3. e is set.

We assume that domestic price setters (e.g., urban workers) are rational and forward-looking. In setting their prices, they are concerned both with maintaining their relative prices and with adjusting to shocks. In reduced form, their behavior can be summarized by expressing the change in domestic prices as follows:

(3) $p = E(e) + \omega E(\tau - \bar{\tau})$,

where E(x) stands for the expected value of x. The first term here captures the relative-price motive,[9] while the second term captures the desired adjustment in home prices in response to the expected terms-of-trade shock. (ω is a parameter representing the elasticity of the desired adjustment with respect to the shock.) Note that p is set <u>before</u> τ is revealed, and $E(\tau - \bar{\tau}) = 0$. Therefore, (3) boils down to:

(4) $p = E(e)$.

Hence, home-goods prices (or, equivalently, wages) increase at the expected rate of nominal depreciation.

Finally, inflation is a weighted average of the increases in the prices of home goods and traded goods:[10]

(5) $\pi = \mu p + (1-\mu)e$.

We are now ready to analyze the behavior of the economy under the two exchange rate regimes.

(a) <u>Fixed Exchange Rates</u>. The analysis of this case is very simple. Under fixed exchange rates, the government irrevocably fixes the value of the currency, giving up its discretionary power to alter it. As mentioned above, rational expectations in this context imply $p = E(e)$. Given the inflation target of π^*, then, the optimal policy for the government is to set $e = \pi^*$.

This gives:

$$p = E(e) = e = \pi^*.$$

That in turn implies that the equilibrium value of the real variable is

$$(6) \quad y = \bar{y} + \beta(\tau - \bar{\tau}).$$

Under this policy regime, then, inflation stays on target while growth fluctuates with the terms of trade.

(b) Flexible Exchange Rates. Under flexible rates, the government behaves in a discretionary manner and determines the value of e to maximize its objective function as expressed in (1). When it does so, it takes home-goods prices (p) as given (as they have been pre-set). Moreover, having observed the terms of trade, it selects an exchange rate that is contingent on the realized value of τ. Substituting (2) and (5) into (1), we can write the objective function in terms of e, p, and τ:

$$W(e, p, \tau) = -[\mu p + (1-\mu)e - \pi^*]^2 - \phi[(\bar{y}-y^*) + \alpha(e-p) + \beta(\tau-\bar{\tau})]^2.$$

Maximizing this expression and solving for e yields:

$$(7) \quad e = \{\alpha^2\phi + (1-\mu)^2\}^{-1} \{[\alpha^2\phi - \mu(1-\mu)]p + (1-\mu)\pi^* + \alpha\phi(y^*-\bar{y}) - \alpha\phi\beta(\tau-\bar{\tau})\}.$$

Assuming that the policymaker places sufficient weight on the real target (growth) so that $[\alpha^2\phi - \mu(1-\mu)] > 0$, we get the following results:

(i) $de/d\tau < 0$;

(ii) $1 > de/dp > 0$;

(iii) $de/d\pi^* > 0$;

(iv) $de/d(y^*-\bar{y}) > 0$.

For ease of exposition, assume an initial equilibrium where $e = p = 0$. The first of these inequalities states that the policymaker will react to terms of trade shocks by compensatory exchange rate policy; a deterioration in the terms of trade will be met by a depreciation. This is of course the main advantage of flexibility in the exchange rate regime. The second result states that an increase in home-goods prices will be accommodated by a depreciation, but only partially. The reason for the partial accommodation is the inflationary cost of depreciation. Third, a reduction in the target value of inflation will call for an appreciation of the currency.

The fourth result links exchange-rate policy to the relationship between the government's target for growth and the natural level of growth. When the government has an expansionary motive ($y^* > \bar{y}$), exchange-rate policy will have a bias towards depreciation. For the rest of the analysis, we will assume that this is indeed the case. There are two possible justifications for this. First, for many reasons, we could think that the economy's natural rate of growth is sub-optimal from a social standpoint. That could be due to pre-existing rigidities in labor markets or various kinds of distortionary (and unremovable) taxation. The government's desire to push the economy beyond the rate at which the economy would settle on its own, then, would be a well-meaning response to this sub-optimality. The second justification is

based on a much less benign view. In this view, the bias towards depreciation derives from naughty motives: gaining political advantage by giving the economy a temporary boost, or allowing inflationary finance of budget deficits.

Under rational expectations, domestic price setters will take into account the government's behavior, as captured by equation (7). Setting $p = E(e)$ and taking the expectation of (7), we can derive the following expression for the expected change in the exchange rate (and therefore the level of home-goods prices):

$$(8) \quad E(e) = p = \pi^* + [\alpha\phi/(1-\mu)](y^* - \bar{y}),$$

where we have used the fact that $E(\tau - \bar{\tau}) = 0$. This is the rule followed by the private sector in setting p. Note that home-goods inflation will be higher, the greater the divergence between the target level of growth and its natural level. That is because price setters will want to cover themselves against currency depreciations that erode their relative prices. In turn, the equilibrium level of depreciation of the exchange rate will be (by plugging [8] into [7]):

$$(9) \quad e = \pi^* + [\alpha\phi/(1-\mu)](y^* - \bar{y}) - (\alpha\phi\beta/[\alpha^2\phi + (1-\mu)^2])(\tau - \bar{\tau}).$$

Note that (9) differs from (8) only by the last term, which is the terms of trade shock that cannot be anticipated by price setters. Therefore, domestic price behavior fully takes into account the systematic component of exchange rate policy (the part due to the gap between y^* and $\bar{y}$), which implies that

the government's expansionary motive creates only inflation and no output gains.

But discretionary policy does buy the economy something, and that is the ability to alter the real exchange rate (and hence smooth output) in the face of unanticipated terms of trade disturbances. This can be seen by solving for the equilibrium level of y:

$$(10) \quad y = \bar{y} + [(1-\mu)^2/[\alpha^2\phi + (1-\mu)^2]]\beta(\tau - \bar{\tau}).$$

Since $[(1-\mu)^2/[\alpha^2\phi + (1-\mu)^2]] < 1$, exchange rate flexibility enables growth to be less sensitive to fluctuations in the terms of trade than in the fixed exchange rate case (as can be seen by comparing [10] with [6]).

(c) Welfare Comparison of the Two Policy Regimes. Table 1 summarizes the inflation and growth consequences of the two policy regimes. The fixed exchange-rate regime does better on the inflation front (on average), while the flexible-rate regime does better on the real side of the economy by reducing the fluctuations in growth rate. The next step is to derive an explicit cost-benefit criterion for choosing between the two regimes.

Table 1: Consequences of the Alternative Policy Regimes

	growth	inflation
fixed exch rate	$\bar{y} + \beta(r-\bar{r})$	π^*
flexible exch rate	$\bar{y} + ((1-\mu)^2/[\alpha^2\phi + (1-\mu)^2]) \times \beta(r-\bar{r})$	$\pi^* + [\alpha\phi/(1-\mu)](y^*-\bar{y}) - ((1-\mu)\alpha\phi\beta/[\alpha^2\phi+(1-\mu)^2])(r-\bar{r})$

The appropriate way to do so is to take an ex-ante stand and ask: which of the two regimes provides a higher level of expected welfare, in light of the structure of the economy, policy preferences of the authorities, and the anticipated pattern of exogenous (in this case terms of trade) shocks? It is possible to answer this question using the results obtained so far. For each policy regime, we can plug the equilibrium outcomes for y and π into the objective function (1) and take the mathematical expectation.

Let us denote expected welfare under the fixed exchange-rate regime by EW_f and the corresponding variable under the flexible exchange-rate regime by

EW_{nf}. Then after some algebra and simplification, the difference between the two can be expressed as:

(11) $EW_f - EW_{nf} = \alpha^2\phi^2\Delta$, with

(12) $\Delta = [(y^*-\bar{y})/(1-\mu)]^2 - \beta^2\sigma^2/[\alpha^2\phi + (1-\mu)^2]$.

We will refer to $(EW_f - EW_{nf})$ as the net benefits of the fixed rate regime. The composite parameter Δ is of ambiguous sign, reflecting the tradeoff between the costs and benefits of the two regimes. The first term making up Δ captures the benefit of the fixed-rate regime, while the second term represents the cost. A fixed rate is preferable to a flexible rate regime whenever Δ is positive.

Note first that the variance of the terms of trade (σ^2) enters on the cost side. That is, the higher is σ^2, the less likely that a fixed rate regime will be preferable to a flexible rate regime. Second, the higher is $(y^* - \bar{y})$ the more likely that a fixed exchange rate will be desirable. This follows from the greater temptation of policy makers with expansionary ambitions to inflate the economy (and depreciate the currency). A fixed exchange rate rules out such depreciation, and leaves policy makers better off, <u>even</u> when judged by their own welfare criterion. Third, a high β makes flexible rates more desirable. That is, when the real economy is highly susceptible to terms of trade shocks, flexible exchange rates have the edge.[11]

Next, we turn to the effect of ϕ. It can be verified that:

$d(EW_f - EW_{nf})/d\phi > 0$ whenever $\Delta > 0$; and

$d(EW_f - EW_{nf})/d\phi \gtrless 0$ whenever $\Delta < 0$.

In words, when a fixed rate is preferable ($\Delta > 0$), an increase in the weight placed on the real target makes a fixed rate regime even more beneficial. When a flexible-rate regime is preferable ($\Delta < 0$), an increase in the weight attached to the real target has ambiguous effects on the net benefits. With respect to Δ itself, we can see from (12) that $d\Delta/d\phi$ is unambiguously positive: that is, there must exist a sufficiently high ϕ such that a fixed rate regime becomes preferable to a flexible rate one. This may sound paradoxical, because the benefit of a fixed-rate regime is lower inflation, not higher growth. But it is an extension of the same logic: when policy makers put a large weight on output relative to inflation, there will be greater temptation to abuse the discretion allowed by flexible exchange rates and a higher inflationary cost. Countries where economic policy is highly politicized, where the central bank lacks autonomy, or where inflation has become chronic and its perceived costs low are settings where we would expect ϕ and $(y^*-\bar{y})$ to be high.

In the preceding paragraph, we looked at the relationship between ϕ and the choice of policy regimes while holding constant all other parameters, and $(y^*-\bar{y})$ in particular. An alternative approach, and one that we will rely on in our empirical analysis, is to ask how the choice of policy regimes is affected by variations in ϕ, while holding the <u>inflation differential</u> between the two regimes constant. From Table 3.1, we can see that the <u>average</u> inflation differential under the two regimes is given by:

$$(13) \quad \pi_{nf} - \pi_f = [\alpha\phi/(1-\mu)](y^*-\bar{y})$$

where the subscripts "nf" and "f" once again refer to the flexible and fixed regimes, respectively. This implies

$$[\alpha\phi/(1-\mu)]^2(y^*-\bar{y})^2 = (\pi_{nf} - \pi_f)^2.$$

Substituting into (11) we get:

$$(11') \quad EW_f - EW_{nf} = (\pi_{nf} - \pi_f)^2 - (\alpha\phi\beta)^2\sigma^2/[\alpha^2\phi + (1-\mu)^2].$$

It can be shown that the second term on the right-hand side is increasing in ϕ. Thus, holding $(\pi_{nf} - \pi_f)$ constant, $EW_f - EW_{nf}$ is decreasing in ϕ. Therefore, controlling for the inflation differential, an increase in the weight placed on the real target renders fixed rates less advantageous. Note that controlling for the inflation differential means in this context adjusting $(y^*-\bar{y})$ pari passu with ϕ to maintain the difference between the inflation rates fixed (see [13]).

We will use the formulation in (11') when we turn to the empirical application to the CFA case. The reason is that we can get a rough handle on the inflation differential under the two regimes by comparing CFA Zone countries with other sub-Saharan countries with flexible exchange rates. By contrast, $(y^*-\bar{y})$ is unobservable.

IV. The Tradeoffs: Empirical Application to the CFA Zone

As we mentioned earlier, there are at least two reasons why a model like that described above is relevant and applicable to the case of the CFA Zone. First, since CFA Zone countries are highly dependent on primary exports, terms

of trade shocks are the main exogenous force that buffets their economies. Therefore our focus on the terms of trade would appear well placed. Second, the presence of neighboring countries with similar economic structures but different exchange rate regimes allows us to construct a reasonable counterfactual. In particular, we can derive some ballpark estimates of the inflationary cost of exchange-rate flexibility by looking at the experience of these comparator countries.

We proceed as follows. We first note that the choice of a fixed exchange rate regime implies a certain preference for price-stability over the real target (or, in the language of the model in section III, a particular value of ϕ in the objective function [1]). We then ask: Given the evolution of these economies and of their external terms of trade, what does the fact that they joined the CFA Zone say about their revealed, ex ante valuation of the output-inflation tradeoff? Finally, we compare the range of revealed output-inflation tradeoffs we obtain in this manner with what we consider to be "reasonable" tradeoffs.

We proceed by determining the critical level of ϕ at which the policy maker would be <u>indifferent</u> between fixed and flexible exchange rate regimes. As discussed in the previous section, it is convenient to work with equation (11'). Setting this equation equal to zero and solving for ϕ, we obtain the critical value of ϕ, ϕ_c. This critical rate is a function of the inflation differential under fixed and flexible rates ($\pi_{nf} - \pi_f$), as well as the other parameters of the model. As implied by the earlier discussion, ϕ_c is increasing in the inflation differential and decreasing in σ^2. In words, as

the inflation cost of exchange-rate flexibility rises, the weight placed on the real target must increase for the policy maker to remain at the same margin of indifference. Conversely, as the terms of trade become more variable, the weight placed on the real target must diminish for continued indifference. Holding everything else constant, a ϕ higher than ϕ_c would imply that a flexible exchange rate regime would be preferable to a fixed rate regime. We now proceed to calculate ϕ_c. We will need empirical estimates of all the other parameters in equation (11').

To get a handle on $(\pi_{nf} - \pi_f)$, we exploit the structural similarity between the CFA member countries and their neighbors. That is, we use the difference between the average inflation rate inside the CFA Zone and in the rest of sub-Saharan Africa as an estimate of $(\pi_{nf} - \pi_f)$. For the CDP deflator, this difference is 15 percentage points (the CFA average rate between 1973 and 1987 was 9 percent, the non-CFA average 24 percent). For the consumer price index, the difference is close to 12 percentage points. We use a figure which lies in between these two differences, with a slight bias towards the GDP deflator: 13.8 percentage points.

As for the σ^2 term in equation (11'), this is obtained by taking the (unweighted) average of the variances of the logarithms of the terms of trade of all the CFA countries during 1965-87. The base data and the variances are given in Table 2. We also present the levels of σ^2 for various sub-periods and individual countries. With the former, we can ask whether the terms of trade have become more volatile so that the decision to fix the exchange rate in 1965 no longer makes sense. With the latter, we calculate the revealed

inflation-output tradeoffs for individual countries to see if Zone membership continues to be optimal for some countries but not others.

The parameters α, β and μ are difficult to estimate precisely. Hence, we vary them parametrically in our calculations. The parameter α represents the increase in growth for an additional one percent depreciation of the real exchange rate. We vary this from a low of 0.05 to a high of 0.20 in our sensitivity tests. Note that $\alpha = 0.20$ implies that a ten percent real depreciation will spur growth--temporarily--by two percentage points. The parameter β is the impact of a terms of trade shock on real income. As a first approximation, the direct effect of the shock will be to reduce real income by the share of imports in GDP. Note that this share is also linked to $(1-\mu)$, the share of tradables in the price index. Under some conditions, the two are equal (see Devarajan, Lewis and Robinson [1991]). Therefore, we set $1-\mu = \beta$ in our calculations and vary β from 0.10 to 0.40.

One last step is needed before we can interpret our calculations. It will be convenient to state our results in terms of implied output-inflation tradeoffs, rather than ϕ_c itself. The tradeoff can be recovered from ϕ_c by calculating the marginal rate of substitution between π and y along an indifference curve (i.e., holding $dW = 0$). Differentiating the objective function (1):

$$(14) \qquad d\pi/dy\big|_{dW=0} = -\phi_c(y-y^*)/(\pi-\pi^*).$$

This gives us the revealed inflation-output tradeoff along the locus on which the country would have been indifferent between a fixed and flexible exchange

rate regime. Remember that ϕ_c is the maximum ϕ for which fixed rates still make sense (holding the inflation differential and other parameters constant). Therefore the expression $d\pi/dy|_{dW=0}$ answers the following question: what is the maximum increase in inflation that the government is revealed to be willing to trade off against a single percentage point increase in growth, given that it has chosen to join the CFA Zone?

In order to map the values of ϕ_c to this inflation-output tradeoff, we need to know y, y^*, π and π^* in (14). It is reasonable to take as the target level of inflation, $\pi^* = 0$. For the actual level, we take $\pi = 0.08$, which is about the average for CFA countries throughout the post-independence period. The target GDP growth rate (y^*) is taken to be 0.05, which is at the lower end of the range of targets in the (usually optimistic) Five-Year Plans of thse countries. The actual (y) will be 0.03, which is about the average performance of CFA countries in this period.

Incorporating these assumptions, Table 3 presents the revealed inflation-output tradeoffs for the countries which chose to join the fixed exchange rate regime. Note that for most values of α and β, the implied tradeoff between growth and inflation is exceedingly steep. For example, when $\alpha = 0.15$ and $\beta = 0.25$, $d\pi/dy|_{dW=0}$ is 1.51. The interpretation is that for the decision to join the CFA Zone to have made sense (given these particular values of α and β), member countries should have been willing to tolerate no more than a one and a half percentage point increase in inflation for a one percent increase in their average annual GDP growth rate. In other words, the implied preference for price stability over output is extremely high. If they were willing to

tolerate a higher inflation rate for this boost in their growth rate, they should not have opted for a fixed exchange rate regime.

The revealed tradeoff is even steeper for a country like Gabon, which suffered the largest terms of trade shocks in the CFA Zone (see Table 2). This is intuitive. The costs of a fixed exchange rate regime rise with the variance of the terms of trade. For Gabon to have joined the CFA Zone, therefore, it must have had an exceptionally low tolerance for inflation vis-a-vis growth (see second panel of Table 3). Likewise, Senegal's tradeoff is the least steep, because it enjoyed the lowest variance in its terms of trade (bottom panel of Table 3).

Sensitivity analysis with the inflation differential (not reported here) does not significantly alter the results. For example, raising the inflation differential to its "high" estimate, 15 percentage points, raises Senegal's tradeoff for the intermediate values of α and β (0.15 and 0.25, respectively) to 6.4 percentage points. That is, even if the gains from joining the Zone were 15 percentage points lower average inflation, the Senegalese revealed that they were only willing to tradeoff 6.4 percentage points of inflation for one percentage point increase in their GDP growth rate.

Our impression is that most African policymakers would be willing to trade up to about 10 percentage points of inflation for a one percentage point increase in their GDP growth rate--that is, to increase their growth from 3 to 4 percent per annum on average. Given that most of the numbers in Table 3 lie below this figure, it appears that the decision to join the CFA Zone reflects an excessive anti-inflation bias. Put another way, if the future is going to

be anything like the past, CFA countries should perhaps seriously evaluate whether they wish to remain in a fixed exchange rate regime.

V. Concluding Remarks

We should stress that we have concentrated here on only some aspects of the costs and benefits of the CFA Zone. We have ignored some important benefits, including the savings obtained by pooling reserves and the attractiveness to foreign investors of a convertible currency. In addition, we have left unmentioned the special relationship with France (and the French treasury) implied by the existence of the Zone. Depending on one's perspective, the latter consideration can be viewed as either a net gain or loss.

Our focus instead has been on the costs of maintaining a fixed exchange rate regime in the context of highly variable external terms of trade. We have attempted to measure the welfare costs arising from the inability to adjust the exchange rate, and to pit these costs against the benefits of lower inflation. The inflation differential between CFA and non-CFA African countries has been around 14 percentage points. We attribute this differential to the standard time-consistency problem inherent in discretionary macroeconomic policy. Nonetheless, our highly stylized calculations suggest that fixed exchange rates have been, on the whole, a bad bargain for the CFA member countries. For most of the CFA members, the inflation benefits do not appear to have been large enough to offset the costs on the output side. Under "reasonable" output-inflation tradeoffs, these countries would have been better off having the flexibility to adjust to

external shocks.

This conclusion needs one important caveat. Our counterfactual effectively assumes that CFA policy makers would have followed the appropriate exchange rate policies in response to terms of trade shocks, had they had the freedom to do so. In light of experience with exchange rate policy in the rest of Africa, this is perhaps a doubtful supposition. Possibly, exchange-rate flexibility would have brought only inflation, and no output benefits.

NOTES

1. See Aghevli et al. (1991) for a concise summary of the issues.

2. This is of course closely related to the literature on "rules versus discretion". See Fischer (1990) for a general survey.

3. The countries are: Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Cote d'Ivoire, Equatorial Guinea, Gabon, Mali, Niger, Senegal and Togo. Mali left the Zone in 1965 and rejoined in 1984. Equatorial Guinea became a member in 1985.

4. Togo did not join at the outset, but did so after a change of government in 1963.

5. For more detailed descriptions of the institutional arrangements in the CFA Zone, see Bhatia (1985) and Guillaumont and Guillaumont (1984).

6. The unweighted average of the standard deviation of growth for the CFA countries is 7.2 percentage points over the entire 1973-87 period. The comparable average for other African countries is 5.4 percentage points.

7. Our approach is somewhat related to that taken in the literature on the insulating properties of fixed and flexible exchange rates in the presence of domestic and external shocks of different kinds (see for example Boyer, 1978, and Aizenman and Frenkel, 1985). However, this literature focused on the goal of stabilizing output only, and neglected the price discipline argument for fixed rates.

8. With a slight reinterpretation of variables, the model can also be stated in terms of the <u>levels</u> of output and prices, rather than their growth rates.

We chose the latter because they are the more relevant variables for policy.

9. There is actually a slight conceptual problem here. Since p and e stand for the changes in the exchange rate and home prices, the relative-price motive is stated in proportional, rather than absolute, form. This implies that price setters let bygones be bygones, and do not attempt to make up for previous losses (or gains). Tracking these dynamic effects would complicate the model considerably.

10. Note that inflation has no direct effect on the equilibrium growth rate (2). Of course, in the long run, persistent inflation will undermine economic activity and growth, which is one of the reasons why inflation is included separately in the objective function (1).

11. β is likely to be large in economies that are very open. Openness therefore increases the desirability of flexibility in exchange rates. This is at odds with the usual conclusion drawn in the literature on optimum currency areas, wherein greater openness is taken to imply less latitude in manipulating the real exchange rate through changes in the nominal rate, making flexibility less desirable.

REFERENCES

Aghevli, Bijan, Mohsin Khan, and Peter Montiel, 1991, Exchange Rate Policy in Developing Countries: Some Analytical Issues, IMF Occasional Paper No. 78, Washington, D.C.

Aizenman, Joshua, and Jacob Frenkel, 1985, "Optimal Wage Indexation, Foreign Exchange Intervention, and Monetary Policy," American Economic Review, vol. 75, June, pp. 402-423.

Bhatia, R., 1985, The West African Monetary Union: An Analytical Survey, IMF Occasional Paper No. 35, Washington, D.C.

Boyer, R., 1978, "Optimal Foreign Exchange Market Intervention," Journal of Political Economy, December, pp. 1045-55.

Corden, W. Max, 1990, "Exchange Rate Policy in Developing Countries," PPR Working Papers, No. 412, World Bank, April.

Devarajan, Shantayanan, and Jaime de Melo, 1987, "Evaluating Participation in African Monetary Unions: A Statistical Analysis of the CFA Zones," World Development, vol. 15, no. 4, pp. 483-96.

Devarajan, Shantayanan, and Jaime de Melo, 1990, "Membership in the CFA Zone: Odyssean Journey or Trojan Horse?" PPR Working Papers, No. 482, World Bank, August.

Devarajan, Shantayanan, Jeffrey D. Lewis, and Sherman Robinson, 1991, "External Shocks and the Equilibrium Real Exchange Rate," unpublished paper.

Fischer, Stanley, 1990, "Rules versus Discretion in Monetary Policy," in B.M. Friedman and F.H. Hahn (eds.), Handbook of Monetary Economics, vol. II, Amsterdam, North-Holland.

Guillaumont, P., S. Guillaumont, and P. Plane, 1988, "Participating in African Monetary Unions: An Alternative Evaluation," World Development, vol. 16, no. 5, pp. 569-76.

Guillaumont, P. and S. Guillaumont (eds.), 1988, Strategies de Developpement Comparee: Zone Franc et Hors Zone Franc, Economica, Paris.

World Bank, 1990, African Economic and Financial Data Base, International Economics Department, Washington, D.C.

Table 2

Terms of Trade in the CFA Zone
(1980=100)

	BEN	BKF	CMR	CAF	COG	CIV	GAB	MLI	NER	SEN	TGO
1965	132	132	104	123	98	101	59	146	144	133	103
1966	124	144	106	118	93	100	60	146	170	136	100
1967	129	147	109	110	103	98	45	157	154	90	103
1968	131	153	120	118	90	105	33	158	159	112	104
1969	126	147	125	132	89	107	30	171	155	124	103
1970	125	161	119	100	83	106	28	181	157	114	100
1971	108	158	98	92	81	88	29	172	164	106	90
1972	117	155	97	90	71	89	36	169	170	110	86
1973	177	178	114	98	42	96	35	182	150	103	93
1974	116	108	93	86	70	93	70	112	125	128	177
1975	94	94	79	73	64	80	62	101	128	118	145
1976	124	119	117	103	69	115	66	129	134	114	125
1977	152	110	147	115	72	146	64	120	125	113	117
1978	128	107	120	96	67	121	61	120	135	101	99
1979	115	108	104	104	74	118	72	105	122	100	93
1980	100	100	100	100	100	100	100	100	100	100	100
1981	103	89	98	88	106	85	107	93	100	102	102
1982	92	83	96	90	101	87	102	83	104	98	93
1983	95	95	94	89	96	92	95	93	107	99	88
1984	97	95	96	95	97	100	95	93	100	101	92
1985	92	81	92	87	94	96	90	82	99	97	86
1986	67	76	62	85	57	105	56	74	94	86	72
1987	86	88	56	84	64	88	64	85	83	90	77

100*Variance[Log(Terms of Trade)]

Period												CFA Avg
65-87	4.10	6.31	4.40	1.99	5.06	1.73	18.30	8.15	4.49	1.44	3.55	5.41
65-72	0.38	0.34	0.80	1.71	1.20	0.50	8.57	0.54	0.27	1.55	0.46	1.48
73-79	3.60	3.54	3.43	1.84	3.17	3.41	5.35	3.29	0.42	0.72	5.13	3.08
80-87	1.53	0.83	2.49	0.25	3.93	0.54	4.04	0.95	0.14	0.27	1.24	1.47

Source: World Bank [1990]

Table 3

Revealed Inflation-Growth Tradeoffs

Maximum Increases in Inflation that CFA Countries Are Willing to Sustain for a One Percent Increase in their Average Annual GDP Growth Rate, As Revealed by their Membership in a Fixed Exchange Rate Regime

(in percentage points)

CFA Zone

	alpha	0.05	0.10	0.15	0.20
beta	0.10	9.71	9.04	8.91	8.86
	0.15	4.74	4.15	4.02	3.97
	0.20	2.95	2.43	2.31	2.26
	0.25	2.08	1.62	1.51	1.47
	0.30	1.59	1.18	1.08	1.04
	0.35	1.28	0.91	0.82	0.78
	0.40	1.07	0.74	0.64	0.61

Gabon

	alpha	0.05	0.10	0.15	0.20
beta	0.10	3.37	2.83	2.71	2.66
	0.15	1.80	1.37	1.26	1.22
	0.20	1.19	0.84	0.75	0.71
	0.25	0.89	0.59	0.51	0.47
	0.30	0.70	0.45	0.37	0.34
	0.35	0.58	0.36	0.29	0.26
	0.40	0.49	0.30	0.24	0.21

Senegal

	alpha	0.05	0.10	0.15	0.20
beta	0.10	34.10	33.38	33.24	33.19
	0.15	15.67	14.97	14.84	14.79
	0.20	9.18	8.53	8.39	8.35
	0.25	6.16	5.54	5.41	5.36
	0.30	4.50	3.92	3.79	3.74
	0.35	3.48	2.94	2.81	2.77
	0.40	2.81	2.30	2.18	2.13

Notes: Assumptions:

$\pi^* = 0$

$\pi = 0.08$

$y^* = 0.05$

$y = 0.03$