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CENTRAL AFRICAN ECONOMIC AND MONETARY COMMUNITY (CEMAC)

Selected Issues

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Approved by the African Department

June 3, 2005

Contents Page

Figures

Boxes

I. The Evolution of Actual and Equilibrium Real Effective Exchange Rates in the CEMAC Region[1]

A. Introduction and Summary

1. The CFA franc zone has been in existence for over half a century.[2] The zone comprises 14 African countries grouped into two monetary unions, the WAEMU (Union Économique et Monétaire Ouest Africaine) and CEMAC (Communauté Économique et Monétaire de l'Afrique Centrale). The 1994 devaluation was instrumental in strengthening the competitiveness of the CFA zone, returning the zone's GDP to positive growth rates, and keeping inflation under control.[3]

2. The recent exchange rate and competitiveness developments have revived the interest in the prospects of and the outlook for the CFA franc. This paper applies the fundamentals equilibrium exchange rate approach based on the Edwards (1989) model and the Johansen (1995) cointegration methodology to analyze the movements of the actual real exchange rate for the CEMAC region vis-à-vis its long-run equilibrium value. Our empirical findings are summarized as follows: first, we show that the proposed fundamentals account for most of the fluctuation of the real effective exchange rates: increases in the terms of trade, government consumption, capital inflows, and productivity improvements tend to cause the exchange rate to appreciate, while increases in investment lead to a depreciation. Second, a comparison of the estimated long-run equilibrium path vis-à-vis the actual level of the exchange rate presents a clear pattern of overvaluation before 1994, an undervaluation from 1994 to about 2001, and a continuing appreciation thereafter. Third, while we estimate that the path of the CEMAC equilibrium real effective exchange rate has brought the real effective exchange rate above its underlying long-run equilibrium value in 2004, this misalignment is not statistically significant; hence, the real effective equilibrium exchange rate is broadly in line with its long–run equilibrium value. Finally, the analysis shows that real exchange rate deviations from its equilibrium level due to temporary factors are expected to revert to equilibrium in absence of further shocks.

3. The rest of the chapter is organized as follows: Section B presents the econometric methodology and the empirical model used for the estimation of the equilibrium real effective exchange rate. Section C discusses the evolution of real effective exchange rates and other relevant economic developments. Next, Section D presents the empirical results including a discussion of the long run and short run behavior, misalignment, and speeds of adjustment. Section E concludes.

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[1] Prepared by Charalambos Tsangarides.

[2] Hadjimichael and Galy (1997) provide a thorough analysis of the CFA zone and its institutions.

[3] This was the only change in the peg since the zone's creation. Since the introduction of the euro in 1999, the CFA franc (CFAF) has been pegged to the euro at CFAF 656 per €1.

B. Estimating the Equilibrium Real Effective Exchange Rate

Methodology

4. A number of different approaches exist in the literature for calculating the equilibrium real exchange rate (EREER).[4] These include traditional uncovered interest parity (UIP) and purchasing power parity (PPP) theories as well as more recent approaches such as the fundamental equilibrium exchange rate (FEER) approach, the underlying internal-external balance approach (UIEB), and the behavioral equilibrium exchange rate (BEER) approach.[5]

5. The FEER approach is a well-recognized approach for calculating equilibrium real exchange rates, particularly appropriate in assessing whether movements of the REER represent misalignments or whether the EREER itself has shifted as a result of changes in the economic fundamentals.[6] Edwards (1989) dynamic model of a three-good (exportables, importables, and nontradables) small open economy with a fixed exchange rate provides a coherent framework to identify the fundamental variables that are associated with the EREER.[7] Since only real factors (the fundamentals) can influence the EREER, the model can be used to describe nominal misalignments by separating the factors that can affect the long-run equilibrium real exchange rate with permanent changes, and the short-run misalignments of the nominal exchange rate stemming from policy variables.

The empirical model

6. We use Edwards' (1989) dynamic model of a small, open economy to identify the dynamics between the fundamentals and the REER. The estimation will proceed as follows. First, using the fundamentals specified by the Edwards (1989) model we investigate the existence of a long-run cointegrating relationship between the REER and the fundamentals and, if such a relationship exists, we estimate it using the Johansen (1988, 1995) methodology. (See Appendix I for more details.) Then, we calculate the path of equilibrium real exchange rates using the estimated parameters and non-transitory components of the determining fundamentals.

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[4] Driver and Westaway (2004) provide a complete taxonomy of the different empirical approaches on equilibrium exchange rates estimation used in the literature.

[5] Pertinent methodological issues are the definition and measurement of the REER, the theoretical and empirical determinants of the EREER, and the actual empirical estimation of the equilibrium REER using a variety of methodologies.

[6] For example, see Williamson (1994), Faruqee, Isard, and Masson (1999), MacDonald and Stein (1999), and Wren-Lewis (2003).

[7] The Edwards (1989) model is discussed in detail in Williamson (1994). Mathiesen (2003) is an application of Edwards' model to Malawi.

7. We augment Edwards (1989) theoretical model to include a variable to capture the Balassa-Samuelson effect and two variables to capture the temporary misalignments from inconsistent macroeconomic policies.[8] The empirical model we estimate is:

$$\ln(\text{REER}) = \alpha_0 + \alpha_1 \ln(\text{TTT}) + \alpha_2 \ln(\text{CGR}) + \alpha_3 \ln(\text{NIR}) + \alpha_4 \ln(\text{PROD}) + \alpha_5 (\text{BFDIR}) + \varepsilon_t$$

where ln denotes the natural logarithm, ε_t is an error term and

TTT = Terms of trade of goods;
CGR = Government consumption as a share of GDP;
NIR = Investment;
PROD = Technological progress index; and
BFDIR= Capital flows;

8. The dataset consists of annual observations for the period of 1970–2004, and the model was estimated with dummy variables to capture the structural break of the 1994 devaluation and the presence of outliers. The variables used are plotted in Figure I, Appendix II. The expected signs of the fundamentals are:

- Terms of trade of goods. The expected sign is *positive*. The terms of trade affect the REER through the wealth effect with a positive term of trade shock inducing an increase in the domestic demand, hence an increase in the relative price of non-tradable goods, which results to a REER appreciation.

- Government consumption as a share of GDP.[9] The expected sign is *ambiguous* in the absence of a breakdown of government spending in tradable and nontradable goods.[10] If government spending is primarily directed towards nontradable (tradable) goods, an increase in government consumption will result to an appreciation (depreciation) of the REER.

- Investment. The expected sign is *negative*. A rise in the investment share of GDP is likely to shift spending towards traded goods (given the high import content of investment) and thus depreciate the REER.

- Technological progress. The expected sign is *positive*. This captures the Balassa-Samuelson effect, in the sense that an increase in the productivity of tradables versus nontradables of one country relative to a foreign country raises its relative wages,

[8] See MacDonald and Ricci (2002) and Mathisen (2003) for a similar approach.

[9] This is a proxy for government demand for nontradables.

[10] Hinkle and Montiel (1999) discuss this in detail.

thus increasing the relative price of nontradables to tradables and, hence, causing a REER appreciation.[11]

- Capital flows.[12] The expected sign is *positive*. An increase in the capital inflows results to an increase in the demand for nontradables and hence an appreciation of REER.

Evolution of real effective exchange rates and other developments

9. Growth in the CEMAC region overall has been strongly linked to external price and exchange rate developments. In the CEMAC region, since the 1994 devaluation real GDP growth averaged 4.1 percent with a 2.9 percent increase in terms of trade. Distinct growth episodes in this period were: (i) the 1996–1999 period where growth was lower, averaging 3.6 percent as a result of unfavorable terms of trade (2.1 percent average decline); (ii) the 2000–04 period where growth picked up averaging 5.5 percent with more favorable oil prices, and a 8.0 percent increase in the terms of trade; and (iii) the 2002–03 period where growth averaged 4.7 percent, dipping below the overall average, in part reflecting declining oil output in more mature producers. With five of six CEMAC members, now net oil-exporters developments and economic prospects continue to be dominated by oil market developments. Real GDP growth strengthened to 8.3 percent in 2004, driven by the oil price increases and new oil production coming on stream in Chad and Equatorial Guinea.

10. The devaluation of the CFA franc in 1994 corrected the overvaluation of the currency and improved the CFA region's external competitiveness. For the CEMAC region, the real effective exchange rate (REER) has appreciated cumulatively by about 33 percent through December 2000, and by a further 18 percent from January 2001 to December 2004, with the latest appreciation essentially due to the strengthening of the euro to which the CFA franc is pegged. By December 2004, the REER was at 88 percent of its pre-devaluation level.

11. The evolution of the REER in the aftermath of the January 1994 devaluation can be divided into three phases (see Table 1 and Figure 1):

(i) January 1994 to December 1998 where the REER appreciated rapidly as a result of the surge in domestic wages and prices following the devaluation;

(ii) A short period of depreciation during January 1999 to December 2000 driven by the decline in the terms of trade resulting from declines in key export commodity prices and an increase in oil prices as well as the slowdown in the world economy; and

[11] As in other studies, we proxy the Balasa-Samuelson effect using the logarithm of real per capita GDP with respect to trading partner countries.

[12] This is proxied by foreign direct investment.

(iii) January 2001 until present, with the REER appreciating, mainly reflecting the strengthening of the euro against the U.S. dollar.

12. Looking at the member countries of each region, we observe significant variations around the regional average (Figure 2). Equatorial Guinea had the highest appreciation at end-2004 (114 percent of its pre-devaluation level) and Gabon the lowest appreciation (74 percent of its pre-devaluation level).

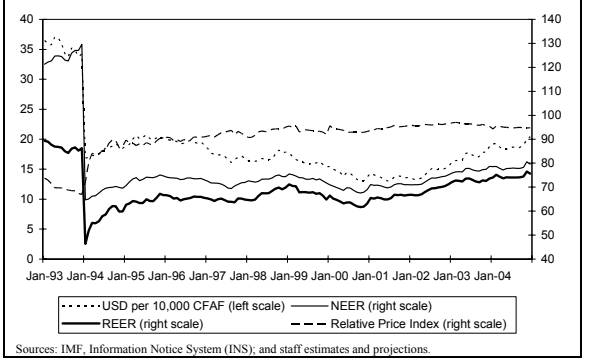
Table 1. CEMAC: Real Effective Exchange Rate and its Components (in percent)

	Jan 1994-Dec 1998	Jan 1999-Dec 2000	Jan 2001-Dec 2004
Percentage change			
Real effective exchange rate	50.8	-11.3	15.6
Nominal effective exchange rate	15.0	-8.6	12.0
Relative Price Index	31.7	-2.4	1.1
Cumulatively			
Real effective exchange rate	42.6	-9.8	18.4
Nominal effective exchange rate	14.2	-7.4	14.5
Relative Price Index	28.6	-1.8	1.6

Sources: IMF, INS and Fund staff calculations.

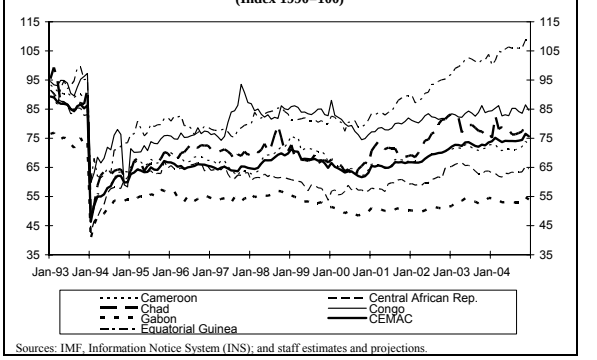
13. In addition, we observe a persistent decline in real GDP per capita with respect to trading partners starting in the mid-1970s until the end of the sample period; we also observe an increase of investment starting in the 1990s, and a quite volatile pattern of terms of trade, with an average increase in the 2000s as a result of favorable export commodity prices (oil).

Figure 1. CEMAC Exchange Rates and Relative Prices (Index 1990=100)



Sources: IMF, Information Notice System (INS); and staff estimates and projections.

Figure 2. Real Effective Exchange Rates of CEMAC Member Countries (Index 1990=100)



Sources: IMF, Information Notice System (INS); and staff estimates and projections.

Further, we observe a surge in foreign direct investment in 2000–03 associated with oil-related construction in Chad and Equatorial Guinea; also, the government consumption to GDP ratio has remained roughly a constant until about 1990 and a showed a slight decline since then.[13]

C. Empirical Results

14. The various specification tests of the cointegration analysis show variable stationary after first differencing, the existence of one cointegrating relationship, a parsimonious model with two lags and with good residual diagnostics (see Appendix II). Our cointegration

[13] Figure II.1 in Appendix II plots these variables of interest.

analysis suggests that there exists a long run relationship between the REERs and their identified fundamentals.

The long-run and short-run relationships

15. The resulting cointegration equation (presented in Table 2) is consistent with the predictions from economic theory, as the estimated coefficients have the expected signs. Table 2 is divided into two panels, with the top panel reporting estimates for the cointegrating vectors (the β's) together with their t-statistics, and the bottom panel reporting the feedback coefficients estimates (the α's) and their t-statistics.[14] The estimated coefficients present elasticities in the case of terms of trade, government consumption, investment, and technological progress; and semi-elasticities in the case of capital flows.

Table 2. Results of Cointegration Estimation
Normalized Variable: ln(Real Effective Exchange Rate)

Specification:	Sample CEMAC	
Estimates of the cointegrating relationships		
Constant	2.71	**
	2.44	
ln(terms of trade)	2.21	***
	7.78	
ln(government consumption)	-0.44	
	-1.62	
ln(investment)	-2.71	***
	-6.11	
ln(technological progress)	1.67	***
	8.63	
Capital inflows	0.06	**
	1.97	
Estimates of the short term impact/feedback coefficients		
D[ln(real effective exchange rate)]	0.08	***
	3.14	
D[ln(terms of trade)]	-0.12	
	-1.35	
D[ln(government consumption)]	0.32	***
	4.02	
D[ln(investment)]	0.17	***
	2.71	
D[ln(technological progress)]	-0.02	
	-0.16	
D[Capital inflows]	-1.09	*
	-1.77	
Half-life of deviation	9.07	

Notes:
1. Three asterisks, two asterisks, and one asterisk denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively; t-statistics in parenthesis.
2. The speed of adjustment coefficient is derived from the error correction model.

16. The **long-run** relationship between the REER and the fundamentals variables is shown in the top panel of Table 2 and can be summarized as follows:

- the terms of trade are positively correlated with the REER indicating a that an improvement in terms of trade would result in an appreciation of the long-run EREER through a possible wealth effect;

- investment is negatively correlated with the REER confirming the hypothesis that

[14] Three asterisks, two asterisks, and one asterisk denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively; t-statistics in italics.

investment increases spending towards traded goods;

- the relatively high long-term impact of technological progress (proxied by the relative real GDP per capita) confirms the Ballasa-Samuelson effect;

- there is no evidence that government consumption has a positive (appreciating) impact on the REER (as the coefficient was found to be statistically insignificant) suggesting that perhaps government spending is sometimes directed towards nontradables and sometimes towards tradables, with a net effect of zero impact on the REER; and

- as predicted by theory, capital inflows have a small, yet statistically significant impact on the REER.

17. In order to get an idea of the marginal impact of the fundamentals' coefficients we examine the models' elasticities and investigate the effect of a 1 percent increase in the fundamentals on the REER. Specifically, a 1 percent increase in:

- terms of trade is associated with a 2.21 percent appreciation of the REER;

- the level of government consumption as share to GDP is associated with a 0.44 percent depreciation of the REER (but it is statistically insignificant);

- investment as share to GDP is associated with a 2.71 percent depreciation of the REER;

- technological progress is associated with a 1.67 percent appreciation of the REER; and

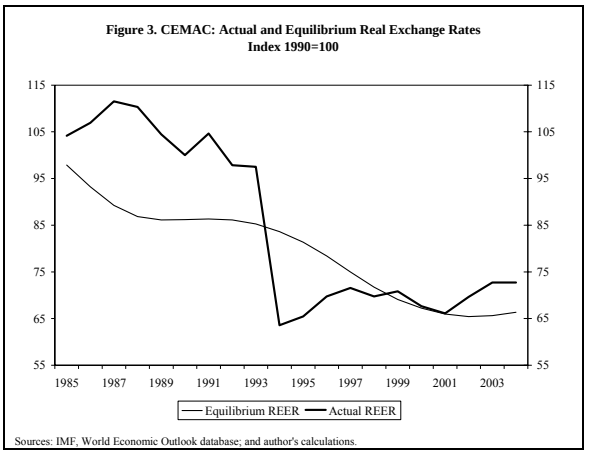
- capital inflows is associated with a 0.11 percent appreciation of the REER.

18. The bottom panel of Table 2 shows the feedback coefficients for the cointegrating vector, or the **short-run** relationship of the LREER and its fundamentals. Some are estimated to be insignificantly different from zero. These are: LNCGR, BFDIR, and LNIR. This suggests that these fundamentals are *not* weakly exogenous with respect to the parameters of the cointegrating relationship, and in the face of any deviation from the long-run equilibrium these variables jointly respond and move the system back to equilibrium. Furthermore, the feedback coefficient for the DLREER equation is negative and significantly different from zero, suggesting stability of the error correction mechanism.

Deviations from equilibrium and speed of adjustment

19. The long-run relationship obtained by estimating the equation of the REER with its fundamentals above permits the calculation of the EREER. Therefore, the EREER can be defined as the level of REER that is consistent in the long run with the equilibrium values of

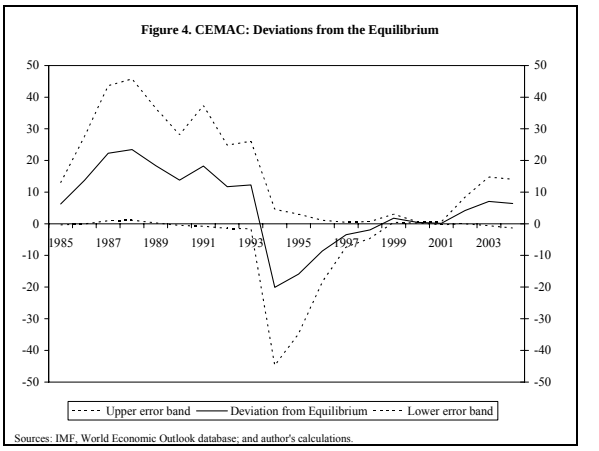
the explanatory variables. Based on the results of the cointegration analysis, the equilibrium EREERs were computed using the long-term components of the fundamentals.[15] Figure 3 displays the evolution of the actual and the estimated EREER rate for the CEMAC region for the period 1985–2004.



20. The actual CEMAC REER went through a period of overvaluation from 1985 up to 1994, with the actual REER well above its equilibrium level, suggesting that the 1994 CFA devaluation was warranted. After the1994 devaluation, the gap between the actual REER and its equilibrium level continuously narrowed as the REER and EREER moved in opposite directions.

21. It is worth examining the factors that contributed to this. From 1994 to the end of the period, the REER depreciated by about 25 percent. This was a result of an appreciation of 31 percent as a result of increases in terms of trade which was outweighed by the REER depreciation caused by productivity and capital inflows decreases and investment increases in the order of 18, 7, and 30 percent, respectively.

22. By end 2001, the CEMAC REER reached its equilibrium level. The appreciating pattern of the REER continued causing the CEMAC REER to remain above their equilibrium levels for the rest of the period of analysis. Finally, in 2004, our model specifications suggest that the CEMAC REER was above its model estimated long-run equilibrium levels suggesting a possible overvaluation. We examine this potential misalignment in more detail by constructing error bands around the deviations from the equilibrium.[16] Figure 4 plots the exchange rate deviations from its estimated equilibrium value together with the error bands. We conclude



[15] The Hodrick-Prescott filter was used to obtain a smooth estimate of the long-term component of each of the fundamentals series. It should be noted that choosing the degree of smoothing is admittedly arbitrary with larger (smaller) factors generating smoother (less smooth) equilibrium real exchange rate paths. As a robustness check, we construct "multiple" long-term components of the fundamentals using a variety of Hodrick-Prescott smoothing factors (10, 30, 50, 100, and 300) and then derive the equilibrium real exchange rate using a weighted average of these series.

[16] This methodology is applied and discussed in detail in Alberola et al. (1999).

that the misalignment is not statistically significant from zero as the 95 percent error bands around the deviations from equilibrium include zero.

23. The real exchange rate can deviate from its equilibrium value as a result of changes in the fundamentals or due to temporary factors, and as Figure 4 shows, there were several episodes of misalignment of the CEMAC EREER. Depending on the cause of the misalignment, the real exchange rate will converge towards a new equilibrium level or return from its temporary position to the original equilibrium value. The estimates derived in this study suggest that for the CEMAC region, on average, about 0.08 percent of the gap is eliminated every year, which implies that, in the absence of further shocks, about half the gap would be closed within 9 years.

D. Conclusions

24. Using a dynamic model of a small, open economy and the Johansen cointegration methodology, the CEMAC region's equilibrium real effective exchange rates was analyzed and an assessment was made as to whether the movements in the aggregate real exchange rates were consistent with the underlying macroeconomic fundamentals. We show that much of the long-run behavior of the real effective exchange rates can be explained by fluctuations in the terms of trade, government consumption, investment, capital inflows and productivity differences. In addition, we estimate that the recent real appreciation of the CFA exchange rate has brought the CEMAC REER slightly above its underlying long-run equilibrium value. However, since the estimated misalignment is not statistically significant, we conclude that the current level of the CEMAC REER is broadly in line with its long–run equilibrium value. Finally, we identify and estimate a feedback effect, which suggests that following a shock, there is reversion to the time-varying long-run equilibrium.

25. The estimation approach herein is subject to certain limitations, some of which are inherent to the literature that tries to estimate the equilibrium REERs. First, there are issues relating to the theoretical definition and measurement of the actual REER, the uncertainty about the theoretical and empirical determinants of the equilibrium REER, and the empirical estimation of the equilibrium REER. In addition, other potential limitations may be the treatment of the large structural break brought about by the 1994 nominal devaluation; explicitly accounting for rigidities and structural factors that may cause the exchange rate to be misaligned in the first place; and the decomposition into the permanent and transitory component of the fundamentals in order to derive the long term series. As a result, the results of the analysis in this chapter should be interpreted with caution. Absolute statements about magnitudes of any possible misalignments should be avoided, not least due to the fact that, given the degree of model uncertainty, error bands around estimated equilibrium exchange rates may, in some cases, yield inconclusive results.

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Details on the Econometric Methodology

The Johansen (1988, 1991, and 1995) maximum likelihood procedure is used to test for the existence of a long-run cointegrating relationship. We begin by specifying a vector of variables Y_t assumed to be in vector autoregressive form (VAR):

$$Y_t = \pi_0 + \sum_{i=1}^{p} \pi_i Y_{t-i} + \Psi D_t + \varepsilon_t \qquad (1)$$

Where Y_t is a (6×1) vector:

$$Y_t = \begin{bmatrix} \textit{Real effective exchange rate}_t \\ \textit{Terms of trade of goods}_t \\ \textit{Government consumption}_t \\ \textit{Investment}_t \\ \textit{Technological progress}_t \\ \textit{Capital inflows}_t \end{bmatrix},$$

and π_0 is a (6×1) vector of deterministic variables; $\pi_i's$ are (6×6) matrices of coefficients on lags of Y_t ; D_t is a vector of dummy-type variables; p is the lag length; and ε_t is a (6×1) vector of independent and identically distributed errors assumed to be normal with zero mean and covariance matrix $\mathbf{\Omega}$. As such, the VAR comprises a system of six equations, where the right-hand side of each equation comprises a common set of lagged and deterministic regressors.

The VAR specification in (1) provides the basis for cointegration analysis. Adding and subtracting various lags of Y_t yields an expression for the VAR in first differences:

$$\Delta Y_t = \pi_0 + \pi\, Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \Psi\, D_t + e_t \qquad (2)$$

where Δ denotes the difference operator; $\Gamma_i = -(\pi_{i+1} + ... + \pi_p)$ is a (6×6) coefficient matrix; and $\pi \equiv \left(\sum_{i=1}^{p} \pi_i \right) - I$.

The VAR model in differences is actually a multivariate form of the ADF unit root test, with the rank of π determining the number of cointegrating vectors:

(i) If $rank(\pi) = 6$ or $rank(\pi) = 0$, then no cointegration exists among the elements in a long-run relationship, and in these cases, it is appropriate to estimate the model in levels (for $rank(\pi) = n$), and first differences (for $rank(\pi) = 0$).

(ii) If $0 < rank(\pi) \equiv r < 6$, then there are *r* cointegrating vectors/relationships. In this case, matrix π can be expressed as the outer product of two full column rank ($6 \times r$) matrices α and β where $\pi = \alpha\beta'$.

With the specification in (ii) the VAR can be expressed as a vector error correction model (VECM):

$$\Delta Y_t = \pi_0 + \alpha\beta' Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \Psi D_t + \varepsilon_t \qquad (3)$$

The matrix β' contains the cointegrating vector(s) and the matrix α has the weighting elements for the *rth* cointegrating relation in each equation of the VAR. The matrix rows of $\beta' Y_{t-1}$ are normalized on the variable(s) of interest in the cointegrating relation(s) and interpreted as the deviation(s) from the "long-run" equilibrium condition(s). In this context, the columns of α represent the speed of adjustment to "long-run" equilibrium.[17] The estimated vector β can be used to provide a measure of the equilibrium real exchange rate and also quantify the misalignment gap between the prevailing real exchange rate and its equilibrium level. The estimated α captures the speed at which the real exchange rates converge to the equilibrium level.

[17] If the coefficient is zero in a particular equation, that variable is considered to be weakly exogenous and the VAR can be conditioned on that variable.

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Figure II.1. CEMAC: Cointegration Variables

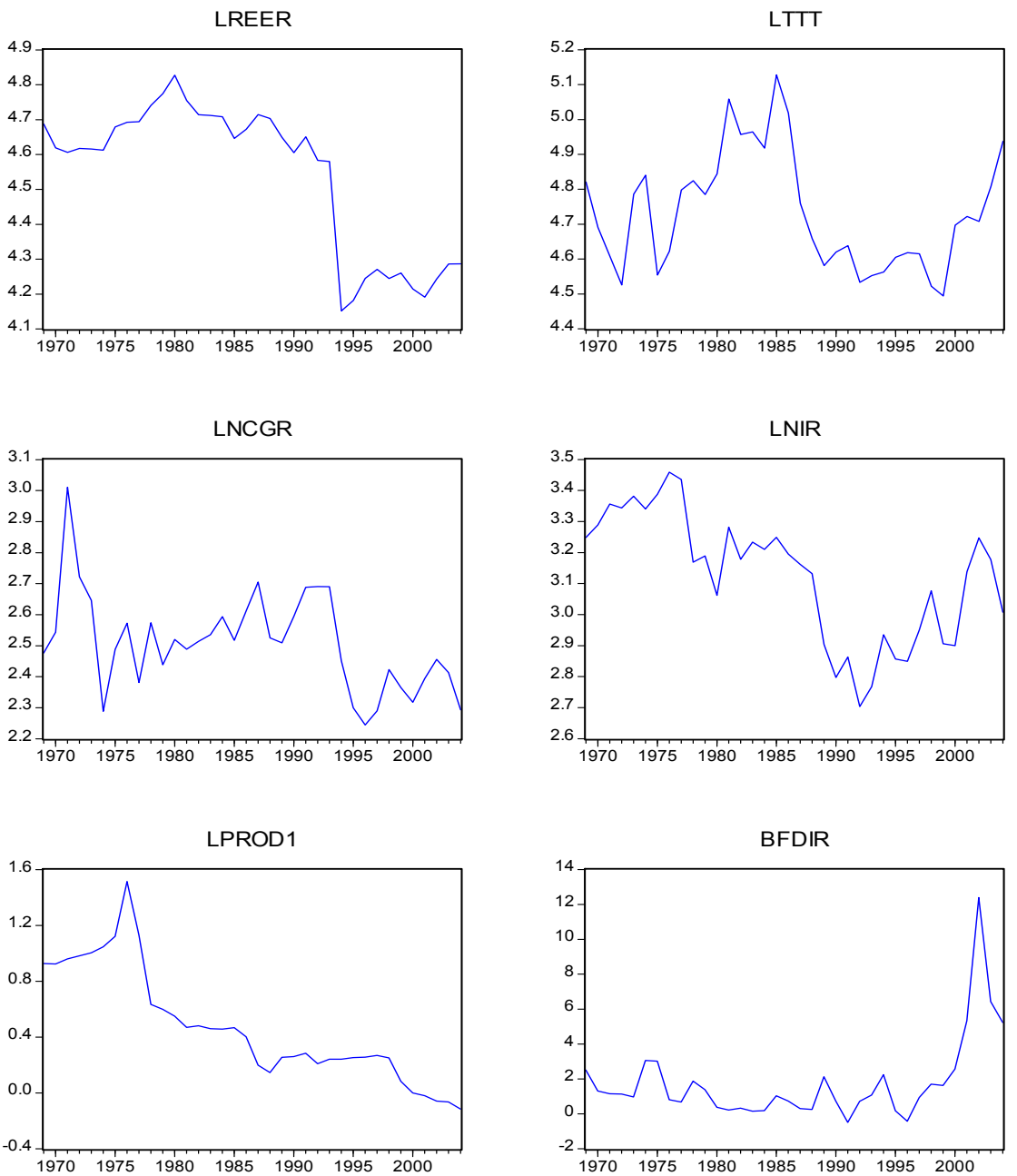

Table II.1. Unit Root Tests
Variables Levels and Differences

Variable	Lags	ADF	p-value	1% level	5% level	10% level
			CEMAC			
ln(REER)	0	-0.86	0.34	-2.63	-1.95	-1.61
Dln(REER)	0	-5.95	0.00	-2.63	-1.95	-1.61
ln(TTT)	0	-2.11	0.24	-3.63	-2.95	-2.61
Dln(TTT)	0	-5.56	0.00	-2.63	-1.95	-1.61
ln(CGR)	0	-0.37	0.55	-2.63	-1.95	-1.61
Dln(CGR)	0	-7.05	0.00	-2.63	-1.95	-1.61
ln(NIR)	0	-0.46	0.51	-2.63	-1.95	-1.61
Dln(NIR)	0	-6.08	0.00	-2.63	-1.95	-1.61
ln(PROD)	0	-1.51	0.12	-2.63	-1.95	-1.61
Dln(PROD)	0	-4.71	0.00	-2.63	-1.95	-1.61
BFDIR	0	-1.68	0.09	-2.63	-1.95	-1.61
DBFDIR	0	-6.50	0.00	-2.63	-1.95	-1.61

Notes:
1. D denotes the difference operator.
2. For p-values less than the 5% significance level, the null hypothesis of a unit root (non-stationarity) is rejected.

Table II.2. Tests for Model Reduction

CEMAC

Model	Log Likelihood	Schwartz Criterion	Hannan-Quinn Criterion	Akaike Criterion
VAR with 1 lag	171.55	-2.77	-4.94	-6.03
VAR with 2 lags	220.92	-1.95	-5.20	-6.84
VAR with 3 lags	318.17	-4.03	-8.36	-10.56

Model reduction	Statistic	Value	p-value
VAR(3) to VAR(2)	F(36,20)	1.60	0.13
VAR(2) to VAR(3)	F(36,46)	1.27	0.22
VAR(3) to VAR(1)	F(72,27)	1.58	0.09

Notes:
1/ The CEMAC VARs include the variables: LREER, LTTT. LCGR, LNIR, LPROD, BFDIR a constant, and four dummy variables for 1974, 1979, 1994-1995, and 2003; the WAEMU VARs include the variables: LREER, LTTT, LCGR, LNIR, LPROD, BFDIR a constant, and five dummy variables for 1994, 1995, 2001, 2002, and 2003.
2/ The F statistic and p-value report the test of the hypothesis that the model reduction from left to right is valid.

Table II.3. Diagnostic Tests for the Residuals

CEMAC

Test	Statistic	Value	p-value
Vector AR 1-2 test	F(36,24)	1.05	0.46
LREER	F(1,15)	6.71	0.02
LTTT	F(1,15)	1.26	0.28
LNCGR	F(1,15)	0.97	0.34
LNIR	F(1,15)	0.75	0.40
LPROD	F(1,15)	0.00	0.97
BFDIR	F(1,15)	2.37	0.14
Vector Normality test	Chi^2(12)	18.06	0.11
Vector hetero test	Chi^2(504)	509.58	0.42

Notes:
1/ The CEMAC VARs include the variables: LREER, LTTT. LCGR, LNIR, LPROD, BFDIR a constant, and four dummy variables for 1974, 1979, 1994-1995, and 2003; the WAEMU VARs include the variables: LREER, LTTT, LCGR, LNIR, LPROD, BFDIR a constant, and five dummy variables for 1994, 1995, 2001, 2002, and 2003.

Table II.4. Johansen Cointegration Tests

Cointegration Test - CEMAC

Number of hypothesized Cointegrating Equations	Eigenvalue	Trace Statistic	5% Critical Value	1% Critical Value
None ***	0.81	126.33	103.85	113.42
At most 1	0.66	70.16	76.97	85.34
At most 2	0.42	33.10	54.08	61.27
At most 3	0.26	14.66	35.19	41.20
At most 4	0.08	4.33	20.26	25.08
At most 5	0.04	1.50	9.16	12.76

The *Trace* test indicates 1 cointegrating eqn(s) at the 0.01 and 0.05 levels.

Number of hypothesized Cointegrating Equations	Eigenvalue	Max-Eigen Statistic	5% Critical Value	1% Critical Value
None ***	0.81	56.17	40.96	46.75
At most 1 **	0.66	37.06	34.81	40.30
At most 2	0.42	18.45	28.59	33.73
At most 3	0.26	10.32	22.30	27.07
At most 4	0.08	2.83	15.89	20.16
At most 5	0.04	1.50	9.16	12.76

The *Max-eigenvalue* test indicates 2 cointegrating eqn(s) at the 0.05 level and 1 at the 0.01 level.

Notes:
1/ The CEMAC VARs include the variables: LREER, LTTT. LCGR, LNIR, LPROD, BFDIR a constant, and four dummy variables for 1974, 1979, 1994-1995, and 2003; The WAEMU VARs include the variables: LREER, LTTT. LCGR, LNIR, LPROD, BFDIR a constant, and five dummy variables for 1994, 1995, 2001, 2002, and 2003.
2/ ** (***) denotes rejection of the hypothesis at the 5% (1%) level.

II. Reserve Adequacy in a Currency Union—The Case of the CEMAC Region[18]

A. Introduction

26. **The CEMAC region's unique characteristics create interesting challenges for assessing reserve adequacy.** First, the currency union arrangements (including a convertibility guarantee by France and reserve pooling) in the context of a fixed exchange-rate regime impose requirements on reserve holdings. Second, due to its dependency on oil exports, the region is particularly exposed to large current account shocks, which in the case of positive shocks, expose weaknesses in liquidity management and the inadequacy of monetary policy instruments, and, in the case of negative shocks, could undermine the sustainability of the peg. Third, going forward, proposed instruments to save part of the oil revenues in special savings funds would lower the region's pooled reserves.

27. **In its evaluation of reserve adequacy in the CEMAC region, this paper will follow recent Fund guidance.** Whereas there is no definitive theoretical or empirical guidance as to what constitutes an "adequate" level of reserve holdings, the Board Paper on Liquidity Management emphasizes a multifaceted approach, that considers both qualitative and quantitative factors (institutional characteristics), and that recommends supplementing the use of static indicators by analyzing in a forward-looking manner the potential sources of pressures on reserves (Box 1). Based on this approach, the paper finds that an additional reserves cushion of about two months of imports and over 100 percent of short-term debt would be needed beyond levels suggested by standard reserve adequacy indicators in order to withstand the impact of oil price fluctuations.

28. **The paper is structured as follows:** Section B discusses the determinants of adequate reserve levels in the CEMAC, from the perspective of the institutional arrangements and also considering the main sources of external vulnerability in the region. Section C looks at the evolution of reserves assets since the mid-1990s, and at whether they met both statutory requirements and more standard reserve adequacy benchmarks. The case of the CEMAC is also compared to similar currency unions (the WAEMU and the ECCU). Going forward, future challenges for reserve adequacy are discussed in Section D. These challenges arise both from the large current account volatility and from a progressive liberalization of capital account transactions. In this context, the implications of alternative arrangements to save oil-related inflows on reserve adequacy will also be considered. Section E concludes.

[18] Prepared by Corinne Deléchat.

Box 1. The Fund's Approach to Reserve Adequacy Assessments

The IMF needs an operational measure of reserves that would seem adequate to help countries cope with external shocks. In light of experiences during recent crises newer research conducted in the Fund recommends to augment ratios summarizing the status of the country's sectoral FX exposures and to conduct sensitivity analysis of projected reserve adequacy ratios. In addition, specific country characteristics such as institutional arrangements and practices that relate to public debt management, financial sector supervision and regulation, corporate governance, and financial market development are of key importance for reserve adequacy assessments.

Reserve adequacy assessments need to be based on a clear understanding of the key factors that affect the likelihood and magnitude of pressures on reserves, including the choice of exchange-rate regime, the extent of external imbalances, the degree of openness of the capital account (including the existence and effectiveness of capital controls in containing liquidity pressures) the regulatory regime, the extent to which debt is denominated in local currency, hedged, or offset by private entities' external assets and foreign currency cash flows, and the derivative exposure of the public sector.

For countries with low or no access to international markets, the focus of the analysis should be on the size and volatility of current account flows. The relevant indicator will be the ratio of reserves to months of imports, with a benchmark value of 3 months. However, that benchmark value needs to be evaluated in terms of the past and projected volatility of current account flows. A higher level of reserves is typically sought in countries where shocks to current account flows can be particularly strong, for instance in countries where the export base is narrow and the price of the few key exports is particularly volatile.

For countries with access to capital markets, the ratio of reserves to short-term debt is still the best single indicator, being a good predictor of crises. In addition, the paper suggests augmenting this ratio to include all foreign currency-linked public domestic debt (by residual maturity) and residents' foreign currency deposits in domestic banks net of domestic banks' liquid foreign currency assets to reserves.

The paper also recommends the use of rolling liquidity analyses to complement the static analysis of standard reserve adequacy indicators, institutions, and balance sheets. Such analyses, which consist in projecting reserve coverage ratios under a baseline scenario over the short- to-medium-term and assessing the potential use of reserves under alternative scenarios could complement the projections and stress testing made in the context of the debt sustainability framework, and underpin the discussions of short- to medium-term reserve targets.

B. Institutional Arrangements

29. **An assessment of reserve adequacy in the CEMAC needs to take into account the key features and requirements of the currency union arrangement**. The CFA franc zone arrangements entail a fixed peg vis-à-vis the euro, the pooling of reserve assets and a guarantee of full convertibility by the French Treasury. This guarantee is supported by limits on reserve holdings of both sub-regional central banks, the BEAC and the BCEAO: each is required to keep at least 65 percent of its foreign assets in the operations account with the French Treasury, and to maintain a foreign exchange cover of at least 20 percent of its sight liabilities. Capital movements between each zone and France are free, although in practice a number of administrative restrictions severely limit de facto capital mobility (Box 2). In addition, capital flows between both zones are restricted insofar as both currencies are not convertible against each other.

30. **When the currency cover ratio declines below 20 percent for three consecutive months, emergency measures must be taken by the central bank to protect the parity**, such as increases in the official interest rates and reductions in refinancing ceilings. Similarly, if the balance of the operations account goes into deficit for 30 days, specific measures are triggered, including the reduction by 20 percent of refinancing ceilings for countries in deficit, and by 10 percent for countries whose surplus is less than 15 percent of its money supply. In addition, if the operations account is in debit position in any one CEMAC member country, the BEAC Governor is to consult with the Ministerial Committee as well as the concerned member in order to agree on rapid corrective measures.[19] The BEAC also aims at maintaining the currency cover ratio above 20 percent in each country, although this is not a statutory requirement and has not in practice always been met by individual CEMAC countries.[20]

31. **Whereas reserve pooling is a key feature of the currency union arrangement, the BEAC continues to attempt to meet the currency cover ratios for individual countries, which implies higher aggregate reserves than is required**. For the purposes of monetary programming, reserves are attributed to each of the member countries, as is money in circulation. Then the monetary program is built up from country-by-country estimates of money and credit demand from the private and public sectors—yielding individual country ceilings for central bank credit to the economy (Masson and Patillo, 2004).

32. **The BEAC's role as a lender of last resort for the region also implies the need to maintain appropriate capitalization in case of banking sector problems**. Although the prudential regulations and surveillance of the sector have improved in recent years,

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[19] BEAC statutes, Article 11.

[20] The cover ratio was below 20 percent until 1999 for Cameroon, and sporadically in Congo, Equatorial Guinea and Gabon since 1995. In these three countries, the ratio is highly volatile due to large variations in oil-related inflows.

weaknesses remain. The ratio of non-performing loans relative to gross loans increased slightly to 141/2 percent in 2004 while provisioning remained constant. Properly measured, one-third of the 33 banks do not meet the minimal required capital adequacy ratio of 8 percent. In addition, 20 out of 33 banks have violated in 2004 the single large exposure limit, representing an increase of more than 40 percent compared with 2002.

C. Sources of External Vulnerability

33. **The convertibility guarantee should be understood as a last recourse and does not eliminate the need to hold adequate reserves to sustain the peg.** In principle, the convertibility guarantee functions like an insurance mechanism in case of adverse external shocks, rendering reserve holdings in excess of what is required under the currency union arrangement redundant. In practice however, CEMAC country authorities and France have proved extremely reluctant to either changes in the parity or substantial liquidity injections (the parity has been modified only once in 1994 after every other possible remedy had failed). Therefore, in addition to meeting the above statutory requirements, CEMAC's reserves should be sufficient to maintain the credibility of the peg and to provide a liquidity buffer in case of adverse external shocks.

34. **CEMAC countries are particularly vulnerable to large terms of trade shocks and for that reason should hold reserves beyond standard benchmarks.** Five out of the six member countries are oil exporters and oil-price fluctuations and the oil production cycle represent major sources of macroeconomic and reserves volatility.[21] The large (although declining) public external debt stock of the region also represents a source of vulnerability. Finally, the BEAC's role as a lender of last resort for the region implies the need to maintain adequate capitalization.

35. **At present there are few capital account vulnerabilities, as capital controls prevent large capital outflows and there is no international capital market access.** However, the progressive liberalization of capital account transactions would imply a need for an adequate reserves cushion. In particular, the situation of excess domestic liquidity should be addressed prior to any liberalization, preferably through the introduction of appropriate sterilization instruments. Other balance-sheet vulnerabilities could stem from large foreign currency exposures of the public or private sector.

[21] The Central African Republic exports diamonds.

Box 2. The CFA Franc Arrangement [1/]

Together, the CEMAC and WAEMU constitute the CFA franc zone. Whereas there are two formally distinct currencies in both zones (the West African CFA franc in WAEMU, and the Central African CFA franc in CEMAC), the arrangement between both central banks and the French Treasury is almost identical (France is represented on the executive boards of the two regional central banks).[2]

The CFA franc zone functions according to the following rules: (a) fixed parity against the euro, adjustable if required by economic reasons after consultation with the French government and the unanimous decision of all member countries; (b) convertibility of the CFA franc at the rate of €1 = CFAF655.957; (c) guarantee of full convertibility through the establishment by each central bank of an operations account with the French Treasury with market-related yields of charges; (d) free capital mobility between the two regions and France; and (e) the pooling of foreign exchange reserves in each monetary area.

The statutes of the central banks require that each central bank: (a) maintain at least 65 percent of their foreign assets in the operations account; (b) provide for exchange cover of at least 20 percent of their sight deposits; and (c) impose a cap on accumulated credit extended to each member country of 20 percent of the previous year's public sector revenue.[3]

Aside from the 1994 50 percent devaluation of the CFA franc, the parity between the CFAF and the French franc/euro has remained unchanged. The move to the EMU third stage and the creation of the euro did not have major implications for the zone, apart from the replacement of the peg to the French franc by the euro and the need to inform the ECOFIN about any change in partity.[4] As the agreement between the French Treasury and the CFA zone members is of a budgetary nature, it does not oblige the ECB to support the peg (EU council decision of November 23, 1998).

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[1] This box draws Hadjimichael and Galy (1997).

[2] CEMAC members are Cameroon, Chad, the Central African Republic, Equatorial Guinea, and the Republic of Congo. WAEMU members are Benin, Burkina Faso, Cote d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo.

[3] As of X, advances to governments have been replaced by central government bills in the WAEMU.

[4] See Masson and Patillo (2004).

D. Evolution of Reserve Adequacy Indicators

Reserves and statutory reserve requirements in the CEMAC and WAEMU

36. **Reserve assets in the CEMAC and WAEMU are now at their highest level in a decade.** Since the 1994 devaluation, reserve assets in the CEMAC have followed an increasing trend—albeit somewhat irregular, with a large recent accumulation due to favorable oil prices and increases in oil production. The increase in the WAEMU has been steadier and reflects mostly favorable commodity prices. Statutory reserve indicators have generally remained well above their benchmark values in both the CEMAC and WAEMU regions. One exception is the share of foreign assets in the operations account in the CEMAC, which was below 65 percent in 1998 and 1999, mostly due to low oil prices. In addition, the currency cover ratio in the CEMAC has remained on average almost 40 percent below that of the WAEMU over the last decade (Table 1)

.

Table 1. CEMAC and WAEMU: Foreign assets of the Central Bank and statutory reserve indicators, 1995-2004
(In billions of CFA francs unless otherwise indicated)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
CEMAC :										
Net foreign assets	95.6	229.6	308.0	84.5	116.1	587.7	485.7	696.7	675.4	1232.9
Foreign assets	235.5	411.5	524.7	310.4	388.7	929.8	851.0	1049.7	991.1	1535.6
of which: Operations account	157.5	288.0	385.5	180.5	251.5	786.8	680.4	870.4	814.1	1305.6
(As a share of foreign assets)	66.9	70.0	73.5	58.2	64.7	84.6	80.0	82.9	82.1	85.0
Currency cover ratio 1/	84.8	83.0	79.6	53.9	56.2	71.1	65.0	68.3	66.3	74.6
WAEMU :										
Net foreign assets	649.3	758.6	955.3	932.1	968.3	1402.2	1983.0	2687.1	2922.6	3028.2
Foreign assets	1387.6	1586.2	1864.7	1919.9	2082.3	2492.9	3011.3	3631.9	3702.5	3701.7
of which: Operations account	1098.5	1369.1	1470.6	1812.6	2216.1	2563.1	3223.9	3348.0	3443.2	3445.3
(As a share of foreign assets)	79.2	86.3	78.9	94.4	106.4	102.8	107.1	92.2	93.0	93.1
Currency cover ratio 1/	91.2	98.0	101.6	97.0	103.1	116.9	115.3	116.7	118.9	116.3

Source: WEO, IMF staff calculations.

1/ Foreign assets as a share of short-term domestic liabilities.

37. **However, the currency cover ratios for individual CEMAC members exhibit wide variations**, with the cover ratios for individual countries in the CEMAC remaining quite low for Cameroon (and below 20 percent until 1999) and for Congo. In addition, the cover ratios for the oil-dependent economies (Congo, Equatorial Guinea and Gabon) are highly volatile due to large variations in oil-related inflows (Table 2).

Table 2. CEMAC Countries: Currency Cover Ratios
(In percent)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Cameroon	8.0	6.8	5.0	4.4	7.2	37.9	38.7	49.5	46.7	52.3
Central African Republic	110.1	107.5	108.0	103.2	100.9	107.2	99.1	99.3	96.6	86.9
Chad	85.2	81.2	81.5	71.8	74.4	87.1	79.8	87.9	73.9	70.3
Congo, Rep. of	31.1	42.4	31.3	6.5	26.4	65.1	35.0	21.6	18.1	31.1
Equatorial Guinea	27.4	16.3	33.3	17.8	24.4	63.4	98.4	101.9	100.2	100.4
Gabon	54.2	67.9	88.5	10.4	16.0	70.8	17.5	38.3	45.3	61.8

Source: WEO, IMF staff calculations.

Traditional indicators of reserve adequacy

38. **For the CEMAC region, the most relevant indicator is the ratio of reserves to prospective imports, as there is no international capital market access**. However, the ratio of reserves to short-term debt on a remaining maturity basis remains important insofar as it captures the size of amortization due on the relatively large external debt, i.e., it captures liquidity (and potentially solvency) risk rather than rollover risk.[22] The ratio of reserves to broad money—an indicator of the potential magnitude of capital flight—has empirically been found to be of little relevance. In addition, capital controls in principle limit potentially large capital outflows.[23]

39. **Traditional reserve adequacy indicators are now at their highest since 1995.** Compared to 1995, reserves have increased as a share of GDP, broad money, prospective imports and short-term debt (on a remaining maturity basis). The trend has however been irregular, with a low in 1998 followed by a peak in 2000, associated with oil price movements. In addition, reserves are still low in terms of imports, where a 3-months cover is normally recommended, and the reserves-to-short-term debt ratio is adequate in the sense that reserves currently cover the region's scheduled amortization for a year and a half. (Table 3).

Table 3. CEMAC: Reserve Adequacy Indicators, 1995-2004
(In percent, unless otherwise indicated)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Gross Reserves as a Percent of:										
GDP	2.6	4.0	4.7	2.8	3.3	6.6	5.7	6.6	5.9	8.0
M2	17.0	28.5	32.8	19.5	22.3	43.4	37.0	39.9	37.1	52.1
Imports 1/	0.9	1.4	1.4	0.9	1.0	1.9	1.4	1.9	1.6	2.5
Short-term debt 2/	22.1	49.4	47.8	33.5	37.6	92.3	67.4	98.2	103.3	166.6

Source: WEO, IMF staff calculations.

1/ In months of following year's imports of goods and services.

2/ On a remaining maturity basis

40. **As of end-2004, the CEMAC region had lower values for most indicators compared to the WAEMU and the ECCU.** The only exception is the ratio of reserves to broad money, which mainly reflects a lower level of broad money given the region's lower level of financial development. As mentioned above, the reserves to imports ratio is on the low side given the fixed exchange rate commitment and the oil-dependency. Again there are

[22] Most of CEMAC's and WAEMU's external debt is official medium-and long-term debt.

[23] In practice, free capital mobility has been constrained by a number of administrative regulations, prudential limits on the net holdings of foreign assets by commercial banks, very high bank commissions for capital transfers abroad and, indirectly, by the discontinuation since August 1993 of the purchases by the two CFA franc zone central banks of their banknotes held outside the zone.

large variations across individual CEMAC countries, with very low reserve indicators in Congo and very high ones in Equatorial Guinea (Table 4).

Table 4. Reserve Adequacy Indicators as of end-2004
(In percent, unless otherwise indicated)

Reserves as a percent of:	GDP	M2	Imports 1/	Short-term debt 2/
Cameroon	5.3	25.9	2.3	89.6
Central African Republic	10.1	58.8	5.8	162.1
Chad	6.1	67.2	2.2	815.6
Congo, Rep. of	0.6	3.2	0.1	7.7
Equatorial Guinea	19.0	215.5	2.8	538.2
Gabon	5.7	30.2	2.0	88.7
CEMAC	**8.0**	**52.1**	**2.5**	**166.6**
WAEMU	**16.3**	**63.6**	**6.6**	**564.8**
ECCU	**19.2**	**19.4**	**2.9**	**200.0**

Source: WEO, IMF staff calculations.

1/ In months of following year's imports of goods and services
2/ On a remaining maturity basis.

E. Future Challenges for Reserve Adequacy

Current account volatility

41. **Going forward, the adequate level of reserves should be determined by taking into account the main sources of pressure on reserves.** For the period 1995–2004, reserves in the CEMAC were six times more volatile than in the WAEMU.[24] For the CEMAC countries, the volatility of reserve flows stems from large current and capital account fluctuations linked to the oil price and oil production cycle. In contrast, in the WAEMU region reserves tend to follow capital account developments and are not so volatile.[25] Reserve flows in the WAEMU are also less correlated with export price movements—although the recent increase in reserves reflects the favorable evolution of commodity prices (Figure 1).

42. **Medium-term projections indicate that reserve levels should rapidly increase and largely meet the standard reserve adequacy benchmarks.**[26] By end-2008, reserves should cover about seven months of imports and over 5 years of amortization (Figure 2). However, as noted earlier, reserve indicators are very sensitive to the underlying oil price assumptions.

43. **To illustrate the sensitivity of reserve indicators to oil price fluctuations, a simple stress test was performed.** Similarly to the stress tests used in the standard debt sustainability analysis (DSA) templates, the oil price was assumed to fall by US$7 per barrel in 2005, corresponding to its 10-year standard deviation. Assuming further that only export

[24] Volatility is calculated as the10-year standard deviation of the annual percentage changes. For the period, reserves volatility in the CEMAC was 53 percent, compared to 9 percent in the CEMAC.

[25] For the last decade, the coefficient of correlation between reserves and the oil price is .94 in the CEMAC, whereas for the WAEMU the correlation between reserves and an index of export prices is -.1.

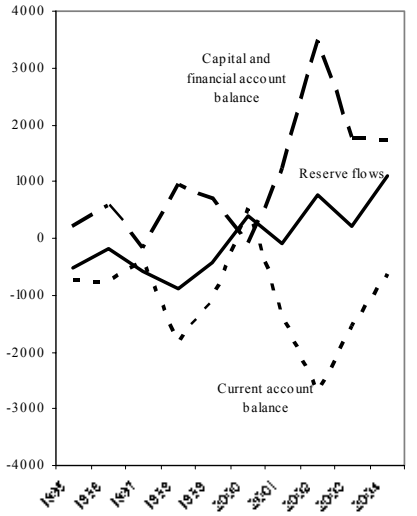
[26] Projections are based on March 1, 2005 WEO assumptions, with the 2005 oil price at US$46.5 per barrel.

revenues would adjust, the corresponding fall in reserves would be of US$2.33 billion. In that case, the reserves to import ratio would fall by almost two months in 2005, from 3.3 to 1.5 months, and would not reach 3 months until 2007. At the same time, the ratio of reserves to short-term debt ratio would fall by over 100 percent in 2005 (from 229 to 105 percent), going back to the benchmark value of 100 percent (Figure 2).

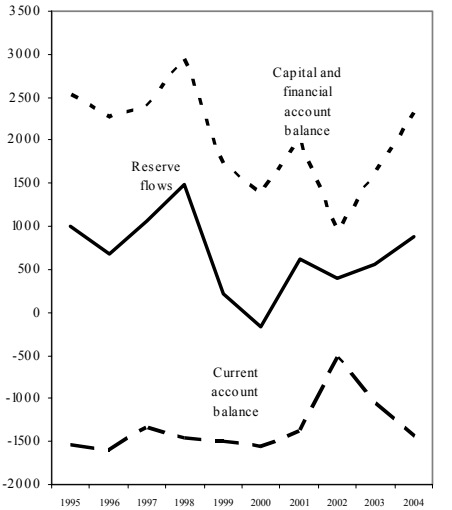
44. **Such sensitivity of reserves to changes in the oil price indicates the need to maintain an additional reserve cushion in excess of the recommended levels.** The above results would point to the need to maintain an additional reserve cover of about two-three months of imports above the three-month benchmark, and a ratio of reserves to short-term debt of about 100–150 percent in excess of the 100 percent benchmark. Therefore, as an indicative target, the BEAC should strive to maintain an import cover of at least five months and a short-term debt cover of about 200–250 percent, in addition to complying with the statutory requirements for reserve holdings. According to the baseline projections, the recommended import cover will not be reached until 2007.

Figure 1. CEMAC and WAEMU: Balance of Payments Flows and Reserve Assets

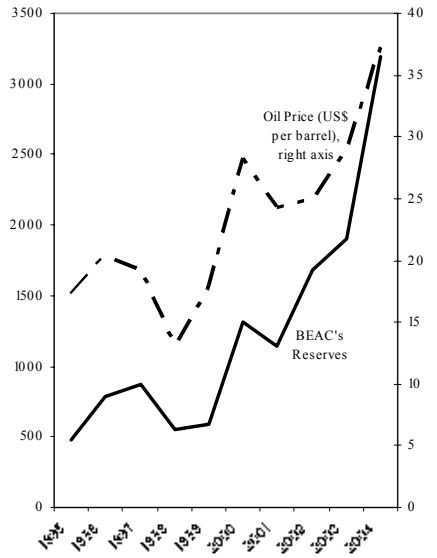
Panel 1. CEMAC: Balance of Payments, 1995-2004
(in millions of U.S. dollars)



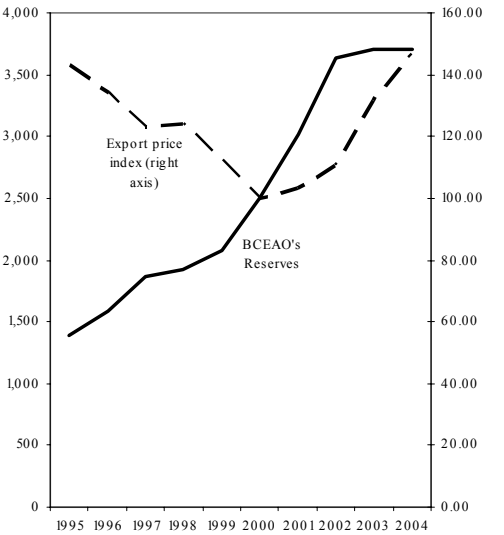
Panel 2. WAEMU: Balance of Payments, 1995-2004
(in millions of U.S. dollars)



Panel 3. CEMAC: Reserve Assets, 1995-2005
(in millions of U.S. dollars)

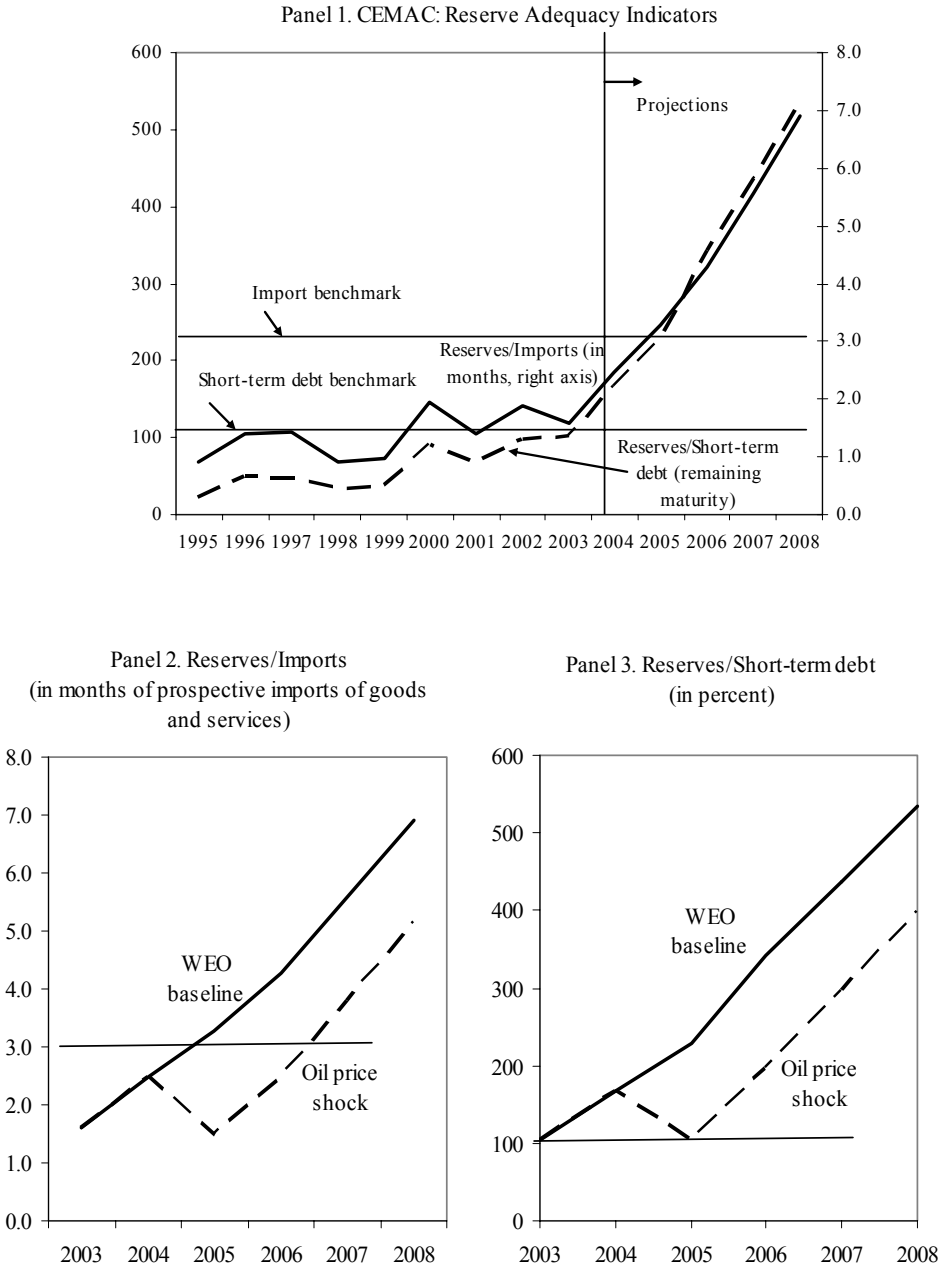


Panel 4. WAEMU: Reserve Assets, 1995-2005
(in millions of U.S. dollars unless otherwise indicated)



Source: WEO and IMF staff calculations.

Figure 2. Projected Reserve Adequacy Indicators



Source: WEO and IMF staff calculations.

Costs of holding reserves for the CEMAC

45. **Because holding reserves is costly, accumulation of reserves significantly in excess of the recommended level would not be advisable.** There is an opportunity cost of holding reserves in terms of foregone alternative investment opportunities, and increased exposure of the central bank's balance sheet to currency risk. In addition, past a certain level it is empirically not clear that a further build up helps reduce vulnerability, and rapid reserve accumulation may suggest an exchange rate misalignment and may lead to excess domestic liquidity expansion. Finally, the costs of sterilization and their impact on central bank profitability also have to be taken into account.

46. **The opportunity cost can be approximated by the difference between the rate of return on reserves and the interest payments on government or central bank borrowing**.[27] As central bank or government bonds have yet to be introduced in the CEMAC region, the closest approximation would be the rate charged by the BEAC on advances to governments. The rate of return on reserves has two components—the rate of return on reserves in the operations account and the rate of return on reserves managed by the BEAC itself. As of end-2004, 85 percent of BEAC's reserves were held in the operations account. The reserves on this account receive the European Marginal Lending Facility Rate (EMLFR).[28] The remaining 15 percent managed by the BEAC is invested in BIS, FED and OECD government papers.[29] As there is no separate information on the returns on those assets, it is assumed here that the totality of reserves is remunerated at the EMLFR.

47. **By that measure, the opportunity cost of holding reserves for the BEAC is relatively small**. The opportunity cost represents only about 0.2 percent of the region's GDP (Table 5). The sterilization cost, as measured by the difference between the average return on reserves and the cost to full sterilization, is even smaller. The interest rate used to calculate the sterilization cost is the rate on liquidity withdrawals ("taux des appels d'offres négatifs"), whereby the central bank can

Table 5. CEMAC: Opportunity Cost of Holding Reserves
(in millions of U.S. dollars unless otherwise indicated)

	1999	2000	2001	2002	2003	2004
Average Reserves	573.6	957.1	1,231.1	1,410.8	1,793.3	2,548.5
EMLFR (in percent)	4.0	5.8	4.3	3.8	3.0	3.0
Rate on Treasury Advances (%)	7.3	7.1	6.9	6.4	6.3	6.0
Rate on liquidity withdrawals (%) 1/	3.0	3.4	3.7	3.2	2.2	2.0
Opportunity Cost 2/	18.9	13.2	32.3	37.2	59.2	76.5
As a percent of GDP	0.10	0.07	0.16	0.16	0.20	0.21
Opportunity Cost 3/	5.83	22.16	7.23	8.29	14.74	25.17
As a percent of GDP	0.03	0.11	0.04	0.04	0.05	0.07

Sources: BEAC, WEO and IMF staff calculations.

1/ Sterilization cost, measured as rate on liquidity placements at 28 days.
2/ Difference between the return on reserves and the rate on Treasury advances.
3/ Difference between the return on reserves and the cost of sterilization-liquidity withdrawals ("appels d'offre négatifs).

[27] See Hviding and Ricci, Espinosa-Vega and Vera Martin (2004).

[28] From 1999 onwards.

[29] With technical assistance from the Fund, a trading room was recently established and investment policy is progressively becoming less conservative.

hold part of commercial banks' excess liquidity. However, these operations are not very successful at mopping up excess liquidity (even in the presence of capital controls)—possibly due to the low rate of return offered to banks—pointing to the necessity of introducing alternative monetary policy instruments such as central bank bills.

Balance sheet vulnerabilities

48. **Aside from official external debt, foreign currency exposures in the CEMAC are moderate.** In addition, external debt has been steadily declining over the last decade, due to regional GDP growth and debt reduction in some countries in the context of the enhanced HIPC Initiative.[30] Based on current WEO assumptions, the reserves to short-term debt ratio are therefore projected to reach 170 percent by end-2005. Due to the lack of market access, non-financial private sector's foreign currency exposures are small, although the lack of information on private external debt prevents an accurate diagnostic. As banks are not allowed to hold FX deposits or to make FX loans, the foreign currency exposure of the financial sector is not very significant. It is not possible to assess the region's overall FX exposure as CEMAC members do not yet report data on their net international investment position (Table 6).

Table 6. CEMAC and WAEMU: Foreign currency exposures
(In millions of U.S. dollars unless otherwise indicated)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
CEMAC										
Net foreign assets of the Central Bank	195.2	438.5	514.4	150.4	177.7	833.7	652.5	1,113.8	1,300.4	2,560.1
Net foreign assets of commercial banks	41.6	38.9	34.1	36.3	31.2	28.9	27.4	32.6	39.3	42.3
Total external debt	19,482.7	19,709.6	18,930.2	18,823.6	19,549.7	17,725.7	17,577.6	17,141.5	19,341.0	16,394.6
of short-term debt 1/	2,177.2	1,590.5	1,832.8	1,647.0	1,581.1	1,429.4	1,696.8	1,708.4	1,847.9	1,913.5
Memorandum items (in percent of GDP):										
Total public external debt	107.8	98.3	99.1	101.7	102.2	89.0	86.5	75.3	66.8	44.9
WAEMU										
Net foreign assets of the Central Bank	1,325.0	1,448.6	1,595.4	1,658.0	1,482.9	1,989.0	2,664.2	4,295.9	5,627.2	6,288.1
Net foreign assets of commercial banks	172.5	161.4	141.1	150.3	129.4	119.9	113.5	135.1	162.7	175.5
Total external debt	28,937.7	29,335.5	27,101.6	24,480.7	24,197.2	24,166.1	23,976.0	25,272.0	26,027.2	26,590.0
of short-term debt 1/	5,022.6	4,682.8	5,040.3	1,725.2	1,590.0	925.8	1,334.6	1,335.4	1,534.4	1,360.8
Memorandum items (in percent of GDP):										
Total public external debt	108.0	101.8	98.3	82.1	81.9	93.1	88.8	84.8	69.5	61.6

Source: WEO, IMF staff calculations.

1/ On a remaining maturity basis.

[30] Cameroon, Chad, the Central African Republic and Congo are HIPC-eligible, and Cameroon and Chad have already benefited from interim debt relief in the context of the initiate.

Managing oil-related inflows

49. **The repatriation requirement for FX proceeds, combined with the pooling of reserves at the BEAC, implies that most of the region's oil inflows add to BEAC's reserves**. As a counterpart, CEMAC governments build up CFA deposits at the BEAC. However, remuneration on these deposits is currently low. Such remuneration is linked to the amount of outstanding advances provided by BEAC (each year member states can draw up to 20 percent of the preceding year's revenue). Only the portion of deposits in excess of these advances can be remunerated at the rate of 1.7 percent,[31] and in practice only Equatorial Guinea and Gabon have such an excedent. In view of the likely further increase in their deposits related to oil inflows, some member countries are concerned about this lack of remuneration in view of the need to preserve the value of their oil wealth.

50. **The BEAC intends to address these concerns by providing an operational framework establishing remunerated Funds for Future Generations (FFGs) and Stabilization Funds (SFs).** In 1998, the CEMAC Ministers agreed on the necessity to generate savings out of oil revenues and to establish FFGs. Chad, Equatorial Guinea, and Gabon established such funds, outside of the BEAC for Chad and Equatorial Guinea, and in the form of an account at the BEAC but with minimal contributions in the case of Gabon. Concerned about the need to maintain the principle of reserve pooling, in 1999 CEMAC Ministers agreed on further implementing rules for the funds for future generations and on the creation of Oil Revenue Stabilization Funds.[32] According to these rules, which were formally adopted by BEAC's Administrative Board on July 12, 2001, the funds would be established at the BEAC and would be remunerated.

51. **The impact of these schemes on reserve adequacy and BEAC's profitability is yet unclear.** Regarding SFs, the FX resources would continue to be channeled through the operations account, and should thus have no impact on reserves. The net remuneration offered by BEAC on the CFA counterpart (2 percent) would represent an additional cost to the BEAC. The total impact would depend on the size of the contributions to SFs by CEMAC members (mostly Chad, Equatorial Guinea, and Gabon). FFGs, however, should not be considered part of monetary reserves as they have a long-term orientation and the assets they invest in would not be recommended as best practice for the investment of monetary reserves. In addition, the FX assets should be the property of the member states, and for that reason as well would not be considered part of the pooled reserves.

52. **In the case of Chad, the BEAC has already agreed on a set of conventions establishing a stabilization fund and a fund for future generations (see Box 3).** A simple estimation of the possible impact on BEAC's reserves of the establishment of FFGs in all

[31] As of January 20, 2005.

[32] CEMAC Ministerial Committee, *Note d'Orientation sur la Mise en Oeuvre des Fonds de Réserve pour les Générations Futures et du Mécanisme de Stabilisation des Recettes Budgétaires* September 20, 1999.

CEMAC oil exporters on the same terms as Chad has been conducted. The estimation assumes for simplicity that savings start in 2004. [33] The Chadian decree specifies that 10 percent of all royalties and dividends received by the state would be allocated to the FFG. This is similar to the conditions set in the Gabonese law establishing a FFG, passed in July 1998.[34] Assuming that all CEMAC oil exporters would implement a savings scheme on the same terms, the projected impact on reserves and reserve adequacy indicators would be rather small (Table 7).[35]

53. **However, the optimal savings profile for, and size of, an FFG will differ across countries.** They depend, inter alia, on each country's set of intergenerational preferences, its phase in the oil production cycle, the projected size of oil reserves, its absorptive capacity and initial level of external indebtedness (Davis et al., 2001, Gereirat, 2005, Katz, et al., 2004). These variables are different for each CEMAC oil producer, and a simple, homogeneous savings rule is unlikely to yield an optimal result. In particular, there are important benefits to saving more early in the production cycle, when revenues are high. Whereas a discussion on the optimal size of FFGs for CEMAC countries is beyond the scope of this paper, allowing more flexibility in the savings profile will be beneficial. Looking at the baseline profile of reserve accumulation and projected oil revenue, larger savings could be accommodated—provided reserves remain at an adequate level (Table 7).

[33] The convention on the establishment of a fund for future generations has not yet been finalized but the main modalities are not expected to change much—the outstanding issue was the rate of remuneration paid to Chad and the management fee of the BEAC.

[34] The Gabonese law established an FFG with a minimum capital of CFAF 500 billion. Until the minimum capital is reached, 10 percent of projected baseline oil revenues are saved in the fund, and 50 percent of oil revenues exceeding the baseline projection contained in the budget (half of the oil windfall). Once the minimum capital is reached all of the oil windfall would be placed in the fund. As of end-2004, the outstanding FFG balance was of CFAF 55 billion (Gereirat, 2005).

[35] These assumptions are however likely to overestimate the actual impact, as total revenue might also include indirect oil revenue (income tax and profit tax) depending on individual countries' definitions. In addition, it is not clear at this point whether all CEMAC oil exporters would agree to participate in such a scheme.

Table 7. CEMAC: Impact of Funds for Future Generations on Reserves
(in millions of U.S. dollars unless otherwise indicated)

Current projections:	2003	2004	2005	2006	2007	2008
Reserves	1,908.3	3,188.7	4,284.9	5,519.7	7,254.9	9,116.9
Reserves/Imports 1/	1.6	2.5	3.3	4.3	5.6	6.9
Reserves/Short-term debt 2/	103.3	166.6	229.1	342.2	435.9	533.8
With Fund for future generations=10 percent of projected CEMAC oil revenues						
Size of Fund for future generations	0.0	211.4	502.3	799.7	1,100.5	1,394.7
Reserves	1,908.3	2,788.5	3,697.1	4,919.0	6,647.0	8,522.6
Reserves/Imports 1/	1.6	2.5	2.8	3.8	5.1	6.5
Reserves/Short-term debt 2/	103.3	166.6	197.7	305.0	399.3	499.0
With Fund for future generations=30 percent of projected CEMAC oil revenues						
Size of Fund for future generations	0.0	634.1	1,507.0	2,399.0	3,301.6	4,184.0
Reserves	1,908.3	2,554.5	3,412.1	4,627.7	6,352.3	8,234.5
Reserves/Imports 1/	1.6	2.0	2.6	3.6	4.9	6.2
Reserves/Short-term debt 2/	103.3	133.5	182.4	286.9	381.6	482.1

Sources: WEO and IMF staff calculations.

1/ In months of prospective imports of goods and services.
2/ In percent of short-term debt on a remaining maturity basis.

F. Conclusion

54. **Whereas reserves are currently at their highest level in a decade and statutory indicators are exceeded by a large margin, standard indicators of reserve adequacy such as the ratios of reserve to imports and to short-term debt remain on the low side**. Taking into account the impact of oil price fluctuations on the current account, it is suggested that reserves for the region should cover at least 5 months of imports and about 250 percent of short-term debt on a remaining maturity basis in order to withstand a one-standard deviation fall in oil prices in any given year.[36] Going forward, an important challenge for the BEAC will be to manage the large projected oil inflows. Both the introduction of central banks or treasury bills to better sterilize the excess liquidity and the establishment of funds for future generations would be helpful. However, the amount of FX resources going outside the reserve pool into special funds would have to take into account the need to maintain adequate reserves.

[36] Using the 10-year standard deviation.

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III. Assessing External Competitiveness in the CEMAC Region[37]

A. Introduction

55. **The constraints of a fixed exchange rate regime require careful attention to maintaining competitiveness.** The 1994 devaluation of the CFA franc was brought about by a prolonged deterioration of the terms of trade of the countries of the CFA franc zone, a steep rise in the countries' labor costs, and a nominal appreciation of the French franc against the U.S. dollar, all of which resulted in an overvalued exchange rate.[38] The devaluation was instrumental in strengthening the competitiveness of the CEMAC and WAEMU countries, and, together with prudent macro policies and structural reforms, helped GDP return to positive growth rates.[39] A decade later, an assessment of whether these competitiveness gains have been preserved or eroded is warranted.

56. **This chapter examines the evolution of competitiveness in the CEMAC region—as compared with the WAEMU.[40]** While a comprehensive assessment is complicated by the predominance of oil exports and by the weak statistical databases of some member countries, the analysis is based on a range of traditional indicators for which data are available, complemented by non-traditional, including survey-based, indicators. Results show a mixed picture of competitiveness in the CEMAC region. On the one hand, evidence of improvements includes the terms of trade and recent improvements in export profitability in the oil sectors. On the other hand, the real appreciation of the CFAF, stagnant or falling export market shares, declines in profitability and market shares of non-oil exports, unfavorable business climate indicators and structural rigidities are signs of competitiveness erosion, as well as Dutch disease.

57. **The paper is organized as follows**: Section B presents the definitions and measures of competitiveness. The analysis of competitiveness starts with the traditional macroeconomic exchange rate and terms of trade measures of competitiveness in Section C. Next, Section D analyzes export performance, market shares and profitability. Continuing the analysis on exports, it also discusses the diversification and input content of exports. Section E looks at some non-traditional descriptive measures of competitiveness in terms of business climate. Section F concludes and discusses policy recommendations.

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[37] Prepared by Corinne Deléchat and Charalambos Tsangarides.

[38] The fixed exchange-rate regime of the CFA franc (CFAF) was adopted by the CFA franc zone countries in 1948. The franc zone countries include the eight members of the West African Economic and Monetary Union (WAEMU) and the six members of the Central African Economic and Monetary Union (CEMAC).

[39] The 50 percent devaluation in January 1994 was the only change in the exchange rate peg. Since the introduction of the euro in 1999, the CFAF has been pegged to the euro at CFAF 655.957 per €1.

[40] Given data constraints, the WAEMU region was used primarily for comparison purposes. A more thorough investigation is required to draw conclusions about the CFA region as a whole.

B. Definitions and Measures of Competitiveness

58. **External competitiveness is broadly defined as the ability of a country to operate efficiently and productively in relation to other countries. This involves raising its level of productivity, its ability to export its goods and services and maintaining high living standards for its citizens**. From a macroeconomic perspective, competitiveness is defined as the degree to which a nation can produce goods and services, which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term, under free trade and fair market conditions (OECD, 1992). At the microeconomic level, competitiveness is the capacity to sell one's products profitably. To be competitive, a firm (and by extension, a country) must be able to undercut the prices or offer products of better quality (or with better service) than its competitors (Cockburn et al., 1998).

59. **Traditional indicators of competitiveness refer to two related concepts of external competitiveness.** They measure either (a) the extent to which traded goods and services can compete with traded goods and services of other countries, both at home and abroad; and (b) the extent to which production of traded goods and services is attractive relative to the production of non-traded goods and services. Specific exchange-rate-based indicators include nominal effective exchange rates, real effective exchange rates based on consumer price indices, export unit values, the relative price of traded goods to nontraded goods, normalized unit labor costs in manufacturing, and the ratio of normalized unit labor costs in manufacturing to value-added deflators (Lipschitz and McDonald, 1991; Marsh and Tokarick, 1994).[41] In addition, for commodity-exporting developing countries, relative commodity price movements and thus terms of trade changes have been found to be an important determinant of real exchange rate movements (Cashin et al., 2004).

60. **Other traditional indicators of competitiveness include measures of the evolution of export flows, market shares and overall export profitability.** Strong export growth (if it is not associated with equally strong import growth), expansion in export market shares, and increasing export diversification all indicate improvements in competitiveness. Such trends are also usually associated with increasing profitability of exports, measured either as falling unit costs or increasing value added. These indicators also have the advantage to be available for most countries, with the exception of unit costs (see above) and sectoral value added. In the latter case alternative measures can be constructed, such as the ratio of exports to an index of wages or to various GDP deflators. For oil exporters, however, it is also important to look separately at the performance of non-oil exports, as export growth and profitability tend to be driven by developments in international oil prices rather than domestic factors, and as one expects the non-oil sector to exhibit "Dutch disease" symptoms.

[41] Unit labor costs are used as an indicator of competitiveness and profitability of the manufacturing sector in countries where salaries constitute an important cost of production.

61. **Indicators of the business climate are useful non-traditional complements to the above measures.** As they provide information on the nature of structural obstacles to competitiveness, they are also of direct use to policymakers. This paper considers FDI flows, financial deepening and survey-based indicators of the investment climate. FDI flows reflect the attractiveness of a country's investment climate and tend to be correlated with increases in exports. Financial deepening indicators provide information about the cost and access to credit. Finally, survey-based indicators of the business climate and governance represent indirect or hidden costs of production, such as an inefficient or unpredictable legal and institutional framework (involving corruption, red tape, the inability to enforce contracts, etc.). Unfortunately, only few of these surveys cover most CEMAC countries. The ones with the better coverage are the World Bank's Doing Business project and the World Governance Indicators of Kaufmann et al. (Box 1).[42]

C. Real Effective Exchange Rate and Terms of Trade Measures

Real effective exchange rate

62. **The devaluation of the CFA franc in 1994 corrected the overvaluation of the currency and improved the CFA region's external competitiveness**. The evolution of the region's real effective exchange rates (REER's)[43] in the aftermath of the January 1994 devaluation can be divided into three phases (Tables 1a and 1b and Figures 1a and 1b) : (i) from January 1994 to December 1998 the REER's appreciated rapidly due to the surge in

Table 1a. CEMAC: Real Effective Exchange Rate and its Components (in percent)

	Jan 1994-Dec 1998	Jan 1999-Dec 2000	Jan 2001-Dec 2004
Percentage change			
Real effective exchange rate	50.8	-11.3	15.6
Nominal effective exchange rate	15.0	-8.6	12.0
Relative Price Index	31.7	-2.4	1.1
Cumulatively			
Real effective exchange rate	42.6	-9.8	18.4
Nominal effective exchange rate	14.2	-7.4	14.5
Relative Price Index	28.6	-1.8	1.6

Source: IMF, INS and Fund staff calculations.

Table 1b. WAEMU: Real Effective Exchange Rate and its Components (in percent)

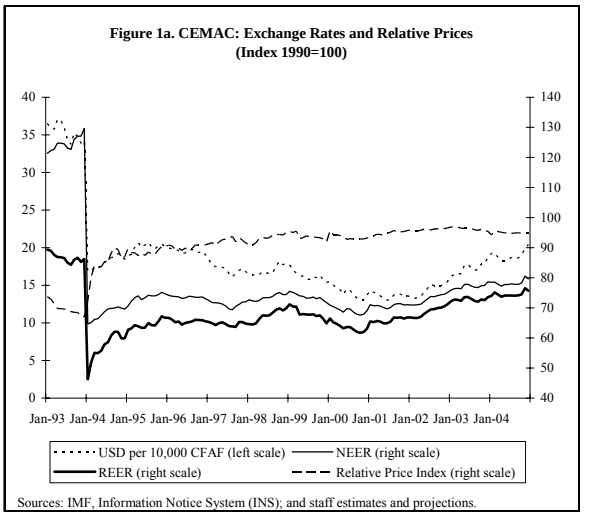
	Jan 1994-Dec 1998	Jan 1999-Dec 2000	Jan 2001-Dec 2004
Percentage change			
Real effective exchange rate	35.4	-8.8	10.1
Nominal effective exchange rate	13.2	-8.1	11.1
Relative Price Index	25.4	-0.2	-2.3
Cumulatively			
Real effective exchange rate	31.0	-8.8	12.2
Nominal effective exchange rate	12.7	-8.2	12.2
Relative Price Index	23.0	0.7	-2.7

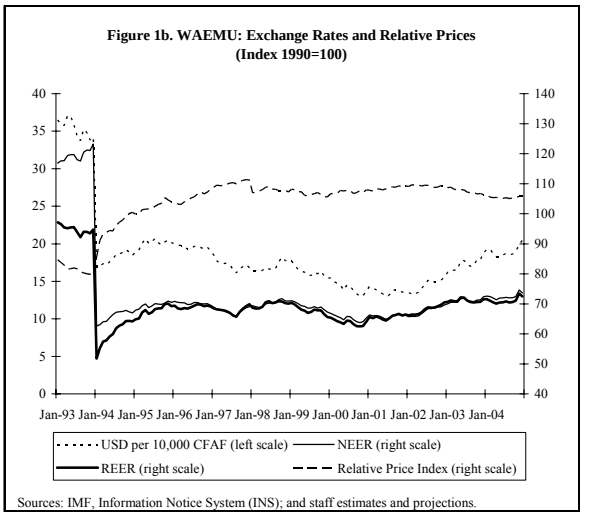
Source: IMF, INS and Fund staff calculations.

domestic wages and prices following the devaluation; (ii) a short period of depreciation during January 1999 to December 2000 driven by the decline in the terms of trade resulting from declines in key export commodity prices and an increase in oil prices for WAEMU and increases in key import commodity prices (which outweighed the increase in oil prices) for

[42] Competitiveness surveys are conducted by the World Economic Forum (Global Competitiveness Report), the International Management Development Institute (World Competitiveness Yearbook), and the World Bank (Doing Business). Indicators of governance such as those developed by Kaufmann, Kraay and Mastruzzi (2004) and Transparency International (perceptions of corruption index), also cover an important dimension of competitiveness.

[43] Unless indicated otherwise calculations of the REER's are based on relative CPIs.





CEMAC, as well as the slowdown in the world economy; and (iii) January 2001 until present, with the REER's appreciating, mainly due to the strengthening of the euro against the U.S. dollar. The large increase in oil prices over that period has so far failed to translate into higher inflation in the region, partly due to simultaneous offsetting factors such as the nominal exchange rate appreciation, low food prices and the increase in government deposits at the BEAC.

63. **Since 1994, for the CEMAC the real effective exchange rate ($REER_C$) has appreciated cumulatively by about 33 percent through December 2000, and by a further 18 percent from January 2001 to December 2004,** with the latest appreciation essentially due to the strengthening of the euro to which the CFA franc is pegged. By December 2004, $REER_C$ was at 88 percent of its pre-devaluation level. For the WAEMU region, the real effective exchange rate ($REER_W$) has appreciated cumulatively by about 22 percent through December 2000, and by a further 12 percent from January 2001 to December 2004, with the latest appreciation essentially due to the strengthening of the euro to which the CFA franc is pegged. By December 2004, the $REER_W$ was at 76 percent of its pre-devaluation level.

64. **Looking at the member countries of each region, we observe significant variations around the regional averages.** In the CEMAC region, there was a somewhat wider variance of REERs compared to WAEMU partly as a result of the emergence of new oil producers. Equatorial Guinea had the highest appreciation (114 percent of its pre-devaluation level) and Gabon the lowest appreciation (74 percent of its pre-devaluation level). In the WAEMU region, Benin has experienced the highest appreciation since the 1994 devaluation and Senegal the lowest, with their REERs reaching 61 percent (Senegal) and 92 percent (Benin) of their pre-devaluation levels.