IMF WORKING PAPER

WP/88/108

INTERNATIONAL MONETARY FUND

Research Department

The Stabilizing Role of the Compensatory Financing Facility: Empirical Evidence and Welfare Implications

Prepared by Manmohan S. Kumar */

Authorized for distribution by Roger Pownall

December 21, 1988

Abstract

Purchases under the compensatory financing facility, the IMF's largest special facility, accounted for more than one quarter of total credit extended by the IMF over the period 1976 to 1985. Given the size of these operations, it is of some interest to determine to what extent the facility served its intended purpose--the stabilization of foreign exchange earnings of member countries experiencing temporary export shortfalls. This paper develops a methodology for evaluating the CFF's stabilizing role and provides some quantitative evidence of its effectiveness. This evidence is then used to obtain an indication of the facility's role in stabilizing the demand for international reserves and its contribution to net welfare gain. The results suggest that the facility has been important in stabilizing members' earnings, and that the net benefits derived by them can be regarded as substantial.

JEL Classification Numbers:
120, 130, 430, 440

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*/ I am grateful to Mr. Nihad Kaibni for suggesting this topic. I am also indebted to Mr. Roger Pownall and Mr. Blair Rourke for some very constructive comments. The usual caveats apply.

Contents

Text Tables

Contents Page

Annex Tables

Summary

This paper analyzes the role of the compensatory financing facility in stabilizing foreign exchange earnings. It might be expected, a priori, that the stream of export earnings for a country using this facility would be more stable than export earnings without it. This paper subjects this expectation to empirical verification by developing and utilizing a methodology that provides an indication of the stabilizing role of the facility. The results are used to examine the impact on reserve requirements and to compute a measure of welfare gain from the facility.

Data for 79 countries (192 compensatory financing facility cases) show that the interval between the end of the shortfall year and purchases under the facility averaged less than three months. This suggests that the facility may well have had a stabilizing influence. A detailed investigation indicates that the facility led to an improvement in the stability of earnings on the order of 5 percent. While its magnitude may be considered small in absolute terms, the improvement is statistically significant, and, given that it is averaged over 11 years, it is also significant from an economic point of view. The study then examines the robustness of these results to alternative rules for adding purchases to export earnings. Although the magnitude of their effect on stabilization differs, the above conclusions remain generally valid.

The study also examines the economic significance of the decline in instability through a detailed analysis of the difference likely to have been made to the countries' reserve requirements. A demand function for international reserves, with instability as an explanatory variable, is estimated for a large sample of countries, and from this it is deduced that the compensatory financing facility could have led to an average saving of 7 percent in reserves. A second exercise uses a standard welfare framework to analyze the welfare gain to countries from reduced earnings instability. This gain consists of the benefit from reduced instability as well as the concessional rate of charge on purchases from this facility. Although the results are sensitive to assumptions regarding the countries' degree of risk aversion, it appears that on average there was a gain to the members.

I. Introduction

This paper examines the role of the compensatory financing facility (CFF) of the International Monetary Fund in stabilizing export earnings. The compensatory financing facility was in operation between 1963 and August 1988. On August 23, 1988 the Fund established a new facility called the compensatory and contingency financing facility (CCFF). While retaining the basic features of the CFF, the new facility also includes a contingency element for use in Fund supported adjustment programs (see Stuart and Pownall, forthcoming). Although use of the CFF was modest in the earlier years, over the period 1976 to 1985 drawings averaged more than one quarter of total credit extended by the Fund. Given the size of these operations, it is of some interest to inquire whether, and to what extent, the facility has served its intended purpose of stabilizing the foreign exchange earnings of member countries experiencing temporary export shortfalls. The main objective of the paper is to provide some quantitative estimates of the stabilizing role of the facility. In addition, the paper uses these estimates to obtain an indication of the CFF's role in stabilizing the demand for international reserves and the wider welfare implications of the facility.

The paper is organized as follows: Part II provides a brief discussion of the evolution and operation of the facility and of why a stabilizing role is to be expected. Part III suggests a methodology which can be used to examine empirically this stabilizing role; this is followed in Part IV by a series of statistical exercises to ascertain the significance of this role. In Part V the paper then examines the implications of the empirical results for reserve requirements of countries using the facility and its wider welfare implications. A last section summarizes the main empirical findings and conclusions of the study.

II. CFF and Its Stabilizing Role

1. Main features of the facility

The main purpose of the compensatory financing facility is to provide timely financial assistance to members experiencing temporary shortfalls in their export earnings due to factors outside their control. The CFF is open to all Fund members but in practice it has been used mainly by developing countries. In order to qualify for a purchase a member must meet several conditions. First, as with the use of all Fund resources, there is a general requirement of a need for the drawing. This is assessed by reference to the country's overall balance of payments position, its reserve position and developments in its reserves. A member must also demonstrate that it has experienced a temporary shortfall in its aggregate export earnings in the sense that a deviation in earnings from their medium-term trend will be of short duration. 1/ In addition, the shortfall has to be attributable to circumstances largely beyond the member's control, which means that the shortfall is not due to inappropriate economic and financial

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1/ See, for example, Goreux (1980).

policies of the member. The member must also be willing to cooperate with the Fund.

Since 1966 access under the CFF has been in two tranches. The first tranche is available to members demonstrating a willingness to cooperate with the Fund in an effort to find, where required, appropriate solutions for their balance of payments difficulties. The second tranche is available to members that have been cooperating with the Fund. The cooperation requirement has been a feature of the facility since its establishment and in 1983 formal guidelines were set out on use of the lower tranche--up to 50 percent of quota--and the upper tranche--up to 83 percent of quota. 1/ The amount of drawing is constrained by the size of the calculated shortfall, subject to a limit on outstanding drawings in relation to the member's quota. Following approval of a request by the Fund's Executive Board, a drawing is made in one installment and normally repaid in eight equal quarterly installments spread over the fourth and fifth years after the drawing. The rate of charge on outstanding CFF drawings is the same as that applied to other drawings from the general resources of the Fund.

The major use of the CFF has been to compensate for shortfalls in merchandise exports. 2/ The shortfall is computed in relation to a medium-term trend which is defined as an average of value of earnings (in SDRs) for five years including two years of projected exports centered on the shortfall year. Since 1979, the export trend has been based on a geometric average rather than on an arithmetic average used in the earlier years. The calculations have always been done on the basis of nominal rather than real values. 3/ The maximum CF drawings that a member may have outstanding at any time in relation to its quota has been changed on several occasions, usually as a result of reviews of the facility by the Executive Board. Since 1984, the maximum limits have been 83 percent of quota for an export shortfall or an excess in cereal import costs with a joint limit of 105 percent of quota for the two elements.

Total drawings under the CFF have been quite substantial. While use of the CFF in the early years of the facility was modest, during 1976-85 annual drawings averaged SDR 1.3 billion, that is, more than one quarter of

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1/ Selected Decisions, IMF (1987), pp. 88-89.

2/ In 1979 coverage of the CFF was expanded to give countries the option of including earnings from workers' remittances and tourism in the calculation of the earnings shortfall. In 1981, it was further extended by permitting the optional inclusion of a temporary excess (an increase) in the cost of commercial cereal imports. This provision was introduced for a period of four years and renewed in 1985 for four additional years. Under the cereal decision the amount of a drawing is calculated as the sum of the export shortfall and cereal import increase subject to limits on outstanding drawings in relation to quota.

3/ For a rationale, and its operational significance, see Goreux (1980), pp. 5-7, and Kumar (1987).

total credit extended by the Fund. For individual years over this period, drawings fluctuated between SDR 241 million in 1977 to SDR 2,839 million in 1983. The share of CF drawings in total Fund credit did, however, decline from about 30 percent during 1976-79 to about 23 percent in 1980-85, as Fund assistance under the credit tranches in support of adjustment programs grew considerably faster than that under the CFF during the latter period.

In analyzing the stabilizing influence of these drawings, it is worth noting that in recent years, the balance of payments difficulties of countries using the CFF have tended to reflect imbalances that go beyond the effects of export shortfalls. The result was that an increasing number of requests for use of the CFF had to be considered in conjunction with Fund-supported adjustment programs; at the same time, the proportion of drawings in the upper CF tranche also increased. Of the 73 CF drawings made from 1982 to 1985, 44 drawings were in the upper tranche, and all but one of these were associated with Fund programs either in place at the time of the CFF request or approved concurrently with the CFF request. Of the 29 lower CF tranche drawings, 9 were also associated with Fund programs but in these 9 cases, the size of the shortfall, and not the test of cooperation, was the factor limiting the drawings to the lower CF tranche (see Kaibni (1986)).

2. The expectation of a stabilizing role for the CFF

A stabilizing effect may be taken to mean a reduction in the extent of fluctuations in foreign exchange receipts with transactions under the CFF than would have been the case without the transactions. Purchases under the CFF can be regarded as supplementing earnings from merchandise exports while repurchases diminish such earnings. While the magnitude of purchases has always been determined in relation to a member's quota, with the consequence that purchases have not necessarily been sufficient in all cases to compensate for export shortfalls, the timing of these purchases and associated repurchases in relation to the profile of exports over time are the crucial factors in an assessment of the stabilizing role of the facility.

There are a number of aspects of the CFF which suggest a stabilizing influence. First, once a shortfall is identified, the member's request can be processed relatively quickly. Secondly, since 1979 the shortfall year may include projected exports for up to six months if it is expected that a shortfall will emerge, thus increasing the timeliness of assistance. Thirdly, as noted above, the computation of the shortfall is not based on past data alone but is calculated as a deviation from trend using two years of projected exports. An accurate identification of the shortfall profile would thus enhance the stabilizing effect of the CFF.

There are, however, a number of other facets of the facility which might act to destabilize earnings. First, CF purchases may take place up to six months after the end of the shortfall year, with the effect that the time lag between the middle of the shortfall year and the purchase could be up to one year. Secondly, repurchases under the facility are usually made in equal quarterly installments during the period beginning three years and

ending five years after the date of purchase--a time frame which may or may not correspond to an upturn in export receipts. Thirdly, if there are large errors in the forecasts for exports for the two post-shortfall years, purchases may have taken place in periods with export excesses rather than shortfalls, thereby destabilizing receipts.

III. Methodology

1. Basic framework

In order to assess empirically the stabilizing influence of the facility, the basic methodology is to compute for the countries which have made CF purchases an index of exports instability without CF transactions. This is then compared with an index which takes into account CF purchases and another that includes both purchases and repurchases.

More formally, let the export earnings of country i in years 1 to t be given by the vector $\tilde{X}i$

$$\text{where } \tilde{X}i = X_{i1}, X_{i2}, X_{i3}, \ldots X_{it} \qquad (1)$$

Denote an index of instability computed from these earnings by I_i

$$\text{where } I_i = f(\tilde{X}_i) \qquad (2)$$

$$\text{and } I_i > 0$$

Export earnings with CF purchases are then

$$\tilde{X}_i^P = X_{i1}, X_{i2}, X_{ik} + S, \ldots X_{it} \qquad (3)$$

where S is the amount of CF purchase made in period k.

An index based on X_i^P is denoted by

$$I_i^P = f(\tilde{X}_i^P) \qquad (4)$$

The null hypothesis H_o that purchases exercise no stabilizing influence can then be stated as follows:

H_o: $I = I^P$ with the alternative hypothesis H_1 being

H_1: $I > I^P$

$$\text{where } I = \sum_{i-1}^{n} I_i \quad \text{and } I^P = \sum_{i-1}^{n} I_i^P$$

and n denotes the number of countries which have made the purchases.

Similarly, with purchases and repurchases an index of instability can be computed and compared with I.

This methodology is relatively straightforward and allows one to focus on the difference made to instability of earnings by transactions under the CFF. 1/ This difference would, as noted, depend on the speed of making the application, the time taken to analyze the request, the accuracy of forecasts, and the timing of the repurchase profile. If the stabilizing effects dominate, instability without the CFF would be significantly higher than with CFF. In the discussion below a number of different indexes which may be used to measure instability, and the appropriateness of each for this empirical exercise, are examined. The variables which can be used to measure instability are also noted and alternative schemes for allocating drawings to export are considered.

2. Reference earnings

Before discussing the above issues, an important element of methodology needs to be given some attention. This concerns the use of actual export earnings streams, X_i, as the reference by which to evaluate the facility's stabilizing role. It may be argued that the profile of these earnings (without CFF transactions) already reflects the possibility of obtaining compensatory finance and that the "true" reference earnings, which are unobservable, would have been different. Given this, an accurate indication of the CFF's stabilizing role would require an estimate of export earnings which would have occurred in the absence of the CFF. This problem is similar to the one encountered in trying to evaluate the impact of Fund programs and, as the recent studies on this suggest, it is far from straightforward to obtain the counterfactual outcome against which the magnitude of this impact can be assessed. (For a comprehensive discussion of this, see Khan and Knight (1985), Goldstein (1986), and Goldstein and Montiel (1986)). 2/

There are, however, two considerations noted in Part II above which suggest that, in the case of the CFF, the use of X_i as reference series may not necessarily impart a bias. The first is that, because of the 'test of cooperation', a country cannot be assured with any degree of certainty, that it will be able to make a CF purchase; even when the test of cooperation is likely to be met, the amount of purchase cannot be known beforehand. It is unlikely, therefore, that a country's export profile would be affected simply as a result of the existence of the CFF. The second, and clearly related, consideration is that CFF purchases can only be made if the export shortfall is largely beyond the member's control. If it is determined that the shortfall is in fact due to policy actions, purchases under the facility would not be allowed. These two considerations suggest that apart from ar y

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1/ A somewhat similar methodology was used by Hermann (1983).

2/ This problem of estimating the counterfactual is of considerable general significance. For its application in the area of capital investment, for example, see Kumar (1984), ch. 5.

very minor "window dressing," it is rather unlikely that the "true" earnings streams would have been different from "observed" earnings. Thus, as far as the use of "reference" earnings is concerned, the use of the above approach would appear to be appropriate.

A related point concerns the cases, which as noted above have been frequent over the last few years, where the Fund's stand-by or other programs have accompanied CFF drawings. It is possible that the policies pursued under a program itself have an impact on the stability, and not just on the level, of export earnings. The issue again concerns the earnings stream to be taken as "reference." However, in view of the above discussion, it would also seem appropriate to continue to take the "actual" earnings as the reference, even though these may differ significantly from what the earnings may have been in the absence of the program.

3. Overcompensated cases

A second aspect of the methodology relates to the treatment of over-compensated cases. These are cases in which shortfalls turn out to have been overestimated and overcompensated 1/ in the light of ex-post export data. It could be argued that the inclusion of these cases may bias the results towards finding, on average, unduly small stabilizing effects. This is because in these cases, CF drawings may actually have had a destabilizing effect; when the drawings were made, export projections for the two post-shortfall years indicated a shortfall, whereas in reality there may have been no shortfall, or even an excess. Of course, to the extent that this study is concerned with actual drawings, it would not be appropriate to separate out the overcompensated cases. Nevertheless, in order to examine the role which forecasting errors might have played, an attempt is made below to examine these cases separately and use is made of "ex-post" drawings, that is, drawings which would have resulted had there been no error in forecasting exports.

4. Methodology for adding drawings to export earnings

A third aspect of the methodology concerns the time period over which purchases are regarded as supplementing export earnings. A number of different procedures can be used. One procedure would be to regard purchases as supplementing exports only over the drawing year. For instance, if the shortfall year was from January 1 to December 31, 1987, and the purchase was made on the April 1, 1988, the entire purchase would be added to export earnings in 1988. To the extent that a member cannot be certain of drawing under the CFF this procedure may appear appropriate. However, to the extent that the purchases may be anticipated somewhat, the benefit from purchases may be regarded as being available earlier than this--say over the shortfall year itself. In this second procedure purchases would be added to export earnings in 1987. (Since the shortfall

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1/ Not all overestimated shortfalls translate into overcompensated purchases, however, due to the effect of quota limits.

year may differ from the calendar year, the purchase can be added to the calendar year on a prorated basis.) 1/ A third procedure, and the preferred one for the exercise below, is to combine the above two procedures and to regard the purchases supplementing export earnings over the shortfall and the drawing year. The distribution of the purchases over the two years would be dependent on the interval between the middle of shortfall year and the drawing month. In the example above, this interval is nine months (the middle of the shortfall year is July 1, 1987 and drawing month is April 1, 1988); two thirds of the interval, (i.e. six months) lies in 1987 and one third in 1988. Hence under this procedure two thirds of the purchases would be considered to have been made in 1987 and one third in 1988. This is the main procedure used in the exercises below, but in order to test the sensitivity of the results, a comparison has been also undertaken with the first two procedures.

5. Instability indexes

A large number of indexes are available which could be used to measure instability in export earnings. 2/ The choice of an index, or set of indexes, is dependent on a number of specific factors which need to be taken into account given the nature of this analysis. The first is that a measure of export instability should be corrected for the trend in exports. This is to ensure that trend changes in export earnings are separated from a measure of the variability around that trend. Unless this is done any such measure will overstate the degree of instability. The problem arises when deciding on the length of the trend. Should it be as long as some business cycles present during the time interval under examination or should it include the entire time interval? If, say, on average the export cycle is five years, a trend based on some sort of 5-year moving average might be appropriate. 3/ If the export cycle is actually different from five years, then an index of this form is likely to under- or overestimate the instability present. The alternative to this would be to use longer time trend focused on the entire length of the sample interval, which in our case would be the 11-year period from 1975-85. Ideally, one should obtain an extraneous estimate of the business cycle for each country before deciding on the index. In the absence of such an estimate it can be argued that a 5-year moving average index would be preferable since it is a measure of short-run instability.

1/ For instance, suppose the shortfall year was from July 1, 1987 to June 30, 1988. Under this procedure, one-half of the purchase would be added to export earnings in 1987 and the other half to 1988. It is not suggested here that a member would be able to anticipate fully the benefits of the CFF, but rather to provide a benchmark for evaluating alternative procedures.

2/ See, for example, Manger (1979) who discusses no fewer than 18 separate indexes.

3/ See, for example, Fleming, et al (1963) and more recently Goreux (1977).

A second important factor is that although the CFF is concerned only with deviations below the trend line (i.e. shortfalls), for purposes of measuring instability, deviations both above and below the trend line should be taken into account. This is because deviations above the trend may be increased by repurchases, or even purchases if the lags between the shortfall and drawing are substantial. This can be done by either squaring the deviations or taking their absolute value. Thirdly, the measure of instability for any one year should be taken as a percentage of the trend value in that year. This should be done so that differences across countries in magnitudes of their exports do not influence the relative effect on export deviations.

Taking into account these three factors it appeared that it would be more appropriate to take a number of different indexes rather than only one to evaluate the magnitude of the stabilizing role of the CFF. To this end, the following three indexes were used in the analysis. The first index I_1 is computed as follows:

$$I_1 = \frac{100}{t} \times \sum_{i=1}^{t} \left| \frac{\bar{X} - Xi}{\bar{X}} \right| \qquad (1)$$

Where $\bar{X}$ = centered 5-year geometric moving average of export earnings

Xi = export earnings in the `shortfall' or `middle' year

t = number of years over which deviations from $\bar{X}$ are computed.

As (1) indicates, this index is based on the average of the annual absolute percentage deviations of exports from a centered 5-year moving average. In addition to satisfying the three requirements noted above, this index has the advantage of allowing for a non-linear trend. The lower the instability, the lower will be the value of the index, with the value of 0 indicating no instability.

A second index, I_2 is computed as follows:

$$I_2 = 100 \times \sqrt{\frac{1}{t} \sum \left(\frac{\bar{X} - Xi}{\bar{X}} \right)^2} \qquad (2)$$

Where $\bar{X}$, X, and t are as before. This index is identical to I_1 except that now the proportionate deviations from the trend are squared, and a square root taken of the mean of these. This is simply the "root mean square error" formula. It is worth noting that squaring the deviations weights gives larger values more than smaller ones. For example, using this index deviations of five in one year and zero in the next four will be considered more than twice as unstable as deviations of one in five

successive years. 1/ Using I_1 there will be no difference in the two cases. To the extent one may want to give bigger weight to larger deviations (2) would be appropriate. 2/ This index could be thus regarded as complementary to I_1.

A third index, I_3, is computed as follows:

$$I_3 = 100 \times \sqrt{\frac{\Sigma e_t^2}{t-2}} \Big/ \bar{X} \qquad (3)$$

Where e_t = residual from an exponential time trend

$\bar{X}$ = mean of export in the sample period.

To compute this index, first an exponential time trend of the form $\ell n\, X_{it} = \alpha_o + \alpha_1 t$ is fitted to export earnings X_{it} for the period 1975 to 1985. The squares of the residuals from this are then summed and taken as a proportion of mean of exports in the sample period. 3/ The main reason for using this index was to see if the use of a time trend over a long-run period yields results markedly different from those obtained by using a trend based on a 5-year moving average.

Each of these three indexes was first computed for the past CF cases without the CF transactions. The indexes were then recomputed with these transactions and the differences between the two sets of indexes examined. It might be argued that since the same index is examined with and without the CF transactions, the precise formula for the index is not particularly relevant. For a qualitative assessment, i.e., whether the difference was positive or negative this may be so; but for any quantitative assessment the formula, of course, does matter. This is particularly so in our case where the quantitative results are used to obtain an overall assessment of the facility.

The variable used in the analysis is merchandise export earnings expressed in SDRs. This is the same variable that is used in computing the shortfall and the variable which the CFF was designed to stabilize. It might be argued that analysis using alternative variables such as the foreign exchange reserves would be more appropriate since stability in these might appear to be more important than stability in the export earnings per se. In practice, however, it is rather difficult to undertake

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1/ This can be seen readily:

In the first case $I_2 = \left(\frac{5^2 + 4(0)^2}{5}\right)^{1/2} - \left(\frac{25}{5}\right)^{1/2} = \sqrt{5}$

In the second case $I_2 = \left(\frac{5(1)^2}{5}\right)^{1/2} - (1)^{1/2} = 1$

2/ Note also that for any $X>0$, $I_2 > I_1$.

3/ This index is similar to that used by Soutar (1977).

analysis using this variable due to its extreme variability. 1/ In Part V below, an attempt is, however, made to relate any gains in earnings stability to the demand for international reserves.

Finally, it should be noted that in the empirical analysis, calendar years are taken as the period of reference. This procedure was adopted because data on export earnings were available annually only on a calendar year basis. It is possible to interpolate data to obtain values on a monthly basis and to conduct the analysis in terms of the actual "shortfall" year rather than on the basis of calendar year. But in practice the procedures available for interpolations are highly mechanistic and are likely to introduce biases due to spurious smoothing out of seasonal fluctuations. 2/

IV. Empirical Results

1. Interval between shortfall and compensation

The empirical analysis was undertaken for the countries which had made CF purchases between January 1, 1975 and December 31, 1985. 3/ This included in all 79 countries that had made 192 purchases over the 11-year period. 4/ Before discussing the results of the exercise noted above, it is worthwhile examining the actual time interval between the shortfall period and the compensation payment. Other things given, the shorter this interval is, the greater the stabilizing role of the facility. Table 1 gives the number of cases with purchases with a given time lag, as well as the mean time lag. As it indicates, the (arithmetic) mean shows an average time lag between the end of the shortfall year and the date of compensation of 3.85 months for the period as a whole. The earliest payment came three months before because the purchase was made under the early drawing provision, and the latest payment nine months after the end of the shortfall year. The majority of purchases took place within six months of the end of the shortfall year. Dividing the whole period into two, from 1975 to 1979 and 1980 to 1985, there is a marginal decline in the compensation intervals

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1/ A preliminary analysis was undertaken using this variable, but due to its extreme variability, even as a proportion of imports, the results were not very meaningful.

2/ Using procedures such as the quadratic interpolation yields hypothetical series which may bear no relationship to the actual series.

3/ As noted earlier, the facility was used extensively from 1975 onwards, following major changes in the operations of the facility. 1985 was chosen as the cut off date since, at the time the empirical analysis was undertaken, comprehensive data were available only up to that year.

4/ The total number of drawings over this period was 202, undertaken by 85 countries. However lack of sufficient data on 6 countries (10 drawings) precluded analysis for them.

Table 1. Interval Between Shortfall and Compensation, 1975-79 to 1980-85

	Period of Shortfall		
	1975-79	1980-85	1975-85
Number of cases with purchases			
Before and at the end of shortfall year	13 (12.4)	14 (16.1)	27 (14.1)
One to three months after the end of shortfall year	26 (24.8)	20 (23.0)	46 (24.0)
Four to six months after the end of shortfall year	47 (44.8)	40 (46.0)	87 (43.3)
More than six months after the end of the shortfall year	19 (18.1)	13 (14.9)	32 (16.7)
Total number of cases	105	87	192
Mean time lag (months)	3.91	3.78	3.85
Standard deviation	0.25	0.29	0.19
Earliest purchase (months)	3	3	3
Latest purchase (months)	8	9	9

Source: Staff computations.

Note: Figures in brackets are the number of cases as a percentage of total cases in the given period.

from an average of 3.9 months to 3.8 months. 1/ The drawings before and at the end of the shortfall year as a percentage of all purchases during each of these two periods also increased from 12.4 percent to 16.1 percent from the first to the second period respectively.

It is interesting to examine whether the mean time lags of the purchases deviate in any significant manner from a given value. Suppose, for illustration, that the null hypotheses is, first, that the mean lag is three months, and, secondly, that it is greater than six months. Applying a two-tailed test for the first hypothesis and a one-tailed test for the second yielded the result that for the whole period, as well as for the two sub-periods the mean lag was not significantly different from three months. The analysis, therefore, does not suggest that there would be necessarily a destabilizing influence exerted by the purchases under the CFF.

2. Estimates of stabilizing influence

The main empirical results using the three indexes discussed above are given in Tables 2 and 3. Consider first Table 2, which reports the results using instability index I_1. The first column in this table shows the value of the index I_1, without any CF transactions for each of the 79 countries. The index is computed for the 11-year period 1975-85. Not surprisingly it varies very considerably across countries with its value ranging from 2.36 percent to 24.95 percent. The second and third columns report, respectively, the values of this index based on export earnings plus CF purchases, and the values of the index based on export earnings plus purchases minus repurchases. The last two columns indicate the difference between columns (1) and (2) and between columns (1) and (3), both as a percentage of column (1).

Consider, for example, the first row. Column (1) shows that over the period 1975 to 1985, the instability index for Argentina had a value of 9.54. Taking into account the CF purchases made over this entire period, the index had a value of 8.77; with purchases and repurchases the value was 9.00. This indicates that CF purchases can be considered to have reduced the instability of earnings over this period. Even though the repurchases by themselves increased instability marginally, purchases and repurchases taken together still had a stabilizing effect. As columns (4) and (5) for Argentina show, purchases decreased instability by 8.01 percent, and purchases and repurchases together decreased it by 5.57 percent.

As the last row of the table indicates, the average value of this index for the 79 countries was 9.80; with purchases it declined to 9.14 and with purchases and repurchases it was 9.17. The average decrease in instability as a proportion of the original value of the index was 5.44 percent for purchases and 5.39 percent for purchases and repurchases together. Both these results were statistically significant at the

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1/ In 1979 a major review of the CFF resulted in changes in the formula for calculating shortfalls, coverage and access limits (see Kaibni, 1986).

Table 2. Instability Index I_1.

Country	Instability Index 1 (1)	(2)	(3)	(1-2)	(1-3)
Argentina	9.54	8.77	9.00	8.01	5.57
Australia	6.30	6.45	6.35	-2.40	-0.78
Bangladesh	5.76	5.65	5.27	1.85	8.44
Barbados	13.20	12.09	12.16	8.44	7.93
Belize	10.56	9.90	10.02	6.24	5.12
Bolivia	7.77	7.47	7.59	3.90	2.28
Brazil	10.29	9.67	9.75	5.97	5.23
Burma	7.51	7.36	7.29	2.00	2.90
Burundi	17.63	18.94	18.79	-7.40	-6.55
Cameroon	7.33	7.03	7.01	4.00	4.27
Central African Rep.	7.87	8.00	7.87	-1.58	
Chad	19.77	17.94	18.23	9.24	7.79
Chile	8.07	8.04	8.07	0.38	0.08
Congo	14.63	14.47	14.42	1.12	1.45
Costa Rica	6.01	5.69	5.72	5.23	4.85
Côte d'Ivoire	8.04	8.08	7.89	-0.53	1.90
Cyprus	10.28	9.38	9.30	8.81	9.57
Dominica	16.36	13.43	13.62	17.89	16.71
Dominican Republic	12.44	11.43	11.56	8.11	7.05
Ecuador	8.89	8.46	8.56	4.89	3.73
Egypt	10.62	10.48	10.50	1.25	1.09
El Salvador	10.99	10.06	10.01	8.44	8.84
Equatorial Guinea	24.95	23.66	23.29	5.16	6.68
Ethiopia	9.70	8.80	9.02	9.22	6.97
Fiji	8.73	9.06	9.10	-3.78	-4.23
Gambia, The	14.15	11.83	11.65	16.40	17.67
Ghana	8.63	7.72	7.87	10.56	8.80
Greece	4.53	4.80	4.72	-5.96	-4.22
Guatemala	7.73	8.47	8.18	-9.49	-5.72
Guyana	12.95	12.54	12.54	3.13	3.10
Haiti	11.25	10.70	10.37	4.93	7.86
Honduras	6.11	5.91	5.88	3.27	3.78
Hungary	2.36	2.36	2.37	-0.09	-0.33
Iceland	6.26	5.73	5.66	8.48	9.56
India	4.02	3.87	3.81	3.57	5.08
Indonesia	10.97	10.73	10.80	2.20	1.60
Israel	4.44	4.44	4.49	0.10	-1.08
Jamaica	7.84	7.83	7.79	0.04	0.65
Kenya	9.15	7.99	8.10	12.67	11.41
Korea	5.74	5.61	5.62	2.20	1.98
Lao P. D. Rep.	19.11	13.76	14.01	28.02	26.69
Madagascar	6.10	6.24	6.36	-2.28	-4.22
Malawi	11.99	10.75	11.19	10.35	6.67
Malaysia	9.32	9.16	9.10	1.70	2.37
Mali	11.85	11.80	11.64	0.40	1.82
Mauritania	10.67	10.25	10.28	3.94	3.60
Mauritius	6.38	5.80	5.66	9.14	11.34
Mexico	11.02	10.92	10.93	0.98	0.88
Morocco	7.40	6.78	6.69	8.42	9.59
New Zealand	4.47	4.55	4.40	-1.84	1.51
Nicaragua	10.48	10.59	10.62	-1.05	-1.31
Niger	10.72	11.10	10.96	-3.56	-2.26
Pakistan	6.98	6.43	6.14	7.83	12.04
Panama	7.54	6.06	6.34	19.59	15.90
Peru	10.24	9.56	9.67	6.66	5.59
Philippines	6.72	6.05	6.04	10.00	10.14
Portugal	7.04	6.79	6.82	3.60	3.05
Romania	3.76	3.87	3.77	-3.11	-0.41
Senegal	10.58	9.71	9.76	8.24	7.76
Sierra Leone	10.91	8.60	8.84	21.16	18.97
Somalia	12.68	10.01	10.01	21.09	21.09
South Africa	6.73	6.12	6.09	9.09	9.53
Spain	4.20	4.16	4.17	1.06	0.76
Sri Lanka	7.52	7.11	6.99	5.36	6.98
Sudan	11.80	10.38	10.41	12.10	11.82
Swaziland	12.78	12.82	12.81	-0.33	-0.23
Tanzania	10.26	9.42	9.44	8.25	7.99
Thailand	5.61	5.87	5.80	-4.61	-3.44
Togo	10.58	10.13	10.23	4.28	3.37
Tunisia	8.37	8.13	8.07	2.89	3.53

Table 2 (concluded). Instability Index I_1.

Country	Instability Index 1 (1)	(2)	(3)	(1-2)	(1-3)
Turkey	12.97	12.40	12.49	4.46	3.70
Uganda	15.91	14.10	14.04	11.37	11.77
Uruguay	8.38	7.46	7.62	10.91	9.10
Viet Nam	11.66	12.03	12.43	-3.11	-6.57
Western Samoa	24.92	20.22	21.08	18.85	15.41
Yugoslavia	6.24	5.76	5.81	7.71	6.93
Zaire	9.17	7.52	7.83	17.98	14.58
Zambia	13.74	11.48	12.12	16.41	11.77
Zimbabwe	7.69	7.61	7.62	1.12	0.94
Total/n	9.80	9.14	9.17	5.44	5.39
S.E.E.	0.48	0.42	0.42	0.80	0.72
S.E.E. on difference					

Source: Staff computations.

5 percent level. 1/ From the table it can also be computed that of the 79 countries, 64 had a decline in instability and that the decline was 5 percent or more in 34 of these 64 countries.

Consider next the results for the average of the indexes I_2 and I_3 provided in Table 3. (Detailed results for these two indexes are provided in the Annex.) In the first half of the table, column (1) gives the values of the instability index I_2 for the average of 79 countries. Columns (2) and (3) show, as before, the average value of the index I_2 based on export earnings plus purchases, and the value of the index based on export earnings plus purchases minus repurchases. As the first row of this table indicates the average value of the index was 12.2; with purchases it declined to 11.5 and with purchases and repurchases, it was again almost the same. There is thus a decrease in instability of 5.1 percent with purchases, but this time with repurchases also the instability declined by 5 percent. These differences are statistically significant. It is worth noting that the value of the index is for each country larger than that obtained from index I_1 (see Annex Table 2). This is to be expected since for any X>0 "root mean square error" would give a larger value than the sum of the absolute value of deviations. The second half of Table 3 provides the results for index I_3 which is based on an estimate of the logarithmic trend in export earnings over the period 1975 to 1985 for the average of 79 countries. (For detailed results see Annex Table 3.) Here the absolute value of the index is somewhat larger than is the case for the other two indexes. However, the change in instability due to the CF transactions is somewhat smaller. On average, instability declined by 3.4 percent with purchases and 3.8 percent with purchases and repurchases. These results are also statistically significant. As the standard errors indicate, the variations around the mean are quite similar for both indexes.

On the basis of the results using these three different sets of indexes, the CFF can be considered to have led to a clear decline in instability in the availability of foreign exchange earnings. It might be questioned, however, whether a decline of around 5 percent is significant in an economic sense. There are a number of factors which suggest that it is indeed significant and that a larger decline could not have been expected. The first of these factors is that the measured decline in instability is the result of CF drawings that were, for most countries, a small proportion of total export earnings or even of export shortfalls. Secondly, the drawings were made, on average, only two or three times during the 11-year period. So for most of the years the fluctuations in earnings from the trend, resulting in surpluses or shortfalls, were not affected in any way by borrowing under the CFF. Thirdly, the CFF is concerned only with shortfalls, but there would be, of course, excesses (or positive deviations) which the facility was not designed to counter, but which would influence the value of the index and the proportionate change in it. A fourth factor concerns the way the present CFF is implemented

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1/ This is under the premise that the observations in columns (1) and (2), and columns (1) and (3) are not independent.

whereby drawings, subject to quota, are always based on the measure of shortfall which takes into account the value of exports in the middle year. This means that even if none of the above factors were operative, on the basis of drawings under the CFF one would still not expect "perfect" stability in the sense of completely eliminating the "shortfall" in the middle year. 1/ Given all these factors, one would not have expected the decline in instability to have been very large. Stated this way, the magnitude of the improvement in stability appears far from negligible. Over an 11-year period the decline is over 5 percent on average, which given the size of CF drawings in relation to exports and shortfall noted above, may even be regarded as significant.

Table 3. Instability Index I_2 and I_3

	Instability Index I_2				
	(1)	(2)	(3)	(1-2)	(1-3)
Average	12.22	11.46	11.51	5.14	4.99
Standard error	0.61	0.54	0.55	0.70	0.62
	Instability Index I_3				
	(1)	(2)	(3)	(1-2)	(1-3)
Average	13.14	12.63	12.60	3.43	3.81
Standard error	0.62	0.60	0.60	0.66	0.64

Source: Staff computations.

In order to examine the extent to which these results are robust to the use of different schemes for apportioning purchases a further investigation was undertaken. This entailed a simulation exercise similar to the above, but this time adding the purchases in the alternative ways noted earlier in Part II. The first of these alternatives was to add the entire purchase to the year in which it was made. The second alternative that the purchases should be regarded as available only over the shortfall year regardless of when they were made, was also examined. Here the purchases were added to export earnings by prorating the purchases over the twelve months of the shortfall.

1/ For a formal proof of this, see Annex.

The summary results of the simulation exercise are given in Table 4. The table reports the change in the values of the three instability indexes following CF purchases and purchases and repurchases averaged over the 79 countries. The first row (row 1.1) indicates that with drawings added to export earnings in the purchase year, all three indexes again show a decline. In the case of the first index I_1, there was now a decline of 1.8 percent, with purchases only; I_2 and I_3 decline by 1.5 percent and 4.4 percent, respectively. With purchases and repurchases, the three indexes decline by 1.8, 1.4, and 4.6 percent, respectively. Although compared to earlier results (row 3.1) the decline in instability is now considerably lower, it is still unambiguous and statistically significant.

Table 4. Earnings Instability and Timing of Purchases

	Percentage change in instability with purchases			Percentage change in instability with purchases and repurchases		
	I_1	I_2	I_3	I_1	I_2	I_3
1. Purchases added to purchase year 1/						
1.1. Mean	1.81	1.53	4.36	1.82	1.39	4.57
1.2. Standard error	0.91	0.77	0.70	0.85	0.71	0.71
2. Purchases added to shortfall year 2/						
2.1. Mean	4.58	4.43	4.57	4.49	4.26	4.99
2.2. Standard error	0.76	0.69	0.73	0.71	0.65	0.75
3. Purchases distributed over shortfall and purchase year 3/						
3.1. Mean	5.37	5.14	5.09	5.31	4.99	5.50
3.2. Standard error	0.75	0.70	0.74	0.68	0.62	0.76

Source: Staff computations.

1/ For this simulation, the entire purchase is added to a country's export earnings in the year it is made.

2/ In this case, the entire purchase is allocated to the shortfall year, regardless of when it was made. The purchase is added to export earnings by prorating it over the 12 months of the shortfall year.

3/ The distribution of purchases is as in Tables 2-3. It is done by taking into account the interval between the middle of the shortfall year and the drawing month.

Similarly when purchases are added to the shortfall year rather than to the purchase year (row 2.1), there is again a clear decline in each of the three indexes with purchases alone and with purchases and repurchases. The results of this simulation exercise indicate that the conclusions obtained earlier are not seriously affected by using different schemes for allocating CF purchases to countries' export earnings.

3. Impact of overcompensated cases

The above exercises have examined all the CF cases for which the relevant data were available. These include a considerable number of cases which were overcompensated in the light of ex post data. 1/ The reason for examining all cases was to obtain as large a sample as possible. It could be argued, however, that the inclusion of overcompensated cases may bias the results towards finding, on average, unduly small stabilizing effects. In these cases CF drawings may actually have had some destabilizing effect since when the drawings were made, in reality there would have been a smaller shortfall or even an excess. This would have amplified the fluctuations in export earnings rather than have dampened them. The exclusion of overcompensated cases or the use of ex post data (that is, determining the shortfall and the drawing from actual rather than projected exports) suggests that a finding, on average, of a stronger stabilizing influence might be expected. Alternatively, by using ex post data one can examine the extent to which the stabilizing effect of the CFF would have been larger had there been perfect foresight--that is, if exports could have been projected for the two post-shortfall years without any error. To examine this issue an additional exercise was carried out using the instability index I_1 and allocating drawings which would have been obtained if "ex post" drawings had been used, instead of using actual drawings. 2/ The results showed that, as expected, the average decline in instability was now greater than that obtained previously. The average decline in I_1 with ex post purchases and repurchases was 6.4 percent compared to 5.4 percent earlier. In other words, the stabilizing influence of the facility would have improved by about a fifth if exports had been forecast without error. Whilst this is a substantial improvement it is, however, based on an extreme premise.

4. Instability and country characteristics

It is generally acknowledged that developing countries relying predominantly on exports of primary products are likely to have less stable export earnings than countries with a more diversified export structure. Many explanations have been put forward for this difference, but the most important is generally accepted as being the greater supply instability for

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1/ This "overcompensated" category does not include early drawing cases where prompt repurchases are mandatory if estimates of export earnings in the shortfall year turn out to be too low.

2/ The purchases were distributed over the shortfall and purchase year as in Table 2.

primary producers, and their commodity and geographic concentration. 1/ An important question in the context of this study is whether the effect of the CFF in stabilizing earnings differs in any systematic manner across groups of countries relying on different types of exports. In order to examine this, the role of the CFF in different country groupings based on their predominant exports was examined. The groupings are based on the WEO classification and include amongst LDCs, "fuel exporters," "primary goods exporters" subdivided into "agricultural goods exporters" and "mineral exporters," "exporters of manufactures," and "services and remittances receivers." The values of the instability index I_1, with and without CFF were computed for each category. The results are given in Table 5. As far as export instability per se is concerned, the exporters of manufactures have markedly lower instability than all other countries. It is even lower than that of the four industrial countries who have used the CFF in the past. Although the average instability index for the service-exporting countries is the highest, it is unduly affected by instability in one country. The instability for the fuel exporters is the next highest resulting from the sharp fluctuations which have taken place in the international oil market over the last decade.

With respect to the effect of the CFF, there are also some notable differences across country groups. The smallest decline in instability is for industrial countries, exporters of manufactures, and fuel exporters whilst the largest decline is for exporters of services and mineral exporters.

It may be thought that this difference could be explained by the difference across country groups in the amount of drawings relative to shortfalls. Ceteris paribus it would appear that the larger the drawings relative to shortfall, the greater the effect on instability. In order to examine whether this was in fact the case, total shortfalls and drawings by these country groups over the period 1975 to 1985 were computed. These indicated that the relationship between drawings relative to shortfalls and the decline in instability is certainly positive but not very strong. For instance, over this period purchases by industrial countries amounted to SDR 684 million, which as a proportion of shortfalls was nearly 88 percent (see Annex Table 4). This was the highest proportion of drawings to shortfalls but, as shown above, the decline in instability for this group of countries was relatively small. On the other hand, the proportion for the exporters of manufactures, at 47.1, was the lowest whilst the decline in instability for these countries was also the smallest. Exporters of services had the second highest proportion of drawings to shortfall and also had the largest decline in instability. 2/ These results tend to suggest that whilst the actual amount of drawing relative to shortfall explains some of the differences in the relative efficacy of CFF across different groups of countries, other factors, notably the timing of purchases, must also have

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1/ There is considerable literature on this. For some early studies see MacBean (1966) and Massell (1970).

2/ The Spearman's rank correlation coefficient was 0.42.

Table 5. Country Characteristics and Instability

Country Category 1/	Instability Index I_1			Percentage Change	
	Without CFF (1)	Purchases only (2)	Purchases and repurchases (3)	(1)-(2)/(1) (4)	(1)-(3)/(3) (5)
Fuel exporters (5) 2/	10.78	10.54	10.56	2.42	2.24
	(1.10)	(1.14)	(1.12)	(0.71)	(0.58)
Agricultural goods exporters (46)	10.64	9.95	9.96	5.57	5.66
	(0.65)	(0.59)	(0.59)	(1.14)	(1.09)
Mineral exporters (14)	9.61	8.93	9.02	6.64	5.85
	(0.57)	(0.52)	(0.53)	(1.95)	(1.64)
Exporters of manufactures (6)	4.43	4.32	4.31	1.73	2.03
	(0.57)	(0.52)	(0.53)	(1.51)	(1.35)
Exporters of services (9)	11.27	9.96	10.98	8.92	8.61
	(2.08)	(1.61)	(1.70)	(2.89)	(2.44)
Industrial countries (4) 3/	5.31	5.22	5.14	1.33	2.76
	(0.56)	(0.53)	(0.52)	(2.50)	(2.32)

Source: Staff computations.

1/ Countries are divided according to WEO classification. Numbers in brackets in the "country category" are the numbers of countries in each category. Purchases are distributed as in Table 2.

2/ Numbers in brackets are standard errors of the means.

3/ The four industrial countries include Australia, Iceland, New Zealand, and Spain with the last purchases in 1976, 1982, 1976, and 1978, respectively.

had some influence. The earlier results also indicate that, contrary to the conclusions reached by some recent studies, low-income countries including agricultural goods exporters and exporters of services, were not treated in any discriminatory way by the operations of the CFF. 1/ If anything, the facility had a more pronounced effect in reducing instability in export earnings in this set of countries.

V. Demand for Reserves and Welfare Implications

The above analysis has shown that the use of CFF led to a decline in the instability of countries' export earnings. Although the magnitude of the average decline may appear small, given that it is an average for 11 years, this decline in instability can be regarded as quite substantial. The CFF was, of course, designed with this objective in mind. But this is not the sole benefit of the CFF--it also provides members with funds at rates of interest that are lower than market rates. This was of particular importance for example, over the period 1975 to 1981, when the average interest rate charged by the Fund on general resources was around 6.5 percent, whereas the cost of borrowing from commercial markets averaged nearly 13 percent. 2/ Any evaluation of the CFF would also need to take account of this aspect of the facility. Against this benefit must be weighed the fact that the welfare of creditor countries declines when the borrowing countries receive loans at below market interest rates. To that extent the analysis below, which focuses only on the borrowing countries, might overstate the welfare benefits of the facility. In this connection it should also be noted, however, that the creditor countries may benefit from the CFF if purchases under the facility allow the borrowing countries to sustain their imports from creditor countries.

There are a number of different approaches that could be adopted in analyzing the net benefits to members of the decline in their earnings instability. One could, for instance, examine the contribution the decline in instability makes to the members' ability to maintain a given rate of imports or to achieve a certain overall growth rate. The analysis below focuses directly on the following: it first examines the impact that the decline in instability may be expected to have had on a member's demand for international reserves. Next, it examines the net gain to the member when the decline in instability is considered in conjunction with the availability of low-cost credit. These two methods of analyzing the benefits of the CFF are discussed below together with some illustrative empirical evidence.

1/ See, for example, UNCTAD (1987).

2/ LIBOR on U.S. dollar deposits for six months, plus 1 percent spread. (See Annex Table 5 for details). During this period whilst LIBOR has varied from 16.7 percent in 1981 to 8.9 percent in 1985, the rate of change on purchases under the CFF has never exceeded 7 percent.

1. Earnings instability and international reserves

In a system of managed floating, which has characterized the world economy since the early 1970s, the demand for international reserves appears not to have changed radically from the preceding period of fixed rates (see Frenkel (1978)). Issues relating to the use of reserves to finance payments imbalances directly, or to manage these imbalances by intervening to influence the exchange rate, as well as discussions about the adequacy of reserves are still of considerable importance. Since the demand for reserves is generally acknowledged to be positively related to the fluctuations in a country's foreign exchange earnings, it is at least conceivable that the availability of funds under the CFF may exercise some influence on this demand. In other words the fact of the availability of CFF, partly through any stabilizing influence, may mean that the need, and hence the demand, for reserves will be lower compared with a situation where there was no such facility. Of course, to the extent that at the time of a shortfall a country cannot be certain that it will be able to obtain drawings under the CFF, the decline in reserve holdings and an increase in imports might not be that substantial. The fact that the amount available is also further constrained by quota limits, indicates the limited effect which the facility might have on member's reserve holdings. 1/ Nevertheless, one would expect the decline in instability associated with the CF drawings to lead to at least some savings of reserves. The methodology adopted below tries to obtain an estimate of the maximum savings which could have been realized.

In order to obtain such an estimate, the relationship between reserve demand and export instability has first to be estimated. For this the framework developed in Frenkel (1978) to analyze the determinants of the demand for international reserves can be utilized. 2/ In this framework the demand function for reserves is assumed to depend on the following three variables:

The first variable is the average propensity to import (m): this can be interpreted as a proxy for "openness" of an economy indicating the extent to which it is vulnerable to external disruptions. In this

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1/ It may be objected that this argument applies to the potential availability of any type of external funding including that from the international capital markets. This may be so in theory but in practice for a large number of LDCs the availability of funds from other sources is even less certain.

2/ See Frenkel (1978), especially pp. 113-121. See also Finger and DeRosa (1980).

interpretation, one would expect demand for reserves to be a positive function of external vulnerability. 1/

The second variable in the demand function for reserves is a measure of the variability of international receipts and payments (σ). The choice of this variable as an argument in the demand function is based directly on the use of reserves for dealing with fluctuations in external transactions and it is expected to have a positive relationship with reserves demand. In the empirical analysis undertaken below, instead of focusing on the variability of total international receipts and payments, a variable which measures directly the variability in export earnings is used. (This variable is identical to one of the measures of instability in export earnings used earlier (Index I_1).) The third variable is a scale variable, measuring the size of international transactions by the level of imports (M).

The methodology was to estimate an equation for individual countries with the above three variables as the explanatory variables and with reserves as the dependent variable. This equation was estimated for a large sample of countries included in Table 1 for the period 1975 to 1985. 2/ The estimates obtained for the coefficient on σ_t were then combined with the results obtained earlier on the impact on instability of drawings under the CFF to obtain an estimate of the possible savings in reserve requirements.

The detailed results of estimating this equation using OLS are given in the Annex. 3/ Using the estimates obtained for the coefficient on σ_t the likely impact on the reserve requirements was computed. The results of this exercise are given in Table 6. The second column of this table reproduces

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1/ It might be noted, however, as Frenkel (1978) demonstrates, that the relationship between reserves and the propensity to import is not clear-cut. In the case of an unfavorable external equilibrium in a Keynesian model of the foreign trade multiplier, the cost of output adjustment could be reduced if the authorities are able to run down their stock of international reserves to finance the deficit. Since as demonstrated, the foreign trade multiplier (and the contraction in output required in the absence of reserves) is inversely related to the marginal propensity to import, it could be argued that the cost of not having reserves, and hence the demand for reserves, is inversely related to the marginal propensity to import.

2/ The equation estimated is identical to that in Frenkel (1978), p. 115. It is of the form $\ell_n R_t = \alpha_o + a_1 \ell_n m_t + a_2 \ell_n \sigma_t + a_3 \ell_n M_t + u_t$. σ_t is the deviation of export earnings from a trend computed as a 5-year moving average. To calculate σ_t for year t, the deviations from t-7 to t or t-11 to t, are averaged. u_t is the error term.

3/ In general, the overall fit of the regression for most countries was quite satisfactory; in a majority of the cases the coefficient on σ_t was positive and statistically significant; the other two variables were also significant in a large number of cases. See Annex Table 6.

Table 6. CFF and the Demand for Reserves: Illustrative Results

Country	Reserve Elasticity With Respect to Export Instability	Decline in Instability (Percentage of Trend)	Reserve in 1980 SDRs (Millions)	Reduction in Reserve Demand 1980 (Millions)	Percentage Reduction in Demand
Argentina	3.47	5.57	5,162.76	997.79	19.33
Burma	0.13	2.90	200.21	0.75	0.38
Chad	2.53	7.79	3.88	0.77	19.72
Congo	0.62	1.45	66.00	0.59	0.90
Costa Rica	2.53	4.85	111.85	13.73	12.27
Côte d'Ivoire	3.88	1.90	15.14	1.11	7.35
Cyprus	0.10	9.57	283.01	2.71	0.96
Ecuador	1.32	3.73	778.29	38.32	4.92
El Salvador	0.12	8.84	59.70	0.63	1.06
Egypt	1.82	1.09	803.67	15.95	1.98
Ethiopia	2.86	6.97	61.57	12.28	19.94
Gambia, The	1.35	17.67	4.36	1.04	23.86
Guyana	0.37	3.10	9.76	0.11	1.15
Haiti	2.41	7.86	12.47	2.36	18.93
Honduras	1.30	3.78	115.12	5.66	4.92
India	1.11	5.08	5,335.18	300.81	5.64
Indonesia	0.09	1.60	4,142.60	5.95	0.14
Jamaica	0.41	0.65	80.67	0.22	0.27
Kenya	0.58	11.41	377.79	25.01	6.62
Malaysia	1.05	2.37	3,370.94	83.90	2.49
Mali	1.96	1.82	11.17	0.40	3.56
Mauritania	1.25	3.60	107.49	4.83	4.50
Mauritius	1.42	11.34	69.66	11.21	16.10
Mexico	3.61	0.88	2,274.17	72.24	3.18
Morocco	1.62	9.59	306.27	47.59	15.54
Pakistan	1.84	12.04	380.96	84.36	22.15
Panama	0.87	15.90	90.19	12.48	13.84
Peru	1.51	5.59	1,521.18	128.35	8.44
Philippines	1.02	10.14	2,186.77	226.22	10.35
Senegal	1.26	7.76	6.20	0.61	9.77
Somalia	0.39	21.09	11.19	0.92	8.22
Spain	1.49	0.76	9,114.90	102.85	1.13
Sri Lanka	1.36	6.98	188.63	17.90	9.49
Tanzania	0.87	7.99	15.60	1.08	6.95
Tunisia	0.18	3.53	453.41	2.88	0.64
Turkey	1.51	3.70	827.49	46.21	5.58
Uganda	0.55	11.77	2.30	0.15	6.48
Uruguay	0.26	9.10	294.88	6.98	2.37
Zambia	0.17	11.77	60.08	1.20	2.00
Row 1. Average	1.31	6.76	997.88	58.41	7.77
Row 2. Average for countries for which equation was not estimated	1.31	7.86	771.86	41.21	10.32
Row 3. Average for all countries	1.31	7.08	932.13	53.41	8.51

Source: Staff computations.

the result obtained for a_2, i.e., the reserve elasticity with respect to export instability. The third column gives the percentage decline in instability (these are the values given in Column 5 of Table 2); Column 4 gives the value of reserves in 1980; Column 5, which gives the reduction in reserve demand, is obtained by multiplying Columns 2 to 4. The last column gives the reduction as a percentage of reserves in 1980. As the last column indicates, for most countries the decline in instability can be regarded as having had a substantial benefit in terms of the savings in reserves. For this group of countries as a whole, the reduction in reserves as a percentage of total reserves is over 7 percent: a far from negligible decline (see Row 1). For those countries for which this equation could not be estimated, an average value of the reserve elasticity (1.31) was used. For this set of countries, the decline in reserve demand was even more substantial at 10.32 percent (Row 2). Taking all countries together, the percentage reduction in reserve demand was 8.51 percent, clearly a substantial saving (Row 3). Of course, it has to be acknowledged that given the nature of the CFF, countries cannot be certain of purchases under this facility and therefore this figure must be regarded as indicating an upper limit to the savings.

2. Welfare gain: some illustrative results

An alternative, but complementary, approach to measuring the CFF's benefit would be to examine the gain to a country using a fairly standard framework for analyzing changes in economic welfare due to commodity price stabilization schemes. In this framework, the question to be addressed is what `value' does the country place on stabilization of earnings using the CFF. This `value' consists of two elements: first, the gain due to decline in instability and secondly, the availability of funds at rates of interest significantly below the rates prevailing in capital markets. At the same time, any costs attached to participating in the IMF system as well as costs relating specifically to applying for the CFF have to be taken into account. 1/

In this framework, the welfare function, W, of a potential recipient of the CFF may be considered to include the following elements:

$$W = W(X, I_X, G, CM) \qquad (4)$$

where X = level of export earnings

I_X = instability of export earnings

G = the cost of CFF credit relative to credit available on commercial terms

1/ In theory there ought to be no or negligible costs attached to applying for the CFF. For processing the application and arranging the purchase, the Fund charges an amount equivalent to 0.5 percent of the loan.

CM = "costs" attached to membership of the IMF and making the application for CFF

There are a number of ways one can make equation (4) empirically operational. Here we apply the framework developed by Newbery and Stiglitz (1981) in the context of obtaining quantitative estimates of the benefits of commodity price stabilization schemes. This framework is concerned with analyzing what the stabilization of the price of a particular commodity is worth to, say, a risk averse farmer--in other words what sum of money he would be willing to pay for the stabilization scheme to be introduced. 1/ If we assume that this concept can also be applied to policy makers in a member country, then the benefits due to lower instability can be computed in the following way: suppose that the country's export earnings are X_o with mean $\bar{X}_o$ and an index of instability σ; with transactions under the CFF this changes to X_1 with mean $\bar{X}_1$, and index of instability σ_{x1}.

Then equating expected utility

$$EU(X_o) = EU(X_1 - B) \qquad (5)$$

where B is the benefit to the country of lower instability. B may be regarded as the amount a country would be willing to 'pay' to obtain the benefit provided by the CFF. Expanding equation (5) in a Taylor series, we can obtain the following expression for the change in welfare:

$$\left(\frac{\Delta W}{W}\right) = \left(\frac{\Delta B}{\bar{X}}\right) = \left(\frac{\Delta \bar{X}}{\bar{X}}\right) - \frac{1}{2} R \Delta \sigma_x^2 \qquad (6)$$

where $\frac{\Delta W}{W}$ = proportionate change in the country's welfare

$\bar{X} = \bar{X}_1 - \bar{X}_o$

R = coefficient of relative risk aversion 2/

$\Delta \sigma_x^2$ = change in the coefficient of variation.

The first term in (6) is the transfer benefit--i.e., the extent to which the country gains from the CFF credit. The second term is the efficiency or risk benefit, the benefit from reducing instability. With risk aversion (R>0), a decrease in instability of export earnings increases the national welfare. Taking into account the costs of making the application, CA and regarding (6) in terms of an expected change in welfare gives

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1/ See Newbery and Stiglitz (1981), pp. 92-95. Also cf. Hermann (1983).

2/ This is defined as $R(X) = -XU'(X) / U''(X)$ where U' is the social utility function; U' and U" denote respectively the first and second derivative of U with respect to the level of export earnings. C.f. Newbery and Stiglitz (op.cit.), p. 72.

$$E\left(\frac{\Delta W}{W}\right) = E\left(\frac{\Delta \bar{X}}{\bar{X}}\right) - \frac{1}{2} RE(\Delta\sigma_x^2) - E\left(\frac{\Delta CA}{\bar{X}}\right) \quad (7)$$

In order to obtain a quantitative estimate of the change in welfare, we need to compute the three terms in (7). The gain in terms of foreign exchange $\frac{\Delta\bar{X}}{\bar{X}}$ will be due to the "grant" element in CF transactions which is defined as the difference between the nominal value of purchases minus the present value of future repurchases and interest payments:

$$\left(\frac{\Delta \bar{X}}{\bar{X}}\right) = \left(\frac{G}{\bar{X}}\right) = P(1-b) \sum_{j=1}^{5} \left(\frac{C_j+I_j}{(1+r)^j}\right) \quad (8)$$

where P = nominal value of purchases

C_j, I_j = capital repayments and interest payments respectively which become due at the end of the year j

r = market interest rate

b = service charge as a percentage of gross credit

To compute the second term on the right in equation (7), 1/2 RE $(\Delta\sigma_x^2)$, we require an estimate of the degree of risk aversion which characterizes policy makers in each of the countries which has obtained funding under the CFF. In the absence of any available information on the magnitude of this parameter, and the critical influence it can exercise on any measure of change in national welfare, we have experimented with three different sets of values for R. The first, R=1, is invariant across countries. This is a special case of a utility function with constant relative risk aversion. It is given by the logarithmic or Bernoullian utility function

$$U(y) = \ell og\ y: \quad R = 1$$

which has unit relative risk aversion. For this function the proportional risk premium is independent of the level of income, Y. In the present context, "risk premium" denotes the amount of foreign exchange earnings a country would be prepared to give up in order to obtain a stream of earnings which is as stable as the one provided by the availability of the CFF. With R=1, it is assumed that this risk premium is the same across all countries.

Clearly, this is an extreme assumption--it would be more reasonable to expect this to differ across countries depending on the degree of risk aversion of country authorities which would in turn depend on the specific circumstances facing the country. Purely for illustrative purposes, we

Table 7 (Concluded). Welfare Gain: Some Illustrative Estimates

	(1) Purchase (SDR Millions)	(2) "Savings" (SDR Millions)	(3) Savings/ Trend (Percent)	(4) Change in Instability (Percent)	Welfare Change (Percent) (5) R=1	(6) $R=\frac{I_i}{\bar{I}}$	(7) $R=\frac{m_i}{\bar{m}}$
Thailand	488.48	112.34	1.93	-3.44	0.21	0.94	0.76
Togo	7.50	1.33	0.68	3.37	2.35	2.49	1.79
Tunisia	24.00	5.08	0.49	3.53	2.26	2.00	2.29
Turkey	161.23	44.13	1.56	3.70	3.41	4.01	3.39
Uganda	81.67	23.54	7.93	11.77	13.82	17.49	16.02
Uruguay	118.83	22.06	2.56	9.10	7.11	6.45	6.58
Viet Nam	31.00	5.60	1.39	-6.57	-1.90	-2.52	-1.90
Western Samoa	5.08	1.27	9.95	15.41	17.65	29.54	22.42
Yugoslavia	277.00	85.55	1.15	6.93	4.61	3.36	6.54
Zaire	268.48	60.69	3.86	14.58	11.15	10.68	13.06
Zambia	267.75	64.15	8.04	11.77	13.93	16.29	21.24
Zimbabwe	56.10	12.42	1.07	0.94	1.54	1.44	1.54
Average (All)	137.73	32.34	2.89	5.39	5.59	6.08	7.31
Average (excluding outliers for $R=I_i/\bar{I}$)	148.86	34.79	2.06	3.87	3.99	4.00	
Averages (excluding outliers for $R=m_i/\bar{m}$)	137.42	32.25	2.03	3.58	3.82		4.35

Source: Staff computations.

The results of this simulation exercise are given in Table 7. Consider, for example, the first row--it shows that over the period 1975 to 1985, Argentina made purchases of over SDR 831 million. Since the rate of interest charged on these purchases was considerably below the market rate, there was an implicit "savings" element in this purchase which in present value terms amounted to over SDR 174 million. As a percentage of the average value of export earnings, this amounted to 2.5 percent (Column 3). Since the average decline in instability was 5.6 percent, using equation (6) it can be computed that with R=1, this would have led to a welfare gain of 5.27 percent of exports. If, however, it is assumed that the degree of risk aversion varies according to the degree of earnings instability or the imports to reserve ratio, the increase in welfare would have been different. Assuming this to be distributed around R=1, $R=I_i/\bar{I}$ yields a welfare gain of 5.2 percent whilst $R= m_i/\bar{m}_i$ yields a welfare gain of 3.7 percent. This pattern is repeated for other countries as well with a significant majority showing a clear increase in welfare. The "average" welfare gain with the three different values of R is 5.6 percent, 6.1 percent, and 7.3 percent, respectively. Excluding outliers, for the second and third values of R leads to a welfare gain of 4.0 percent, and 4.4 percent, respectively. Given the paucity of information on R, these estimates are, of course, purely illustrative but they indicate that under quite plausible assumptions, it can be shown that on average the CFF has been of considerable net benefit to the Fund members and also that this benefit has varied very considerably across countries.

VI. Summary and Conclusions

This paper has examined a number of issues related to the role the CFF has played in stabilizing the foreign exchange earnings of Fund member countries. It was argued that on an a priori basis it might be expected that for any given country, the stream of export earnings with CFF, that is, exports plus purchases less repurchases, would be more stable than earnings without the CF transactions. However, it was also noted that there are some aspects of the facility which may exercise some destabilizing role. It is therefore an empirical issue as to whether the facility did exercise a stabilizing influence, and the magnitude of this influence. The basic methodology adopted was to compute a number of different indexes to measure instability in merchandise export earnings without CFF, and then to examine whether the transactions under the CFF had made any significant difference to the values of these indexes. These results were then used to examine the impact on reserve requirements and to compute a measure of welfare gain from the facility.

Using data for 79 countries (192 CF cases), it was first shown that the interval between the end of the shortfall year and purchases under the CFF was on average not more than three months. This, it was argued, suggested that the CFF may well have had an important stabilizing influence. Three sets of indexes were then computed both with and without CFF transactions. The results showed that, regardless of the index, the CFF led to an improvement in the stability of earnings of the order of

5 percent. Whilst the magnitude of the improvement may be considered small in absolute terms, it was statistically significant and given that it is an average over 11 years it is also significant from an economic point of view. The paper then examined the robustness of these results to alternative rules for adding purchases to export earnings. Although the magnitude of their effect on stabilization was different, in general the above conclusions continued to remain valid. A further analysis excluding those cases where there had been overcompensation showed that the stabilizing effect was somewhat stronger than for the full sample. An analysis of the instability in earnings by predominant export of country confirmed that exporters of manufactures have a much lower instability than exporters of primary goods. There was, however, no systematic difference in the stabilizing role of CFF across these different groups of countries.

Two further sets of exercises were next undertaken to examine the economic significance of the decline in instability. In the first case, a detailed analysis was undertaken of the difference this is likely to have made to the countries' reserve requirements. A demand function for international reserves, with instability as an explanatory variable, was estimated for a large sample of countries and from this it was deduced that the CFF could have led to a saving on average of as much as 7 percent in reserves. A second exercise used Newbery-Stiglitz welfare framework for analyzing the welfare gain to countries from reduced earnings instability. This gain consists of the benefit from reduced instability as well as the concessional rate on CF purchases. Although the results are sensitive to assumptions regarding the countries' degree of risk averseness, it appeared that on average there was a non-negligible gain to the members.

The main conclusion to be drawn from the above findings is that the CFF has performed a clear role in stabilizing fluctuations in foreign exchange earnings of developing countries. The reason for this has been the availability of substantial compensation close in time to the shortfall in export earnings.

The Stabilizing Role of the CFF

The potential for stabilizing role

Suppose we define "perfect" stability in terms of zero shortfall. Then under the present rule of the CFF one would not obtain "perfect" stability. This is because the drawings (subject to quota) are always based on a measure of shortfall which is computed using the shortfall itself (the middle year). This can be seen readily from the following:

Suppose that the actual exports are:

X_1, X_2, X_3, X_4, X_5

where X_3 are the exports in the shortfall year.

The trend in exports is:

$$\bar{X}_0 = (X_1X_2X_3X_4X_5)^{1/5} \qquad (1)$$

and the shortfall will be given by:

$$S = (\bar{X}_0 - X_3) \qquad (2)$$

Adding the full amount S to X_3 will not, however, eliminate the shortfall if it is recalculated. To obtain that, the compensation should be greater than S. To see this, assume that the compensation S is unknown and also that the original exports are X_3. There will be prefect stability if and only if:

$$S = 0$$

This means that the earnings in shortfall year plus drawings, say X_3', equal the trend value $\bar{X}_1$. Substituting in (1) this is simply that:

$$\bar{X}_1 = (X_1X_2\bar{X}_1X_4X_5)^{1/5} \qquad (3)$$

$$\text{i.e., } \bar{X}_1 = (X_1X_2X_4X_5)^{1/4} \qquad (4)$$

So only if the compensation is $\bar{X}_1$-X_3 will the stability be perfect.

It can be easily seen that $\bar{X}_1$ will be always greater than $\bar{X}_0$ for any $X_3>0$. This is because $\bar{X}_1$ will give a trend value which will make the shortfall 0. In other words, given the existing CF formula, even if a country was compensated for the full amount of shortfall, calculating stability "ex post" will yield a shortfall.

This feature of compensation under the CFF can be illustrated with an arithmetic example (Annex Table 1). Row (1) in this table indicates a

hypothetical stream of export earnings for a country for five years, t+1 to t+5. Earnings in the middle year are 99.88 and 'trend' value is 116.45 (Row 2). This gives a shortfall of 16.57. Now assume that the country is compensated for the entire amount of this shortfall. We can consider that an addition to the earnings so that the 'fully compensated' earnings in the middle year are now 116.45 (Row 4). The point to note is that this does not 'eliminate' the shortfall, if the shortfall is computed with this as the new value of earnings. The trend using this is now 120.08 (Row 5), so that there is again a shortfall, this time of 3.63 if the procedure is repeated once again, the new shortfall is 0.73 (Row 9). Eventually, of course, the shortfall will be eliminated when the export earnings plus compensation is equal to the new value itself in this example 12.1. Since in the facility, compensation is granted only once for a shortfall in a given period, this example illustrates that even full compensation will not provide the complete elimination of the shortfall.

Table 1. Profile of "Fully" Compensated Earnings

	Row	t_1	t_2	t_3	t_4	t_5
1.	Original earnings	100	110	99.88	131.1	146.41
2.	Trend			116.45		
3.	Shortfall			16.57		
4.	Fully compensated earnings	100	110	116.45	131.1	146.41
5.	New trend			120.08		
6.	New shortfall			3.63		
7.	Fully compensated earnings	100	110	120.08	131.1	146.41
8.	New trend			120.81		
9.	New shortfall			0.73		
10.	Fully compensated earnings	100	110	120.81	131.1	146.41
11.	New trend			120.96		
12.	New shortfall			0.15		
13.	Fully compensated earnings	100	110	120.96	131.1	146.41
14.	New trend			120.99		
15.	New shortfall			0.03		

Table 2. Instability Index I_2: Detailed Results

Country	Instability Index 1 (1)	(2)	(3)	(1-2)	(1-3)
Argentina	12.00	10.82	11.14	9.80	7.14
Australia	7.69	7.88	7.79	-2.46	-1.31
Bangladesh	7.55	7.24	7.03	4.17	6.98
Barbados	16.03	15.10	15.30	5.79	4.56
Belize	13.79	13.41	13.46	2.77	2.41
Bolivia	8.71	8.22	8.40	5.58	3.50
Brazil	11.98	11.40	11.55	4.89	3.64
Burma	9.11	8.60	8.58	5.56	5.82
Burundi	20.74	22.16	22.09	-6.82	-6.50
Cameroon	10.03	9.84	9.81	1.81	2.11
Central African Rep.	11.02	10.69	10.59	2.93	3.86
Chad	25.82	24.77	24.67	4.07	4.48
Chile	10.58	10.23	10.18	3.29	3.78
Congo	17.22	17.18	17.14	0.25	0.48
Costa Rica	7.96	7.74	7.73	2.73	2.90
Côte d'Ivoire	10.24	10.08	9.91	1.54	3.17
Cyprus	13.04	11.91	11.90	8.61	8.73
Dominica	21.13	17.14	17.20	18.90	18.61
Dominican Republic	16.03	14.82	14.94	7.51	6.78
Ecuador	11.27	10.81	11.03	4.08	2.19
Egypt	12.85	12.89	12.83	0.50	0.91
El Salvador	12.66	12.09	12.06	4.54	4.78
Equatorial Guinea	33.18	30.74	30.29	7.35	8.71
Ethiopia	11.61	10.65	10.77	8.23	7.19
Fiji	11.83	11.59	11.51	2.07	2.73
Gambia, The	19.36	18.25	18.45	5.71	4.69
Ghana	11.38	9.45	9.68	16.96	14.99
Greece	5.86	5.97	5.90	-2.01	-0.74
Guatemala	10.34	10.65	10.50	-2.92	-1.50
Guyana	16.55	15.88	15.89	4.17	3.99
Haiti	13.38	12.73	12.53	4.89	6.38
Honduras	7.19	7.04	6.95	2.20	3.44
Hungary	2.67	2.75	2.74	-3.10	-2.95
Iceland	8.34	7.50	7.41	10.08	11.15
India	4.85	4.83	4.74	0.49	2.38
Indonesia	13.10	12.87	12.97	1.79	1.03
Israel	5.22	4.98	5.00	4.49	4.11
Jamaica	9.58	9.43	9.43	1.57	1.55
Kenya	12.36	11.01	11.13	10.98	9.94
Korea	7.26	7.12	7.12	1.95	1.86
Lao P. D. Rep.	25.61	19.04	21.43	25.66	16.32
Madagascar	7.08	7.29	7.46	-3.07	-5.47
Malawi	14.29	13.45	13.69	5.85	4.20
Malaysia	11.25	11.16	11.06	0.77	1.61
Mali	14.76	14.83	14.76	-0.47	0.03
Mauritania	13.39	12.85	12.81	3.97	4.28
Mauritius	8.00	7.10	7.03	11.23	12.12
Mexico	13.25	13.24	13.23	0.08	0.14
Morocco	8.42	7.68	7.59	8.78	9.96
New Zealand	5.49	5.43	5.35	1.22	2.58
Nicaragua	12.06	12.10	11.99	-0.37	0.53
Niger	13.00	13.18	13.05	-1.29	-0.45
Pakistan	8.32	8.06	7.82	3.15	6.06
Panama	10.15	9.56	9.71	5.77	4.34
Peru	12.64	11.56	11.65	8.49	7.80
Philippines	8.12	7.38	7.34	9.16	9.68
Portugal	8.48	8.25	8.16	2.74	3.80
Romania	4.98	5.06	4.99	-1.46	-0.02
Senegal	14.20	13.17	13.17	7.22	7.25
Sierra Leone	12.57	9.82	10.05	21.87	20.11
Somalia	16.96	12.41	12.41	26.84	26.84
South Africa	10.67	10.05	10.01	5.82	6.17
Spain	4.74	4.69	4.71	1.02	0.60
Sri Lanka	10.66	10.39	10.28	2.54	3.50
Sudan	14.13	12.84	12.82	9.15	9.23
Swaziland	14.05	14.01	13.96	0.23	0.61
Tanzania	12.16	11.18	11.19	8.07	7.93
Thailand	6.51	6.79	6.69	-4.16	-2.74
Togo	14.84	14.57	14.64	1.81	1.34
Tunisia	9.66	9.43	9.39	2.41	2.83
Turkey	14.30	13.73	13.87	3.98	3.03
Uganda	23.04	20.44	20.63	11.30	10.47
Uruguay	10.24	9.38	9.42	8.39	8.03
Viet Nam	15.34	15.11	15.42	1.46	-0.53
Western Samoa	27.05	22.35	23.28	17.35	13.91
Yugoslavia	7.10	6.57	6.65	7.45	6.34
Zaire	11.63	10.19	10.31	12.33	11.32
Zambia	16.03	14.00	14.46	12.69	9.81
Zimbabwe	8.85	8.57	8.59	3.11	2.85
Total/n	12.22	11.46	11.51	5.14	4.99
S.E.E.	0.61	0.54	0.55	0.70	0.62
S.E.E. on difference					

Source: Staff computations.

Table 3. Instability Index I_3: Detailed Results

Country	Instability Index 1 (1)	(2)	(3)	(1-2)	(1-3)
Argentina	11.50	10.94	11.35	4.90	1.33
Australia	9.32	9.42	9.33	-1.10	-0.15
Bangladesh	10.55	10.27	9.99	2.72	5.36
Barbados	20.70	19.96	20.27	3.57	2.06
Belize	12.89	12.31	12.39	4.54	3.88
Bolivia	9.14	8.69	8.84	4.90	3.32
Brazil	15.86	15.17	15.35	4.34	3.23
Burma	9.27	8.65	8.60	6.69	7.24
Burundi	18.41	20.54	20.50	-11.57	-11.34
Cameroon	14.11	14.09	14.05	0.20	0.48
Central African Rep.	10.16	10.95	10.62	-7.75	-4.55
Chad	26.77	26.32	25.85	1.69	3.44
Chile	10.64	10.41	10.38	2.21	2.47
Congo	21.99	22.00	21.96	-0.04	0.14
Costa Rica	8.28	8.12	8.04	1.99	2.89
Côte d'Ivoire	10.45	10.51	10.19	-0.61	2.47
Cyprus	11.26	10.80	10.71	4.01	4.89
Dominica	18.55	16.01	16.10	13.69	13.22
Dominican Republic	16.89	15.68	15.71	7.19	7.01
Ecuador	14.22	13.61	13.87	4.28	2.48
Egypt	15.18	15.18	15.11	0.02	0.51
El Salvador	13.82	13.17	13.14	4.66	4.94
Equatorial Guinea	33.35	32.91	32.11	1.30	3.69
Ethiopia	14.12	13.49	13.36	4.49	5.41
Fiji	12.08	12.22	12.04	-1.12	0.32
Gambia, The	21.91	21.44	20.98	2.15	4.25
Ghana	12.06	10.63	10.79	11.85	10.49
Greece	7.40	7.44	7.35	-0.67	0.58
Guatemala	10.16	10.68	10.45	-5.15	-2.87
Guyana	17.08	16.51	16.40	3.32	3.96
Haiti	13.58	12.87	12.37	5.22	8.87
Honduras	7.27	7.10	6.90	2.29	5.05
Hungary	3.00	3.14	3.13	-4.41	-4.13
Iceland	8.62	7.84	7.67	9.05	10.99
India	4.99	4.95	4.76	0.73	4.60
Indonesia	15.70	15.41	15.52	1.88	1.14
Israel	6.04	5.95	5.96	1.45	1.28
Jamaica	9.85	9.81	9.73	0.37	1.25
Kenya	12.44	11.28	11.36	9.32	8.69
Korea	6.07	5.96	5.94	1.82	2.14
Lao P. D. Rep.	22.65	22.16	23.84	2.16	-5.27
Madagascar	7.31	7.72	7.79	-5.59	-6.63
Malawi	16.91	16.27	16.35	3.82	3.34
Malaysia	14.20	14.15	13.98	0.39	1.56
Mali	14.71	14.93	14.77	-1.49	-0.43
Mauritania	13.23	12.88	12.67	2.65	4.25
Mauritius	7.87	6.89	6.75	12.47	14.18
Mexico	19.00	19.01	19.00	-0.05	-0.01
Morocco	7.98	7.50	7.37	6.07	7.65
New Zealand	6.07	6.09	6.00	-0.25	1.17
Nicaragua	13.21	13.34	13.23	-0.97	-0.12
Niger	16.23	16.43	16.30	-1.26	-0.43
Pakistan	9.30	8.23	8.01	11.56	13.91
Panama	8.27	8.09	8.36	2.18	-1.04
Peru	13.64	12.74	12.79	6.61	6.20
Philippines	9.25	8.48	8.40	8.29	9.21
Portugal	8.22	7.91	7.91	3.67	3.68
Romania	6.26	6.36	6.21	-1.61	0.82
Senegal	14.44	13.51	13.51	6.39	6.42
Sierra Leone	13.75	11.08	11.09	19.39	19.34
Somalia	18.75	13.55	13.55	27.75	27.75
South Africa	12.69	12.00	11.94	5.46	5.96
Spain	6.15	6.12	6.14	0.48	0.04
Sri Lanka	14.67	14.54	14.31	0.86	2.46
Sudan	14.85	13.89	13.59	6.47	8.47
Swaziland	15.61	15.62	15.55	-0.07	0.38
Tanzania	13.16	12.18	12.11	7.40	7.97
Thailand	6.99	7.68	7.48	-9.89	-6.98
Togo	17.88	17.75	17.71	0.78	0.97
Tunisia	9.62	9.54	9.46	0.78	1.69
Turkey	18.13	17.99	18.03	0.76	0.53
Uganda	24.10	22.15	22.19	8.09	7.92
Uruguay	10.49	9.72	9.70	7.38	7.49

Table 3 (Concluded). Instability Index I_3: Detailed Results

Country	Instability Index 1 (1)	(2)	(3)	(1-2)	(1-3)
Viet Nam	12.68	12.40	12.73	2.19	-0.37
Western Samoa	26.62	23.07	23.59	13.34	11.40
Yugoslavia	7.87	7.45	7.54	5.32	4.21
Zaire	12.26	10.90	11.00	11.13	10.31
Zambia	18.10	16.23	16.52	10.30	8.75
Zimbabwe	9.43	9.11	9.15	3.39	3.03
Total/n	13.14	12.63	12.60	3.43	3.81
S.E.E.	0.62	0.60	0.60	0.66	0.64
S.E.E. on difference					
Number of column (2)>(1) = 18					
Number of column (3)>(1) = 14					

Source: Staff computations.

Table 4. Shortfalls and Drawings by Country Category

Country Category 1/	Total Shortfall 2/	Drawing 3/	Drawing As Percentage of Shortfall
Fuel exporters	1,135.8	660.9	58.2
Agricultural goods exporters	11,387.6	5,519.1	48.5
Mineral exporters	5,335.8	2,741.5	51.4
Exporters of manufactures	3,031.1	1,426.9	47.1
Exporters of services	1,558.1	976.6	62.7
Industrial countries	684.1	600.6	87.8

Source: Staff computations.

1/ Countries are divided according to WEO classifications.
2/ Total shortfall is the sum of the shortfalls for countries in each category over the period 1975 to 1985.
3/ Total drawing is the sum of drawings for countries in each category over the period 1975 to 1985.

Table 5. LIBOR and Rates of Charge on Purchases Under the CFF

Year	LIBOR 1/	CFF Charge 2/
1976	8.12	6.12
1977	8.37	6.12
1978	11.20	6.12
1979	14.15	6.12
1980	16.03	6.12
1981	18.72	6.25
1982	15.60	6.00
1983	11.93	7.00
1984	13.29	7.00
1985	10.64	7.00
1986	8.85	6.00
1987	8.50	5.80
1988	9.00	5.80
1989	10.00	5.80
1990	9.50	5.80

1/ Rate of six months U.S. dollar deposits plus 2 percent spread. Data projected for 1988 to 1990.

2/ This rate is identical to the rate of charge on purchases of ordinary resources. From 1981 to 1987 rates were operational from May 1 to April 30 of the following year. For the earlier period rates (averages for 3-5 years) were operational from April 30, 1977 to April 30, 1981.

Table 6. Determinants of the Demand for International Reserves

Country	Constant	ln σ_t	ln M	ln m	R^2/Adj R^2	D.W.	Number of Years Over Which σ_t Computed
Argentina	11.25	3.47	0.74	0.88	0.65	1.50	7
	(1.32)	(2.45)	(1.09)	(1.30)	0.52		
Australia	-28.11	0.11	2.51	-6.06	0.61	2.15	5
	(-2.70)	(2.27)	(3.46)	(-2.76)	0.47		
Burma	-0.86	0.13	0.98	-0.01	0.69	1.91	11
	(-0.24)	(2.28)	(2.05)	(-0.03)	0.58		
Chad	7.53	2.53	0.51	-1.24	0.72	0.98	11
	(0.95)	(2.19)	(0.72)	(-1.25)	0.62		
Congo	-11.01	0.62	1.63	-2.74	0.81	1.96	11
	(-3.59)	(5.26)	(4.93)	(-2.27)	0.74		
Costa Rica	7.53	2.53	0.51	-1.24	0.72	0.98	11
	(0.95)	(2.19)	(0.72)	(-1.25)	0.62		
Côte d'Ivoire	24.79	3.88	-0.67	4.97	0.81	1.65	5
	(4.79)	(5.21)	(-1.23)	(1.55)	0.75		
Cyprus	-2.85	0.10	1.18	-1.36	0.92	1.60	11
	(-1.36)	(2.45)	(4.71)	(-1.60)	0.89		
Ecuador	-2.44	1.32	1.04	-2.42	0.83	1.78	11
	(-1.79)	(3.77)	(5.79)	(-3.55)	0.76		
El Salvador	-8.47	0.12	2.04	0.20	0.66	1.65	11
	(-2.22)	(1.78)	(3.72)	(0.23)	0.53		
Egypt	3.14	1.82	0.65	-1.33	0.97	2.21	11
	(2.44)	(8.03)	(7.48)	(-7.59)	0.96		
Ethiopia	29.75	2.86	-0.59	-0.54	0.57	1.88	7
	(0.75)	(2.03)	(-0.35)	(-0.17)	0.40		
Fiji	4.00	0.42	0.19	-0.59	0.78	2.73	11
	(6.15)	(2.94)	(1.92)	(-1.88)	0.70		
Gambia, The	22.96	1.35	-3.99	4.31	0.61	2.42	7
	(2.20)	(0.86)	(2.27)	(1.46)	0.46		
Greece	1.08	0.40	0.62	-1.00	0.46	1.66	11
	(0.37)	(1.20)	(2.05)	(-1.21)	0.27		
Guatemala	7.99	1.03	0.07	-0.42	0.34	1.18	7
	(2.24)	(1.46)	(0.04	(-0.28)	0.04		
Guyana	-17.40	0.37	3.26	-5.43	0.50	1.32	11
	(-1.28)	(2.71)	(1.47)	(-1.48	0.31		
Haiti	15.60	2.41	-1.11	0.52	0.29	2.05	11
	(1.73)	(1.50)	(-1.48)	(0.18)	0.02		
Honduras	10.55	1.30	-0.16	0.90	0.85	2.16	11
	(4.05)	(4.17)	(-0.50)	(1.84)	0.79		
India	0.17	1.11	1.33	0.27	0.75	0.98	5
	(0.02)	(2.26)	(2.35)	(0.18)	0.66		
Indonesia	-9.55	0.09	1.36	-2.95	0.81	2.36	11
	(-2.31)	(1.07)	(4.81)	(-2.44)	0.74		
Jamaica	11.63	0.41	-0.65	2.18	0.52	2.01	7
	(2.52)	(2.07)	(-1.11)	(2.60)	0.35		
Kenya	4.82	0.58	0.08	-1.32	0.42	1.74	5
	(1.09)	(1.17)	(0.17)	(-1.48)	0.20		
Madagascar	19.02	3.05	-1.75	-1.87	0.64	-1.33	7
	(2.73)	(1.69)	(-2.75)	(-1.33)	0.51		

Table 6 (Concluded). Determinants of the Demand for International Reserves

Country	Constant	ln σ_t	ln M	ln m	R^2/Adj R^2	D.W.	Number of Years Over Which σ_t Computed
Malaysia	1.38	1.05	0.85	-1.63	0.94	2.13	11
	(0.85)	(2.67)	(8.20)	(-3.29)	0.92		
Mali	2.37	1.96	0.60	-0.029	0.90	2.80	7
	(1.14)	(3.49)	(2.48)	(-0.06)	0.86		
Mauritania	5.77	1.25	0.24	-2.03	0.61	1.74	7
	(1.22)	(1.66)	(0.42)	(-0.34)	0.46		
Mauritius	10.32	1.42	0.83	-2.37	0.68	1.99	7
	(4.20)	(1.98)	(-2.20)	(-0.78)	0.56		
Mexico	31.13	3.67	-1.22	1.39	0.55	2.66	7
	(1.41)	(1.64)	(-0.90)	(0.69)	0.38		
Morocco	7.81	1.62	0.10	-1.55	0.85	1.64	7
	(2.01)	(6.15)	(-2.09)	(-1.70)	0.84		
Pakistan	-4.99	1.84	1.33	-2.96	0.80	2.08	7
	(-1.58)	(3.16)	(5.60)	(-2.57)	0.72		
Panama	-2.96	0.87	1.00	-3.07	0.89	3.09	7
	(-2.02)	(2.72)	(4.53)	(-4.79)	0.85		
Peru	4.20	1.51	0.55	-2.31	0.73	1.21	11
	(0.18)	(1.96)	(0.57)	(-1.70)	0.03		
Philippines	7.70	1.02	0.21	-0.013	0.39	0.89	7
	(1.78)	(1.69)	(0.61)	(-0.01)	0.16		
Romania	1.67	0.57	0.52	-1.03	0.52	1.58	7
	(0.68)	(1.89)	(2.14)	(-1.20)	0.35		
Senegal	-7.41	1.26	1.10)	-5.34	0.39	1.47	3
	(-0.75)	(1.03)	(0.98)	(-1.98)	0.17		
Somalia	11.49	0.39	-0.90	2.81	0.87	2.11	11
	(4.48)	(1.54)	(-2.25)	(6.58)	0.82		
Spain	2.77	1.49	0.70	-2.23	0.90	2.27	11
	(1.30)	(4.25)	(5.26)	(-5.39)	0.85		
Sri Lanka	5.66	1.36	0.70	1.02	0.69	1.81	11
	(1.09)	(1.82)	(1.32)	(1.21)	0.58		
Tanzania	29.57	0.87	-3.19	1.58	0.67	1.11	3
	(4.11)	(1.71)	(-3.30)	(1.63)	0.54		
Thailand	6.00	0.44	0.26	-0.16	0.91	2.49	5
	(7.64)	(7.68)	(5.04)	(0.58)	0.88		
Tunisia	-1.94	0.18	0.89	-1.57	0.84	1.79	3
	(-0.55)	(1.85)	(2.61)	(-1.42)	0.78		
Turkey	30.35	1.51	-1.85	1.95	0.85	2.23	5
	(5.86)	(2.77)	(-4.50)	(6.65)	0.79		
Uganda	13.80	0.55	-0.72	2.00	0.87	2.17	3
	(4.18)	(3.90)	(-1.52)	(6.50)	0.82		
Uruguay	5.25	0.26	0.85	2.71	0.67	2.24	7
	(1.39)	(2.05)	(2.60)	(2.09)	0.54		
Zambia	9.49	0.17	-0.44	1.75	0.66	2.15	7
	(2.27)	(2.87)	(-0.81)	(2.35)	0.53		

Note: Numbers in brackets are "t" ratios.

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