

**REPORT TO THE IMF EXECUTIVE BOARD OF THE  
QUOTA FORMULA REVIEW GROUP**

April 28, 2000

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## I. EXECUTIVE SUMMARY AND RECOMMENDATIONS

1. The International Monetary Fund (IMF) relies on financial resources obtained from its member countries. Each member country is assigned a quota, which is payable in part in reserve assets, and the remainder in the member's own currency. Hard currency paid in through the quota subscriptions represents the readily usable resources of the IMF. Quotas also determine members' potential access to IMF credits, their relative voting power in the institution, and their relative shares in any new allocation (creation) of SDRs.
2. The distribution of quotas has been guided, but not determined strictly, by formula, beginning with the original quota formula used at the Bretton Woods conference in 1944. That formula, along with four other formulas devised in the 1960s, relates quotas to five economic variables, namely, GDP, official reserves, current account receipts and payments, the variability of current receipts, and the ratio of current receipts to GDP. The formulas have always been viewed as guidelines, and efforts to improve them—with limited or no results—are made at each five-yearly general review of quotas required by the IMF Articles of Agreement.
3. In 1997, the IMF's ministerial advisory body, the Interim Committee, reiterated its view "that the formulas used to calculate quotas be reviewed by the [Executive] Board promptly after the completion of the eleventh general review." As a first step in this review process, the Managing Director requested a group of external experts to review the quota formulas, with a view to providing the IMF Executive Board with an independent report on their adequacy. The report is expected to serve, together with IMF staff's comments on it as well as staff's further work on the quota formulas, as a basis for the Executive Board's own consideration of the quota formulas in preparation for the next general review of quotas.
4. The review was conducted by eight experts, consisting of Richard Cooper (Professor, Harvard University), as chairman; Joseph Abbey (Executive Director, Center for Economic Analysis, Accra, Ghana); Montek Ahluwalia (Member, Planning Commission, New Delhi, India); Muhammad Al-Jasser (Vice Governor, Saudi Arabian Monetary Agency); Horst Siebert (President, Kiel Institute of World Economics, Germany); Gyorgy Suranyi (President, National Bank of Hungary); Makoto Utsumi (Professor, Keio University, Japan); and Roberto Zahler (former President, Central Bank of Chile). The group is also known as the Quota Formula Review Group (QFRG).
5. The QFRG's mandate, as given in its terms of reference (Chapter II), includes reviewing the quota formulas with respect to "their adequacy to help determine members' calculated quotas...in a manner that reasonably reflects members' relative position in the world economy as well as their relative need for and contributions to the IMF's financial resources, taking into account changes in the functioning of the world economy and the international financial system and in light of the increasing globalization of markets." This mandate has been interpreted by the QFRG to preclude addressing the question of the absolute level of quotas as distinguished from their relative apportionment among member

countries, as well as changes so far-reaching as to require amendment of the Articles of Agreement. The mandate of the QFRG includes simplification of the formulas, proposing, as appropriate, changes in the variables and their specification in the formulas, and other issues directly related to the quota formulas.

6. The QFRG reviewed technical and statistical material provided by IMF staff on the background and history of the quota formulas (reported on in Chapter III), examined the changes in world economy relevant to its review of the formulas (Chapter IV), and discussed possible statistical inferences from actual quotas (Chapter V). In light of this preparatory work, the QFRG discussed various proposals for change in the quota formulas and has made a number of recommendations (Chapter VI).<sup>1</sup>

### **Main findings**

7. The QFRG's main findings are as follows:

- Significant changes in the world economy since 1944 have made IMF member countries more exposed to external shocks. This is particularly the case for those without adequate and assured access to private capital markets, and the correction of these countries' payments imbalances takes longer than envisioned at the Bretton Woods conference. These relevant changes in the world economy include: (a) global economic integration, with countries having increased their openness to trade and capital flows; (b) the near tripling of the world's population from the levels when the IMF was established; (c) the rapid expansion of capital markets and private capital flows, and their volatility, together with a reduction in the role of official financing; (d) the move to greater exchange rate flexibility; and (e) the great growth to near universal membership of the IMF, as practically all countries not present at the Bretton Woods conference later joined, as did the countries of the former Soviet Union.
- In light of the changes in the world economy, we considered the relative merits of an extensive list of economic variables that could enter into a new quota formula. The list includes those already contained in the existing formula (GDP, official reserves, current payments and receipts, variability of current receipts, and the ratio of current receipts to GDP) and several that appear to have some statistical correlation with historical actual quotas, such as a country's capital flows, its external debt, and its population. We also considered GDP converted at PPP-exchange rates, various measures of the openness of a country's economy, per capita income, the share of food and energy in imports, access to capital markets, and variability of exchange rates. We comment on the quality and availability of statistical data on these variables (see Chapter VI).
- We find that the quota formulas themselves have had only an indirect influence on actual quotas. Their results provided a starting point for negotiations of new members' quotas or were used to guide a marginal shift in members' relative quota shares. Of the increases in quotas of members, normally approved every five years as a result of a general review, less

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<sup>1</sup>Included in the report of the QFRG are a series of Annex notes and a statistical Appendix, which are being issued separately.

than one third was in the form of the so-called “selective” element which is based on the results of the quota formulas. (The remaining bulk of quota increases has been in proportion to then existing quotas.) A few increases in quotas were agreed on an ad hoc basis outside the five-yearly quota reviews; these increases have the character of selective quota increases, but were negotiated much like initial quotas of new members.

- Gaps between actual quota shares, on the one hand, and calculated quota shares (the results of the quota formulas), on the other hand, have persisted over time. This reflects not only the relatively small size of the selective element in quota increases but also the continual changes in individual members' economic circumstances.

### Recommendations

8. In light of the above findings, our recommendations are as follows:

- We believe that the most important criteria for assessing any proposals for change in the quota formulas are: (i) any new formula should have a sound economic basis and reflect the relevant changes in the world economy; (ii) its form and content should be consistent with the multiple functions of quotas; and (iii) it should be simple and transparent.
- From the majority is a basic recommendation to simplify the current system of five quota formulas containing five variables into a single linear formula containing only two variables, one representing a country's ability to contribute to the IMF's resources and the other its external vulnerability. In the new formula, we suggest that ability to contribute should have the larger weight, about twice that of external vulnerability (see box).

<b>Existing quota formula:</b>	Five equations containing GDP, reserves, current account transactions, variability of current receipts, and the ratio of current receipts to GDP
<b>Recommended formula:</b> (majority view)	$Q = a Y + b V$ where $Q$ = quota $Y$ = GDP averaged over three years $V$ = measure of external vulnerability $a, b$ = relative weights, $a = 2b$ and $Q, Y,$ and $V$ are expressed in terms of countries' shares in global totals

- Our preferred measure of ability to contribute is the GDP variable, converted into a common currency at market exchange rates, and averaged over three years to avoid the effects of undue exchange rate and GDP variability.

- We recommend expanding the existing measure of a country's external vulnerability—the variability of current receipts—to cover also the variability of net long-term capital flows. This redefinition takes into account the large and growing impact of long-term capital flows, especially foreign direct investment.
  - We considered certain extensions of our basic recommendation. Modestly compromising the criterion of simplicity by adding a third variable was suggested, with varying degrees of support registered for using a measure of openness (in the form of the average of current receipts and payments, augmented by direct investment flows), official reserves, or population. Another variant from the basic recommendation is to have a second formula, also containing the two variables, GDP and external vulnerability, with the latter having the larger weight. In such a two-equation system, a country's calculated quota would be the higher result of the two formulas (after the totals from either formula were normalized).
  - Some of us have dissenting views on two aspects of the basic recommendation. One minority view supports conversion of the GDP variable into a common currency using PPP exchange rates rather than market exchange rates. Two members support a three-variable formula, with the third variable being a measure of openness, with all three variables having equal weights. Another member supports population as a third variable to give poor countries relatively greater voting power.
  - We believe that quotas should be adjusted to recognize the constantly changing world economy, and the continual relative change of the circumstances of individual members. Ideally, a new quota formula should help to foster such an adjustment of quotas. However, it is not necessarily desirable to change quotas rapidly, as circumstances of individual members may also shift or reverse from one review to the next.
9. We have framed our recommendations without reference to any preconceived results in terms of the quotas of any individual country or groups of countries. Nonetheless, if our recommendations are accepted, we expect to see over the long term an increase in the quota shares of countries with fast-growing and highly open economies, though such increase would be moderated as their access to the capital markets becomes more stable and reliable. We believe this outcome would fundamentally strengthen the quota-based finances of the IMF.

## **II. TERMS OF REFERENCE OF THE REVIEW OF THE QUOTA FORMULAS**

### **A. Purpose of the Review**

10. The report of the IMF's Executive Board to the Board of Governors on the increases in quotas of Fund members under the Eleventh General Review reiterated the view of the Interim Committee "that the formulas used to calculate quotas should be reviewed by the Board promptly after the completion of the Eleventh General Review."

11. As a first step in this review process, the Managing Director has requested a group of external experts to review the quota formulas used in the determination of quotas in the IMF. The main purpose of the review is to provide the Executive Board with an independent report on the adequacy of the quota formulas, including proposals for changes, if appropriate. This report could serve—together with staff's comments on it as well as staff's further work on the quota formulas—as a basis for the Board's own consideration of the quota formulas in the context of the Twelfth General Review of Quotas.

### **B. Focus of the Review**

12. The review will be carried out by a group of eight external experts, as indicated in "C" below. The mandate of the group is intended to be broad and would include the following main areas:

- \$ To review the quota formulas and their working, and to assess their adequacy to help determine members' calculated quotas in the IMF in a manner that reasonably reflects members' relative position in the world economy as well as their relative need for and contributions to the Fund's financial resources, taking into account changes in the functioning of the world economy and the international financial system and in light of the increasing globalization of markets.
- \$ To propose, as appropriate, changes in the variables and their specification to be used in the formulas.
- \$ To examine other issues directly related to the quota formulas.

13. Taking into account the role of quotas in the IMF, the group is requested in its review of the quota formulas to review, inter alia, issues that have arisen in recent discussions by the Executive Board. Some of the main issues in recent reviews have focussed on whether the quota formulas are currently adequate and also whether the variables in the formulas reasonably reflect the main features of the world economy. In this connection, some Directors have requested the explicit inclusion of capital movements and access to capital markets in the quota formulas, while other Directors have noted that the quota formulas should contain a variable that would indicate a member's per capita income as an indicator of relative wealth, and they also ask whether population should be taken into account, either directly or indirectly.

14. Issues regarding data have also arisen, in particular, whether purchasing power parity indexes, taking into account their reliability, or real effective exchange rates, taking into account their construction, should be used to convert nominal GDP expressed in domestic

currency into SDRs as an alternative to the current practice of making such conversions at market exchange rates. Directors have also raised questions regarding both the number of quota formulas and whether they should be reduced, and also the possibility of restructuring the formulas so as to simplify them with a view to removing anomalies in their working.

### **C. Procedures**

15. Professor Richard Cooper will serve as chair. The group shall conduct its review freely and objectively, and make recommendations to the best of their professional abilities.

16. The group of experts shall have access to information in possession of the IMF as needed for carrying out its review. This will include access to all papers to the Executive Board, and the Committee of the Whole, dealing with the General Reviews of Quotas and the role of quota formulas in the determination of quotas. Each member of the group undertakes to protect the confidentiality of information in possession of the IMF obtained in the course of the review.

17. The group of experts will begin its work in July 1999 and make best efforts to complete its report by the end of December 1999. The confidential report of the group will be submitted to the Managing Director and the Executive Board at the same time. The IMF reserves the exclusive rights to the report, and the members of the group undertake not to publish any part of the report separately.

18. The Managing Director will make arrangements to assist with any support from the IMF staff requested by the group of experts.

## **III. QUOTA FORMULAS BACKGROUND AND HISTORY**

19. This chapter summarizes the functions of quotas in the IMF, presents a history of the quota formulas, including an analysis of how various economic variables affect the results of the formulas, and describes the role of quota formulas in determining the initial quotas of members and their quota increases in the general quota reviews every five years. This chapter also lists the main issues that Executive Directors have raised concerning the quota formulas.

### **A. Functions of IMF Quotas**

20. Each member is assigned a quota in the IMF, which is expressed in terms of SDRs.<sup>2</sup> A member's quota has several functions:

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<sup>2</sup>The SDR (special drawing right) is a reserve asset created by the IMF as a supplement to existing reserve assets. It was originally valued in terms of gold (equal to one U.S. dollar) but since 1974, the value of the SDR has been determined by that of a basket of major currencies. The average value of the SDR was \$1.37 in 1999.



(a) It is equal to the member's capital subscription to the IMF. Up to 25 percent of the subscription is payable in reserve assets (in gold, under the original Articles of Agreement) and the remainder in the member's domestic currency. Reserve assets are defined to include the currencies of members considered by the Fund to have sufficiently strong external positions to finance IMF lending to other members, and SDRs. The reserve asset portion of a quota subscription creates an equal amount of a creditor position, called the "reserve tranche position," which the subscribing member can withdraw from the IMF essentially on demand. Consequently, while creditor countries tend to maintain their reserve tranche positions, debtor countries tend to draw down such positions. In practice, the reserve asset component of the IMF's quota resources is represented by the quotas of the countries that are creditors in the IMF and by a small portion of the quotas of other members. The mechanics of how the IMF makes use of its subscribed quota resources in its lending operations is described in Box 1.

(b) The maximum amount of credit that a member may obtain from the IMF is based on its quota. Limits on members' access to resources under the IMF's financing facilities are expressed in terms of quota. The IMF originally set the limit on outstanding Fund credit at 100 percent of quota, but the limit rose to as high as 600 percent in the early 1980s, when quotas were clearly too small in relation to members' need for IMF financing (see Table 1).<sup>3</sup> Since November 1992, the limit has been set at 300 percent. However, in December 1997 and April 1999, the IMF established the Supplemental Reserve Facility (SRF) and the Contingent Credit Line (CCL), respectively, as financing facilities under which access is not subject to a quota limit. The SRF has been designed to help members deal with large, short-term balance of payments financing needs arising from disruptive losses of market confidence, and the CCL was designed to provide members following sound economic policies with a precautionary line of defense against future balance of payments problems that might arise from "contagion" from developments elsewhere. The SRF has been used by Korea, Russia, and Brazil, but the CCL has not been used to date.

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<sup>3</sup>Such access limits on outstanding credit could not be financed solely from quota resources, and the IMF engaged in borrowing to supplement its capital base. Access to IMF credit may also be subject to annual limits, i.e., to amounts that can be drawn over a period of time.

### **Box 1. The Financing Mechanism of the IMF**

- The IMF's financing mechanism has its roots in the credit facilities that existed between central banks before the IMF was established.<sup>1</sup> When obtaining credit or borrowing from the IMF, a member purchases from the IMF the currency of another member in exchange for its own currency. The currency purchased is the currency of a member in a strong external position. As the IMF's resources are available only temporarily, repayment of IMF credit is made within specified time periods. Repayment is effected through a reversal of the original transaction—the member repays by paying the IMF foreign currency acceptable to the IMF and repurchasing its own currency that the IMF had acquired.
- For the IMF to be able to lend, it has on tap, through members' payments for capital subscriptions (in the form of quotas or quota increases), a pool of gold, currencies, and SDRs. A quarter of a member's quota payment is normally paid in usable assets (SDRs or currencies of other members acceptable to the IMF), and the balance is paid in the member's own currency. The quota payment made in usable assets creates an equal amount of "reserve tranche position" (by definition, this position is initially equal to the usable asset payment for a quota subscription). Through the purchase/repurchase mechanism of IMF financing, the value of the pool of subscribed assets of the IMF remains constant, though its composition changes. When members borrow from the IMF, the pool contains more of debtor members' currencies and less of SDRs or currencies of creditor members. The reverse takes place as members repay their borrowings from the IMF. A debtor member's currency is not usable for financing IMF lending, unless that member's external position were to recover and strengthen to the point that it would be treated as a creditor. Hence, the IMF's lending capacity is significantly less than the value of its total pool of assets.
- The resources paid by members for their quotas or quota increases are within the unrestricted ownership of the IMF, and the currencies paid in are held by the IMF in depository accounts at members' central banks. For example, when Japan paid for its quota increase of SDR 5.07 billion in 1999, part of the payment was made in a combination of SDRs and other members' currencies (SDR 1.27 billion), and the remainder was in Japanese yen (¥607 trillion, equivalent to SDR 3.8 billion). The IMF's holdings of Japanese yen rose by more, because other members paid part of their quota increases in Japanese yen.
- Members are obliged to maintain the SDR value of the currency holdings of the IMF. In the above example of the IMF's holdings of Japanese yen, Japan would have to pay in additional yen into the IMF's account at the Bank of Japan if the yen were to depreciate against the SDR. On the other hand, the IMF would refund some of these yen holdings if the yen were to appreciate. The IMF denominates its accounts in SDRs and the maintenance-of-value provision ensures that there would be no valuation gains or losses for the IMF with respect to its holdings of members' currencies.
- A member's reserve tranche position is equal to the difference between its quota and the IMF's holdings of its currency. A member may draw up to the full amount of its reserve tranche position at any time, subject only to its representation to the IMF that it has a balance of payments need. The mechanism for drawing on a reserve tranche position is the same as for a member borrowing from the IMF, as described above.

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<sup>1</sup>Central banks would borrow from each other with the borrower purchasing the currency of the lender, paying for it by crediting the lender's account with the borrower in the borrower's currency. Alternatively, the borrower could obtain foreign currency through the sale of bills of exchange in its currency, with a commitment to repurchase them at the same exchange rate after a short period.

**Box 1 (concluded). The Financing Mechanism of the IMF**

- Members' currencies held by the IMF do not bear interest. As a matter of practice, the IMF allows a member to substitute non-interest-bearing notes (IOUs) in place of its currency in the IMF's depository account. However, interest is paid to a creditor when its currency is used to finance another member's borrowing from the IMF. The IMF's holdings of the creditor member's currency falls, enlarging the reserve tranche position of the creditor. Creditor members receive interest on their reserve tranche positions, except on a small portion.<sup>2</sup> Debtor members pay interest on their borrowings from the IMF. Both the interest rates charged and paid by the IMF to its debtor and creditor members are market-related.
- The choice of currency to be purchased by a borrowing member is effectively one by which the IMF decides which member country (or countries) is (are) being called upon to finance IMF lending. Operationally, the IMF decides quarterly, based on the expected pipeline of member borrowings and repayments, which currencies are to be used (and up to what amounts) for purchases, and which currencies (and in what amounts) to accept in repurchases. In other words, the IMF decides which creditor countries' reserve tranche positions would be adjusted—up or down—to match the ebb and flow of borrowing countries' transactions with the IMF. Since 1999, such decisions have been governed by a principle that requires that creditor members' reserve tranche positions be related uniformly to their IMF quotas. In other words, quotas also determine the relative shares of creditor members in financing the IMF.
- Efforts are made to match a borrowing country's preference for currency it receives with the currency in which IMF credit is extended. In addition, a member country establishes procedures to ensure, that, if needed, its currency (held by the IMF and transferred to a borrowing country in an IMF lending transaction) can be converted into one of the major currencies (the U.S. dollar, euro, Japanese yen, or pound sterling).

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<sup>2</sup> The existence of unremunerated reserve tranche positions is mainly a reflection of the fact that, prior to 1978, members paid for part of their quota subscriptions in gold, and some of this gold is held by the IMF and does not earn interest income that could be passed through to the membership. A debtor member with a reserve tranche position also has an unremunerated portion of that position.

Table 1. Cumulative Access Limits under Credit Tranche Policies 1/  
(In percent of quota, except as indicated)

General Quota Reviews: Entry into Effect	Time Period when Access Limits were in Effect	Credit Tranche	Extended Fund Facilities	Cumulative Limit (or Maximum Combined Access) 2/	No. of Cases of Actual Access Beyond Cumulative Access Limit
	From Fund establishment to September 1974	100	--		0
	September 1974 to January 1976	100	140	165	0
	January 1976 to March 1978	145	140	176.25	0
Sixth: April 1, 1978	April 1978 to February 1979	100	140	165	0
	February 1979 to September 1979	202.5	280	305	0
	September 1979 to July 1980			465	0
	July 1980 to December 1980			600	0
Seventh: November 29, 1980	December 1980 to December 1983			600	0
Eighth: November 30, 1983	1984			408–500	1
	1985			408–450	0
	1986–1990			400–440	0
	January 1991 to November 11, 1992			440	0
Ninth: November 11, 1992	November 11, 1992 to present			300	5
Eleventh: January 22, 1999					

1/ This table covers only access under the “regular” Fund facilities, and therefore excludes use under the Compensatory Financing Facility/Compensatory and Contingency Financing Facility (originally established in 1963), and the Buffer Stock Financing Facility (BSFF). Also excluded are use under the Structural Adjustment Facility/Enhanced Structural Adjustment Facility/Poverty Reduction and Growth Facility (SAF/ESAF/PRGF). Use of Fund credit under the Supplemental Reserve Facility (SRF), established in December 1997, is considered as use under stand-by or extended arrangements, but is not subject to the cumulative access limit. The number of cases of SRF use beyond the 300 percent access limit is included in the table. Access policy under the Contingent Credit Line (CCL) established in April 1999 is essentially the same as under the SRF, but no use of the CCL has taken place to date.

2/ Includes access under the Supplementary Financing Facility (February 1979–March 1981) and the Enlarged Access Policy (March 1981–November 1992). Cumulative access limits began to be applied in 1979.

(c) The distribution of quotas determines members' voting power. Each member has 250 votes (called "basic" votes) plus one additional vote for each part of its quota equal to SDR 100,000.<sup>4</sup> As the total of basic votes represents only a small fraction of total votes, the voting power of members is essentially directly related to the size of their quotas. The distribution of quotas and voting power is important to large members and to coalitions of smaller members because important IMF decisions requiring a vote are subject to special majorities of 70 or 85 percent.<sup>5</sup>

(d) A member's relative share in a general allocation, i.e., creation, of SDRs is equal to its share in total quotas.<sup>6</sup> The IMF allocated a total of SDR 21.4 billion in two phases, in 1970B72 and 1979B81.

## **B. History of the Formulas**

21. Quotas have been guided but not determined by formula. The quotas of 44 countries were negotiated at the United Nations Monetary and Financial conference at Bretton Woods, New Hampshire and promulgated in Schedule A of the IMF's Articles of Agreement. Quotas of subsequent members were also arrived at by negotiation, though the staff has relied on the results of quota formulas in setting a recommended initial quota for a new member. The Articles provide for the possibility of periodic as well as ad hoc quota increases. The role of the quota formulas in determining actual quotas or increases in quotas is described further in Section D below.

22. The quota formulas themselves have evolved slowly over time starting from the formula that was devised at Bretton Woods. The changes made in 1962-63 and 1983 did not fundamentally alter the structure or working of the quota formulas.

### **The original Bretton Woods formula**

23. The original Bretton Woods formula related a member's quota to its national income, reserves, external trade, and the fluctuation of its exports (see Box 2). The formula provided

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<sup>4</sup>Article XII, Section 5.

<sup>5</sup>Among such decisions are those affecting the Fund's financial operations (e.g., changes in members' quotas, gold sales, allocation or cancellation of SDRs, or changes in the method of valuation of the SDR), amendment or interpretation of the Articles of Agreement, and changes in the number of Executive Directors. For a fuller discussion of the Fund's voting system, see J. Gold, *Voting Majorities in the Fund*, Pamphlet No. 20 (Washington, IMF, 1977).

<sup>6</sup>Article XVIII, Section 2(a) specifies that "the rate at which allocations are to be made shall be expressed as percentages of quotas on the date of each decision to allocate."

some guidance to the delegates at the Bretton Woods conference in determining the distribution of quotas among the original participants, and the coefficients of the variables in the formula were determined in such a way as to give support to the broad configuration of initial quotas that would be acceptable. However, the formula had no official status given that the quotas of the four largest countries were “determined at the highest political level in the United States...”<sup>7</sup>

24. The design and specification of the Bretton Woods formula were subject to several preconceived constraints, viz.: (1) the IMF would ultimately have assets of about \$10 billion, out of which the Bretton Woods participants' quotas would be \$8 billion, leaving the balance of \$2 billion for new members; (2) the United States, which held the bulk of international liquidity, would supply a major part of the IMF's assets, while the principal postwar demands on the IMF would be for gold or dollars; (3) the quota of the United States would be twice as large as the quota of the United Kingdom; (4) the combined quotas of the United Kingdom, its dominions and colonies, should be equal to that of the United States, and the quotas of other large members should be reasonably related to those of the United States and the United Kingdom; (5) countries which could pay the largest amounts of gold and convertible currencies to the IMF would not necessarily be those who would wish to make the largest use of its resources; and (6) the countries with the four largest quotas should be (in descending order of size): the United States, the United Kingdom, the USSR, and China.<sup>8</sup>

25. To varying degrees, the results of the Bretton Woods formula differed from the final agreed outcomes for most of the 45 countries that participated at the conference. The two largest quotas (of the United States and the United Kingdom) were very close to the results of the formula, and the remaining members were roughly evenly divided between those with quotas above and below the results of the formula (see Table 2). Among the large members,

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<sup>7</sup>See Raymond F. Mikesell, “The Bretton Woods Debates: A Memoir,” *Essays in International Finance*, No. 192 (Princeton, NJ: International Finance Section, Department of Economics, Princeton University, 1994).

<sup>8</sup>Constraints (1) through (5) are referred to in Oscar Altman, “Quotas in the International Monetary Fund,” *Staff Papers*, Vol. 5, (Washington: IMF, 1956-57), p. 136. Constraint (6) is referred to in J.K. Horsefield, *The International Monetary Fund 1945-65*, Vol. 1 (Washington: IMF, 1969), p. 95 and in Mikesell (1994) p. 22.

## Box 2. Evolution of the Quota Formulas

### The Original Bretton Woods Formula

The original Bretton Woods formula may be written in symbols as:

$$Q^C = (0.02Y + 0.05R + 0.010M + 0.10V) (1 + X/Y) \quad (1)$$

where

$Q^C$  = Calculated quota

$Y$  = National income, 1940

$R$  = Gold and foreign exchange reserves as of July 1, 1943

$X$  = Average annual exports (five-year average), 1934–38

$M$  = Average annual imports (five-year average), 1934–38

$V$  = Maximum fluctuation in exports defined as the difference between the highest and lowest value of exports in 1934–38.

### 1962/63 Revision of the Formula and Multi-Formula System

#### *Revised Bretton Woods*

$$Q_I = (0.01Y + 0.025R + 0.05M + 0.2276V) (1 + X/Y) \quad (2)$$

$$Q_i^* = (0.01Y + 0.025R + 0.05P + 0.2276VC) (1 + C/Y) \quad (3)$$

where

$Q_I$  = Quota calculated with Set I data

$Q_i^*$  = Quota calculated with Set II data

$Y$  = National income in a recent year

$R$  = Gold and foreign exchange reserves at the end of a recent year

$X, M$  = Average annual exports or imports over a recent five-year period

$C, P$  = Average annual current receipts or payments over a recent five-year period

$V, VC$  = Variability of annual exports or current receipts, defined as one standard deviation from the centered five-year moving average, from a recent 13-year period.

#### *Modified Formulas on Set I Data*

Scheme III:  $Q_2 = (0.0065Y + 0.078M + 0.5065V) (1 + X/Y) \quad (4)$

Scheme IV:  $Q_3 = (0.0045Y + 0.070M + 0.9622V) (1 + X/Y) \quad (5)$

Scheme M4:  $Q_4 = 0.005Y + 0.044M + 0.044X + 1.044V \quad (6)$

Scheme M7:  $Q_5 = 0.0045Y + 0.039M = 0.039X + 1.304V \quad (7)$

#### *Modified Formulas on Set II Data*

Scheme III:  $Q_2^* = (0.0065Y + 0.078P + 0.5065VC) (1 + C/Y) \quad (8)$

Scheme IV:  $Q_3^* = (0.0045Y + 0.070P + 0.9622VC) (1 + C/Y) \quad (9)$

Scheme M4:  $Q_4^* = 0.005Y + 0.044P + 0.044C + 1.044VC \quad (10)$

Scheme M7:  $Q_5^* = 0.0045Y + 0.039P + 0.039C + 1.304VC \quad (11)$

**Box 2 (concluded). Evolution of the Quota Formulas**

*Calculated quota*

$$Q^C = \text{Max} [ \text{Mean} ( Q_1, Q_1^* ), \hat{Q} ] \quad (12)$$

where

$$\hat{Q} = \text{Mean of the lowest two of Mean} ( Q_i, Q_i^* ), i = 2 \text{ to } 5$$

and the values of  $Q_i$  ( $i = 2$  to  $5$ ) and  $Q_i^*$  ( $i = 1$  to  $5$ ) have been normalized so that their totals equal that of  $Q_1$ .

**1983 Revision of the 1962/63 Formulas**

Bretton Woods:  $Q_1 = (0.01Y + 0.025R + 0.05P + 0.2276VC) \times (1 + C/Y)$  (13)

Scheme III:  $Q_2 = (0.0065Y + 0.0205125R + 0.078P + 0.4052VC) \times (1 + C/Y)$  (14)

Scheme IV:  $Q_3 = (0.0045Y + 0.03896768R + 0.07P + 0.76976VC) \times (1 + C/Y)$  (15)

Scheme M4:  $Q_4 = 0.005Y + 0.042280464R + 0.044 (P + C) + 0.8352VC$  (16)

Scheme M7:  $Q_5 = 0.0045Y + 0.05281008R + 0.039 (P + C) + 1.0432VC$  (17)

Where

Y = GDP in a recent year

R = Average value of gold, SDRs, and foreign exchange reserves in a recent year

X, M, C, P, V, VC = as defined in 1962/63.

*Calculated Quota*

$$Q^C = \text{Max} ( Q_1, \text{Mean of lowest two of } Q_2, Q_3, Q_4, Q_5 ) \quad (18)$$

where the values of  $Q_i$  ( $i = 2$  to  $5$ ) have been normalized so that the totals of  $Q_i$  equal that of  $Q_1$ .



Table 2. Calculated and Actual Quotas at the Bretton Woods Conference 1/

	Calculated Quota  (Amounts in millions of U.S. dollars)	Actual Quota (Schedule A)	Percentage Difference of Actual from Calculated Quota
Australia	149	200	34
Belgium	250	225	-10
Bolivia	9	10	11
Brazil	107	150	40
Canada	278	300	8
Chile	37	50	35
China	350	550	57
Colombia	30	50	67
Costa Rica	3	5	67
Cuba	37	50	35
Czechoslovakia	117	125	7
Denmark 2/	n.a.	...	n.a.
Dominican Republic	n.a.	5	n.a.
Ecuador	5	5	0
Egypt	59	45	-24
El Salvador	5	2.5	-50
Ethiopia	n.a.	6	n.a.
France	620	450 4/	-27
Greece	41	40	-2
Guatemala	7	5	-29
Haiti	5	5	0
Honduras	3	2.5	-17
Iceland	4	1	-75
India and Burma	367	400	9
Iran	n.a.	25 5/	n.a.
Iraq	n.a.	8	n.a.
Liberia	n.a.	0.5	n.a.
Luxembourg	7	10	43
Mexico	63	90	43
Netherlands	325	275	-15
New Zealand	54	50	-7
Nicaragua	n.a.	2	n.a.
Norway	66	50	-24
Panama	n.a.	0.5	n.a.
Paraguay	2	2	0

Table 2 (concluded). Calculated and Actual Quotas at the Bretton Woods Conference 1/

	Calculated Quota	Actual Quota (Schedule A)	Percentage difference of actual from calculated quota
	(Amounts in millions of U.S. dollars)		
Peru	21	25	19
Philippines	n.a.	15	n.a.
Poland	114	125	10
Union of South Africa	175	100	-43
Union of Soviet Socialist Republics	763	1200	57
United Kingdom	1275	1300	2
United States	2929	2750	-6
Uruguay	22	15	-32
Venezuela	25	15	-40
Yugoslavia	85	60	-29
Rest of U.A.N. 3/	<u>n.a.</u>	<u>n.a.</u>	n.a.
Total	8409	8800	

Note: Three members -- Haiti, Liberia, and New Zealand -- joined the Fund with different quotas from those shown in Schedule A of the Articles of Agreement.

1/ A "n.a." signifies that the country was not named in the list. Three dots (...) signify that the country was named in the list but that no figure was given.

2/The quota of Denmark was determined by the Fund after the Danish Government declared its readiness to sign this Agreement but before signature took place.

3/ United and Associated Nations.

4/ Quota increased to \$525 million in January 1947.

5/ Quota increased to \$35 million in July 1948.

the biggest deviations from the formula were China (+57 percent from the calculated quota), the USSR (+57 percent), and France (-27 percent), though the last had its quota raised in January 1947 to reduce the discrepancy to -15 percent. The percentage deviations of actual from calculated quota for the remaining members ranged widely from -75 percent (Iceland) to +67 percent (Colombia and Costa Rica), and seven members' quotas were within ±10 percent of the formula (Belgium, Canada, Ecuador, Ethiopia, Greece, India, and Paraguay). The actual quotas of the larger developing countries—notably China, India, Brazil, and Mexico—were significantly higher than the quotas resulting from the application of the Bretton Woods formula.

26. An assessment of the Bretton Woods formula was made by IMF staff in the early years.<sup>9</sup> It was noted that the formula gave the greatest weight to national income but also resulted in varying relationships of quotas to imports across member countries. Furthermore, the economic significance of each of the component variables in the quota formula was not considered self-evident. For example, national income was seen as a possible measure of wealth and productive capacity, but it presented difficulties for comparative international measurement and was not seen as an adequate indicator of potential need for IMF resources. It was also argued that, since the IMF was to help members cope with balance of payments fluctuations, the variability of exports should have been given greater weight (this view later influenced the revision of formulas in the 1960s). Nonetheless, the staff did not see the Bretton Woods formula as a bad one and felt that it would have been difficult to devise a better formula, given the multiple functions of quotas and the constraints to which the formula was subjected.

### **Formulas for the Fourth through the Seventh General Reviews**

27. In 1962-63, a multi-formula approach was adopted. This approach was designed to produce somewhat higher calculated quotas for members with relatively small and more open economies. The large members generally continued to have their calculated quotas determined on the basis of the Bretton Woods formula. These multiple quota formulas were used until the Seventh Review of 1978.

28. Other changes made in 1962-63 included a reduction by half of the coefficients of the variables in the original Bretton Woods formula and a redefinition of the variable for the maximum fluctuation of exports. The reduction in the size of the coefficients of the Bretton Woods formula yielded a calculated set of quotas closer to the then-existing quotas.

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<sup>9</sup>Altman (1956), pp. 136-41.

The measure for the variability of export receipts was aligned with that used for the Compensatory Financing Facility of 1963.<sup>10</sup>

29. Under the multi-formula approach, a number of experimental versions of the Bretton Woods formula were developed by reweighting and modifying the original formula. Of these, four were adopted for use together with the Bretton Woods formula. In these modified or derivative formulas, the reserves variable was eliminated, the coefficient of national income was decreased from the value used for the Bretton Woods formula, and the coefficients of trade and the variability of exports were increased. Furthermore, the multiplicative factor (i.e., one plus the ratio of exports to national income) was eliminated in two of the formulas, thereby making them linear. The results of the formulas were normalized by applying to each an adjustment factor that equated the sum of the results of each formula with the sum for all members that was obtained using the Bretton Woods (reduced) formula.

30. Apart from the changes in the specification of the quota formulas, two sets of data came to be used. As a consequence, alternative calculations were made by substituting: (a) current payments (imports, payments for services, and private transfers) for imports; (b) current receipts (exports, receipts from services, and private transfers) for exports; and (c) variability of current receipts for variability of exports. Two sets of calculations, Set I calculations using exports, imports, etc., and Set II calculations using current receipts, current payments, etc., were thus made.

31. From the results of the ten calculations (five formulas applied to two data sets), a calculated quota range and a single calculated quota were derived, as follows: (1) the two quota calculations made from the Set I and Set II Bretton Woods formulas (revised) were averaged, and this average was used as one end of the calculated quota range; (2) an average was made of the lowest two calculations, based on the derivative Set I calculations, and of the lowest two Set II versions of the derivative formulas; the average of these four

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<sup>10</sup>Variability,  $V$ , was redefined as one standard deviation from trend, where trend was represented by a centered five-year moving average. Specifically,

$$V = \left[ \frac{\sum_{t=3}^{11} (X_t - \bar{X}_t)^2}{9} \right]^{1/2} \quad \text{where } X_t = \text{value of current receipts in year } t, \text{ and}$$

$\bar{X}_t =$  centered five-year moving average of  $X_t$  calculated over a 13-year period.

It may be noted that the coefficient for variability (0.2276) is equivalent to one half of the coefficient (0.10) in the original Bretton Woods formula after taking account of the redefinition of the measure of variability.

calculations was used as the other end of the calculated quota range; and (3) a single calculated quota was derived as the higher end of the calculated quota range. This procedure resulted in calculated quotas based on the Bretton Woods formula for many industrial countries and on the variant formulas for many developing countries.<sup>11</sup>

### **Formulas for the Eighth through the Eleventh General Reviews**

32. The quota formulas were further revised in 1983, reducing the influence of variability of current receipts on members' calculated quotas. The resulting formulas were used in the Eighth through the Eleventh General Reviews.

33. As regards the variables in the formulas, GDP replaced national income; the reserves variable was re-introduced into all the derivative formulas; and the measure of reserves, broadened to include SDRs and ECUs, was redefined as a twelve-month average rather than a year-end level. Furthermore, Set I calculations were dropped, and the coefficient of variability was reduced by 20 percent in the four derivative formulas. The calculated quota was derived as the higher of the result of the Bretton Woods formula and that obtained by averaging the two lowest results of the derivative formulas. Adjustment factors continued to be applied to each of the derivative formulas so that the totals for all members derived under each formula at the time of a general quota review equal that derived under the Bretton Woods formula.

### **C. How Variables Affect the Calculated Quotas**

34. The calculated quotas tend to exhibit greater stability over time than the economic variables that enter into the quota formulas. This reflects both the composite character of the quota formulas and the fact that the various indicators included in them are not perfectly correlated. Moreover, the influence of a given variable on a member's calculated quota depends on the particular formulas that determine the member's calculated quota, given that the calculated quota is defined as the higher of the results of the Bretton Woods (reduced) formula and the average of the lowest two results from the four derivative formulas. In general, for a member on the Bretton Woods formula, GDP tends to have a relatively large influence on the calculated quota, whereas for members using the derivative formulas, the influence of the external trade and variability tends to be the strongest. The variables with the largest contributions to members' calculated quotas have been GDP and current payments (Table 3A).

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<sup>11</sup>See Michael Edo, "Multiformula Method Adds Flexibility in the Calculation of Members' Quotas," *IMF Survey*, June 5, 1978, pp. 166–68.

**Table 3-A. Average Contributions of Variables to Calculated Quotas**  
(In percent of calculated quotas)

	GDP	Reserves	Current Payments	Current Receipts	Variability	Ratio of Current Receipts to GDP
<b>1. By WEO Classification</b>						
<b>All Members</b> (weighted averages) 1/	28.9	3.9	33.3	4.4	13.4	16.1
<b>Advanced Economies</b>	20.3	4.9	36.3	4.9	10.3	23.3
Major Industrial Countries	31.2	2.7	34.7	5.8	12.0	13.6
Other Advanced Economies	16.4	5.7	36.9	4.6	9.7	26.6
<b>Developing Countries</b>	13.4	5.5	33.6	7.6	23.7	16.2
Net Creditors	4.9	3.2	22.0	10.3	44.3	15.4
Net Debtors	13.9	5.6	34.3	7.4	22.5	16.2
of which HIPC or least developing countries	12.9	5.6	35.2	8.2	25.0	13.1
<b>Transition Economies</b>	5.4	2.4	25.9	11.0	39.7	15.6
<b>2. Selected Countries</b>						
United States	51.5	1.4	31.0	--	6.1	10.0
Germany	11.3	4.9	36.3	14.3	22.4	10.8
United Kingdom	26.3	2.6	42.1	--	5.3	23.7
Saudi Arabia	5.0	3.0	25.7	21.0	45.3	--
Russia	9.6	1.1	26.0	10.7	42.0	10.7
China	41.8	7.2	32.2	--	4.7	14.1
Brazil	52.7	9.1	20.9	--	9.9	7.3
Denmark	18.7	3.0	41.9	--	4.2	32.3
Thailand	21.3	10.1	39.7	--	4.6	24.3
Zambia	6.0	2.3	34.0	9.1	33.8	14.8
Myanmar	87.9	1.0	7.5	--	2.2	1.3
Suriname	2.8	0.5	22.8	--	13.4	60.5

Source: Statistical Appendix, Part A, Section I.

1/ The contribution to the calculated quota is the variable times its coefficient, expressed in relation to the member's calculated quota. The contribution of the ratio of current receipts to GDP is the contribution of the nonlinear element to the calculated quotas, i.e., the extent to which the calculated quota is raised by the application of the multiplier (unity plus the ratio of current receipts to GDP). The weighted average contribution is equal to the sum of the product of the estimated coefficient applied to the variable, summed over all members or groups of members, and expressed in relation to the total of calculated quotas.

35. At the margin, however, the impact on the calculated quotas of the variables that enter into the formulas differ from their relative contributions. In general, the marginal influence of GDP is smaller than its average contribution, and the opposite is the case for current receipts and its variability. To illustrate these relationships, Table 3B shows the partial elasticities of each country's calculated quota with respect to GDP, current receipts, current payments, variability, and reserves. These elasticities provide an indication of the extent to which a given member's calculated quota would change when a particular variable changes, while other factors are kept constant. They also indicate the margin of error in the calculated quota to the extent that a particular variable is itself subject to statistical or estimation errors or to distortions arising from valuation problems or any particular data weaknesses.

36. For the membership as a whole, GDP has the smallest marginal impact on calculated quotas, while the variable with the largest marginal contribution to calculated quotas is current payments. The smallness of the marginal impact of GDP is attributable mainly to the effect of the nonlinear element in the quota formulas.<sup>12</sup> The variability of current receipts has only a slight impact on the calculated quotas of most industrial countries, while GDP has a large impact for the United States, China, and Brazil. The opposite is the case for the relatively open economies of such members as Saudi Arabia and Denmark. The marginal effect of the current account variables on the calculated quota also tends to rise with the openness of the economy of the member country.

#### **D. Role of Quota Formulas in Determining Actual Quotas**

37. The Articles of Agreement provide no guidance on how a member's quota is to be determined. The quotas of the original members were, as noted earlier, negotiated on the basis of some rough guidance from the results of the Bretton Woods formula. For a new member, Article III, Section 1, provides that the terms of membership, including its quota, shall be based on principles consistent with those applied to existing members. Consequently, although the initial quota of a new member is also negotiated on the basis of results of the quota formulas, emphasis is given to "fitting" a new member's quota into the structure of existing quotas (see Box 3).

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<sup>12</sup>This effect produces a partial elasticity of the calculated quota with respect to GDP that is negative for many members. For a fuller discussion of this feature of the formulas, see Annex Note 1.

**Table 3-B. Relationship Between Calculated Quotas and Variables Entering into the Quota Formulas**

	Partial Elasticity of the Calculated Quota with respect to					<i>Memo:</i> Ratio of Current Receipts to GDP
	GDP	Reserves	Current Payments	Current Receipts	Variability	
1. By WEO Classification 1/						
<b>All Members</b>	-0.007	0.060	0.425	0.245	0.273	0.20
<b>Advanced Economies</b>	0.030	0.065	0.500	0.281	0.126	0.20
Major Industrial Countries	0.231	0.032	0.413	0.194	0.132	0.17
Other Advanced Economies	-0.040	0.077	0.530	0.312	0.124	0.39
<b>Developing Countries</b>	0.002	0.066	0.426	0.234	0.265	0.20
Net Creditors	-0.086	0.037	0.281	0.251	0.518	0.46
Net Debtors	0.007	0.068	0.434	0.233	0.251	0.18
of which HIPC or least developing countries	0.023	0.069	0.426	0.211	0.271	0.19
<b>Transition Economies</b>	-0.082	0.027	0.348	0.261	0.447	0.34
2. Selected Countries						
United States	0.472	0.016	0.344	0.100	0.068	0.11
Germany	0.020	0.055	0.425	0.251	0.249	0.28
United Kingdom	0.109	0.034	0.552	0.237	0.069	0.31
Saudi Arabia	0.050	0.030	0.257	0.210	0.453	0.48
Russia	0.014	0.012	0.310	0.205	0.460	0.28
China	0.346	0.084	0.375	0.141	0.054	0.16
Brazil	0.496	0.098	0.226	0.073	0.107	0.08
Denmark	-0.045	0.044	0.619	0.323	0.062	0.48
Thailand	0.040	0.134	0.525	0.243	0.061	0.32
Zambia	-0.065	0.026	0.428	0.230	0.382	0.38
Myanmar	0.878	0.010	0.076	0.013	0.022	0.01
Suriname	-0.529	0.013	0.578	0.605	0.338	1.53

Source: Statistical Appendix, Part A, Section I.

1/ Entries are averages, over all members in each group, of the elasticity of the calculated quotas of individual members with respect to the given variable. The elasticity of the calculated quota CQ with respect to a variable X is defined as:

$$\epsilon = \frac{\delta CQ}{\delta X} \times \frac{X}{CQ}$$

where all other variables entering into the quota formulas are held constant. The figures shown indicate the impact on the calculated quota of a one percent change of a given variable.



### Box 3. Quotas of New Members and Ad Hoc Quota Increases

The Executive Board, through a committee set up to deal with an application for membership or a request for an ad hoc increase in quota, arrives at a quota that it recommends for voting by the IMF's Board of Governors. Executive Directors consider the staff's recommendations which are based on a methodology that has traditionally relied on comparisons with other Fund members in order to ensure that the recommended quota fits sensibly within the prevailing structure of quotas. The methodology requires choosing particular country comparators, and using those comparators to determine a recommended quota.

Until the 1970s, total quotas were roughly in balance with the total of quotas calculated using the quota formulas.<sup>1</sup> Comparators were generally those members which had *actual* quotas broadly similar to the *calculated* quota of the applicant member. A specific recommended quota was then derived judgmentally, in part by examining a country's ranking among its comparators on the basis of individual variables (generally among those in the quota formulas) such as national income or total trade. Judgments were made about the quality of data used, the range of comparators, the variables used for comparisons, and other factors, such as the prior history of quota increases not taken up by a member.

Once the totals of calculated and actual quotas began to diverge, it became necessary to choose a recommended actual quota on the basis of a ratio (differing from unity) applied to the calculated quota. Thus, the practice of using ratios of actual to calculated quotas of broadly similar comparator groups emerged. The main elements of the current methodology include:

- Choosing multiple comparator groups using as criteria:
  - The membership as a whole, with the rationale being that actual quota shares should adjust towards calculated quota shares. The adjustment could be achieved if each member's quota was determined by applying the ratio of actual to calculated quotas for the whole membership to the country's calculated quota;
  - A broad sample of countries with similar economic characteristics, defined as those members whose calculated quotas, GDP, and, total current transactions were within a range of one-third above or below the country in question, sometimes excluding countries which were outliers in terms of their ratios of actual to calculated quotas, or excluding extremely small countries.
  - Various other general characteristics (e.g. whether a country is classified as industrial or developing, oil exporters, Fund creditors, or centrally planned economies; and whether the country has certain noneconomic characteristics, such as geographical location) suggested by the fact that ratios of actual to calculated quotas could differ substantially across various groups of members;
- Setting recommended actual quotas (or quota ranges) by applying the average (sometimes median) ratios of actual to calculated quotas of the relevant comparator groups to the calculated quota of the new member or the member requesting an ad hoc increase in quota.

In practice, the staff suggests a quota range for the Executive Board's consideration; and the Executive Board agrees on a quota within, and sometimes outside, the range recommended by the staff.

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<sup>1</sup> The total of actual quotas has since fallen to about 40 percent of the total of calculated quotas.

38. Increases in quotas take effect as a result of the general quota reviews conducted within intervals of not more than five years, or at the request of the member concerned.<sup>13</sup> The bulk of the quota increases resulting from the five-yearly general quota reviews has taken the form of increases expressed as a uniform percentage of the then existing quotas (the “equiproportional” element), as can be seen in Table 4. Such quota increases would have kept the then-existing quota distribution unchanged, but the remainder of the quota increase in quota reviews has served to shift the distribution of quotas, generally toward that of the calculated quotas resulting from the quota formulas. This element of a quota review has been characterized as selective, in the sense that this form of quota increase varies across members when expressed in terms of existing quotas, or is given only to a subset of the membership. Selective quota increases have generally been based on the results of the quota formulas.

39. The balance between the equiproportional and the selective elements in a quota review has largely been a matter of judgement by the Executive Board. The proportion of all quota increases allocated to the equiproportional and selective elements has, on average, been 70 percent and 30 percent, respectively. The equiproportional element has been as large as 98 percent, and at the other extreme, the selective element has been as large as 60 percent of the overall increase.

40. Several factors account for the preponderance of the equiproportional element in past quota reviews and for the consequent relatively slow adjustment of members’ quota shares over time. First, a general review of quotas needs the approval of 85 percent of the total votes of members, so that changes in quota shares of members tend to be relatively slow and require a broad consensus. Second, members tend to resist a fall in their shares in aggregate quotas, not only because quotas are regarded as a matter of national prestige but also in view of the multiplicity of functions that quotas perform. Third, because the shares of developing countries in actual quotas have been significantly larger than their shares in quotas based on the quota formulas (and the opposite is the case for the industrial countries), there is considerable opposition from the developing countries to raising the selective element as a means of closing the gap between members’ shares in actual quotas and their shares in calculated quotas. Fourth, under the Articles of Agreement, no member’s quota can be reduced without the member’s consent.<sup>14</sup>

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<sup>13</sup>Article III, Section 2(a). An increase in quota outside a general quota review is referred to as an ad hoc quota increase.

<sup>14</sup>Article III, Section 2(d). The process by which a member’s quota is adjusted requires the adoption of a Board of Governors’ resolution, as well as the member’s subsequent consent to and payment for the quota adjustment (or refund by the IMF in the case of a quota reduction).

Table 4. General Reviews of IMF Quotas 1/  
(In percent)

Review of Quotas	Board of Governors' Adoption of Resolution	Equiproportional Increase in Quotas	Overall Increase 2/ in Quotas	Entry into Effect
First Quinquennial	No increase proposed	C	C	
Second Quinquennial 1958/59	No increase proposed February 2, 1959 3/ April 6, 1959	C 50	C 60.7	April 6, 1959
Third Quinquennial	No increase proposed	C	C	
Fourth Quinquennial	March 31, 1965	25	30.7	February 23, 1966
Fifth General	February 9, 1970	25	35.4	October 30, 1970
Sixth General	March 22, 1976	Increases were determined on the basis of different groups of countries	33.6	April 1, 1978
Seventh General	December 11, 1978	50	50.9	November 29, 1980
Eighth General	March 31, 1983	19	47.5	November 30, 1983
Ninth General	June 28, 1990	30	50.0	November 11, 1992
Tenth General	No increase proposed	C	C	
Eleventh General	January 30, 1998	33.75	45.0	January 22, 1999

1/ Quota increases under a General Review comprise: (1) an equiproportional component, that is, a uniform percentage for all members participating in the review, and (2) a selective increase, which adjusts members' quota shares, generally in order to align them with their relative economic size.

2/ Includes the effect of special increases for some members, as well as the general increase for all members as proposed under the quota review.

3/ Provided for an equiproportional increase of 50 percent and special increases for 3 countries; the resolution adopted in April 1959 provided for special increases for 14 additional countries.

41. Changes in the relative shares in quotas of IMF members also result from ad hoc quota increases agreed outside the context of a general quota review, as well as from members not consenting to their proposed increases in quotas (Tables 5 and 6). These factors also account for a significant part of the divergence between actual quotas today and the results of the quota formulas.

42. There have been two types of ad hoc quota increases. The first is that based on a special policy for increasing the quotas of a group of countries, such as the small quota policy in effect in the late 1950s and the increases in quotas that were agreed under the decision on Compensatory Financing in the early 1960s (see paragraph 44). The quota increases under the small quota policy were not based on the results of the quota formula, whereas those under the Compensatory Financing decision were based on variants of the Bretton Woods formula that were devised at the time. The second type of ad hoc increase reflects the unique circumstances of a particular member, and while the number of this type of ad hoc quota increases approved by the IMF has been small, some involved relatively large countries (France, Australia, Italy, China, and Saudi Arabia). In general, this second type of ad hoc quota increase has been treated in a manner similar to that for determining the initial quota of a new member, and the very few increases agreed since the 1960s were based in part on the results of the quota formulas. However, China is an important case where the ad hoc increase in 1980 provided for a quota share significantly larger than China's share in calculated quotas based on the quota formulas.

43. As regards the determination of initial quotas of new members, the Bretton Woods formula was used for 27 members that joined the Fund between 1946 and September 1958 (i.e., before a 50 percent overall increase in quotas was agreed in 1959). As with the original members, there were substantial differences between the actual initial quotas and those calculated from the Bretton Woods formula, and in many cases the member preferred to take a smaller quota than indicated by the calculations. From September 1958 to September 1965, 35 relatively small and newly independent countries joined the Fund, and for these countries, the use of the Bretton Woods formula was generally discarded. Instead, their initial quotas were set on the basis of the "small quota policy" that had been developed in 1955.<sup>15</sup> That policy prescribed a minimum size for small quotas, which was initially fixed at \$7.5 million

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<sup>15</sup>The small-quota policy was instituted at the time of the Second Quinquennial Review of Quotas in 1955 under which (i) countries with quotas less than \$25 million could double their quotas, provided no quota would, as a result, be greater than \$25 million (there were no quotas then between \$15 million and \$25 million) and (ii) countries could receive on request a minimum quota of \$7.5 million. The policy was later formalized in connection with the 1959 increase in quotas. Out of a total Fund membership of 68 countries at the end of 1958, all but three of 32 eligible members elected to increase their quotas under the small-quota policy.

Table 5. Ad Hoc Increases in IMF Quotas 1/  
(Quotas in millions of SDRs)

Member	Year Resolution Was Adopted	Quota		Increase	Justification for Increase
		From	To		
France	1946	450	525	75	low initial level
Paraguay	1946	2	3.5	1.5	low initial level
Egypt	1948	45	60	15	low initial level
Iran	1948	25	35	10	low initial level
Honduras 2/	1952	0.5	2.5	2	see footnote 2
Philippines	1958	15	50	35	low initial level
Australia	1960	300	400	100	"catch up" to 1959 review
Chile	1960	75	100	25	"catch up" to 1959 review
Colombia	1960	75	100	25	"catch up" to 1959 review
Yugoslavia	1960	90	120	30	"catch up" to 1959 review
Egypt	1962	90	120	30	export variability
Israel 3/	1964	25	50	25	see footnote 3
Italy	1964	270	500	230	improve Fund liquidity and comparability with quota of other members
Malaysia 3/	1964	37.5	100	62.5	see footnote 3
Lao PDR	1969	7.5	10	2.5	"catch up" to Fourth Review
China	1980	550	1,200	650	resumption of Fund relations
Saudi Arabia	1981	1,040.1	2,100	1,059.9	improve Fund liquidity and conclude borrowing arrangement
Cambodia	1994	25	65	40	resumption of Fund relations
<i>Pending request:</i>					
China	...	4,687	...	...	return of Hong Kong to Chinese sovereignty in 1997

1/ The quota increases shown in this table exclude the quota increases authorized under the small quota policy of 1955 and in connection with the 1963 Decision on Compensatory Financing of Export Fluctuations. The table also excludes ad hoc or special increases agreed in the context of general reviews of quotas.

2/ The quota of Honduras was reduced at its request in 1948, but restored to the original amount in 1952.

3/ These ad hoc increases were "borderline" cases that were agreed in the light of quota increases under the Compensatory Financing Decision of 1963.

Table 6. Fund Members that did not Consent to the Proposed Maximum Quota Increase Under Past General Reviews

(In millions of SDRs)

1959 Review 1/			Fourth Review (1965) 1/			Fifth Review (1970)			Sixth Review (1976)		
"Present" quota (1)	Proposed quota (2)	Increase not taken (3)	"Present" quota (4)	Proposed quota (5)	Increase not taken (6)	"Present" quota (7)	Proposed quota (8)	Increase not taken (9)	"Present" quota (10)	Proposed quota (11)	Increase not taken (12)
550.0	825.0	275.0	550.0	690.0	140.0						
			50.0	63.0	13.0	50.0	114.0	49.0	25.0	31.0	6.0
						9.0	56.0	47.0			
						19.0	67.0	43.0			
						19.0	24.0	4.0			
			25.0	32.0	7.0						
			11.3	15.0	3.7	30.0	62.0	25.0	37.0	110.0	61.0
Total		275.0			163.7			168.0			67.0
Seventh Review (1978)			Eighth Review (1983)			Ninth Review (1990)					
"Present" quota (13)	Proposed quota (14)	Increase not taken (15)	"Present" quota (16)	Proposed quota (17)	Increase not taken (18)	"Present" quota (19)	Proposed quota (20)	Increase not taken (21)			
660.0	1,075.0	415.0	660.0	1,117.4	457.4	291	394.8	103.8			
						504	864.8	360.8			
						71.3	96.2	24.9			
20.0	35.1	5.1	92.4	250.2	157.8	44.2	60.9	16.7			
						169.7	233.1	63.4			
			202.6	385.9	183.3						
Total		420.1			798.5			569.6			

os and Panama, which at the time either did not consent or withdrew its consent, but which were subsequently granted ad hoc increases to restore the quota increases not taken. eases were proposed for China under the Fifth and Sixth Reviews. An ad hoc increase of SDR 650 million, from China's initial quota of SDR 550 million to SDR 1,200 million, was '80, as was China's participation in the general increases proposed under the Seventh Review.

and later increased to \$11.25 million.<sup>16</sup> The minimum quota subsequently became inappropriately large for very small countries that applied to join the Fund in the mid-1960s. For these countries, initial quotas were determined largely on the basis of the average ratio of actual quotas to foreign trade of other small-quota countries. Following the 1962-63 revision of the quota formula, the results of the quota formulas were again systematically used for new members.

44. At around the time when the quota formula was revised in 1962/63, the Fund also adopted a Decision on Compensatory Financing of Export Fluctuations that provided for sympathetic consideration of requests for quota increases by certain primary-product exporting countries, in particular those with relatively small quotas “to make them more adequate in the light of fluctuations in export proceeds and other relevant criteria...”<sup>17</sup> The quotas of 32 members, plus two “borderline” cases (Malaysia and Israel), were increased under this policy before it was terminated at the start of the Fifth Quinquennial Review in 1969-70. This decision led to the first quota increases outside a five-yearly quota review that were based on a uniform application of the quota formulas. Since then, however, there have been only a few other cases of ad hoc increases in quotas.

45. The earliest selective quota increases were in fact not based on the Bretton Woods formula. The 1959 Review provided for selective quota increases for Canada, Germany, and Japan to reflect economic factors as well as their potential to contribute to the Fund’s liquidity. Another 14 countries received selective increases because their relative quota positions had been adversely affected by quota increases of other members and by the increase in Fund membership between 1947 and 1959.

46. Selective increases in quotas were agreed under the Fourth Review (1965) for 16 members whose quotas were either relatively low as compared with the quota calculations made for them (i.e., lower by 25 percent or more), or that were in a position to add to the Fund’s liquidity (Austria, Canada, Germany, Japan, and Sweden; the last four countries were also participants in the General Arrangements to Borrow agreed in 1962 ). Under the Fifth General Review, 78 members were authorized to increase their quotas by amounts larger than the equiproportional increase (and one member, the United Kingdom, increased its quota by less than the amount of the equiproportional increase). The criterion for such increases was whether the result of the quota formulas exceeded the member’s then-existing quota.

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<sup>16</sup>For quotas above \$11.25 million, the procedure followed was to compare the country with existing members of similar economic size and characteristics, and to align quotas accordingly.

<sup>17</sup>Decision No. 1477–(63/8). It was expected that more than half of the member’s export proceeds should derive from primary-product exports, and that its then existing quota should be less than the formula-based quota calculation (based on 1961-62 data) by 25 percent or more.

47. Under the Sixth Review, it was agreed that the aggregate share in quotas of the major oil-exporting countries would be doubled, while the combined share of all other developing countries remained unchanged. This meant that the increase in the quota share of the major oil-exporting countries was correspondingly matched by an equal decline in the share of the industrial countries in total quotas. The distribution of selective increases within the various groups of countries, as classified for the purpose of the Sixth Review, relied extensively on the differences between a member's calculated and then-existing quotas. In the Seventh Review, 11 members shared in a very small amount that was allocated for selective increases based on the excess of their calculated quotas over their then-existing quotas.

48. The Eighth and Ninth Reviews resulted in a method that determined the selective increases in quotas in proportion to each member's share in calculated quotas.<sup>18</sup> In these reviews, all members received selective increases in their quotas. Furthermore, in the Ninth Review, a rearrangement of quotas was agreed among the Group of Seven (G-7) industrial countries, mainly to permit Japan to have, along with Germany, the second largest quota in the IMF. The rearrangement used essentially an ad hoc method, though the result was generally in the direction of the G-7 members' shares in calculated quotas. This rearrangement did not affect the quotas determined for all other members on the basis of the agreed-upon size and distribution of the overall increase in quotas, kept the voting power of the United States unchanged, and featured an agreement by the United Kingdom and France on an equal distribution of quotas between themselves under the Ninth Review and subsequent reviews of quotas.<sup>19</sup>

49. No increase in quota was agreed in the Tenth Review. Under the Eleventh Review, part of the selective element was distributed to all members in proportion to their shares in the total of calculated quotas (i.e., along the lines of the method used in the Eighth and Ninth Reviews) and another part to a subset of the membership in a manner that uniformly reduced the differences between their shares in actual and calculated quotas. The latter part was intended to have the character of an ad hoc increase in quotas for those members whose calculated quota shares were very high in relation to their actual quota shares.

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<sup>18</sup>This method of distributing the selective element had wide but muted distributional effects because it was applied to all members and was combined with an equiproportional element equal to 40 percent (Eighth Review) or 60 percent (Ninth Review) of the overall increase. Under this technique, a member would increase (lower) its share in actual quotas if its share in the total of calculated quotas exceeded (was less than) its corresponding share in actual quotas. This technique was considered to be straightforward, transparent, and simple in the context of calculated quotas, which in many cases were multiples of actual quotas.

<sup>19</sup>See Orlando Roncesvalles and Andrew Tweedie "Augmenting the IMF's Resources," *Finance and Development*, December 1991, pp. 26–29. The G-7 also includes Italy and Canada.



### **E. Issues Concerning the Quota Formulas**

50. The IMF's Executive Board has reviewed the quota formulas in six of the last eight general reviews of quotas. Concerns have been raised about the structure and working of the formulas, and their effects on the distribution of quota increases under successive reviews. These concerns may be seen against the background of several major trends in the distribution of actual quotas. First, the aggregate quota share of developing countries in the IMF has tended to decline, abstracting from the addition of new members, while the share of the industrial countries has increased. Second, for many members that have recorded relatively fast rates of economic growth, the pace at which their quotas have been adjusted has been relatively slow, and the actual increase in their shares in total quotas has not been commensurate with their relative real growth rates. A third element, which has increasingly influenced the discussion in recent quota reviews, has been the impact of changes in quota shares on the distribution of votes and on members' representation in the Executive Board, which could disrupt the balance in the number of constituencies at the Board representing industrial and developing countries.

51. In the light of these considerations, issues have arisen as to whether the current quota formulas continue to be adequate for their purposes, and in particular whether the variables in the formulas remain reflective of developments in the world economy. On the one hand, many Directors, in particular from the major industrial countries, have put forward the view that the quota formulas should better reflect the globalization of markets and that the determination of quotas should in particular take into account the role of capital movements and access to capital markets. On the other hand, from the point of view of the low-income developing countries, such variables as population or an indicator of relative wealth (e.g., per capita income) have been proposed for inclusion in the formulas. Furthermore, a number of technical issues have been raised, relating mainly to the data used in calculating quotas: for example, whether to use purchasing power parity (PPP) indexes or real effective exchange rates for converting GDP expressed in local currency terms into SDR equivalents, instead of using market exchange rates. Another technical issue pertains to the relative weights of the variables, e.g., that of the variability of current receipts, whose coefficient was reduced in 1982-83. The perversity in the structure of the nonlinear Bretton Woods formula because of the small or negative marginal effect of GDP on the calculated quota has also remained. Finally, some Executive Directors have requested an increase in the transparency of the quota formulas as well as a simplification of the formulas and a reduction in their number.

### **IV. CHANGES IN THE WORLD ECONOMY**

52. The terms of reference of the QFRG provide that its review of the quota formulas would include "assessing their adequacy to help determine members' calculated quotas in the IMF in a manner that reasonably reflects members' relative need for and contributions to the IMF's financial resources, *taking into account changes in the functioning of the world economy and the international financial system and in light of the increasing globalization of markets*" (emphasis added). These changes in the world economy have a bearing on the IMF's financial operations and on the size of members' quotas, and consideration is given in this report to their implications on the appropriate specification of the quota formulas.

## Major developments since Bretton Woods

53. Major developments that have a potential bearing on the financing role of the IMF have occurred in the global economy over the past half century. First, countries have become more integrated economically, through increased openness to both trade and capital flows, as barriers to trade in goods, services, and assets have been removed and technological changes have reduced transaction costs. Partly as a consequence, international transactions have risen more rapidly than domestic economic activity. Trade openness is, however, more widespread and accepted than capital account openness, especially with respect to short-term capital flows. Second, the world's population has grown from 2.3 billion in 1947 to about 6 billion today, raising demand for all kinds of goods and services, public and private. Third, the size and volatility of private capital flows across national borders have greatly increased, as discussed more fully below, while, at the same time, the role of official financing has significantly decreased. In addition, during the past 50 years, the role of the public sector in general has been steadily diminished as compared with that of the private sector. Fourth, the original system of exchange rates linked to gold or the U.S. dollar, with infrequent adjustments, has given way to much greater exchange rate flexibility, although a significant number of IMF members still maintain a peg to a major currency or have joined together in regional fixed exchange rate systems.<sup>20</sup> The European "snake" arrangements of the early 1970s evolved into the European Monetary Union by 1999, with the euro replacing 11 participating currencies. Moreover, the membership of the IMF grew from 40 charter members to 182, with the achievement of independence by many countries, and by 2000 it has become almost universal. This has resulted in substantial demands for IMF resources on the part of new members. Taken together, these changes have made members' economies more exposed to external shocks, and has resulted in demands for IMF resources by countries, without adequate and assured access to private capital markets, and where the correction of payments imbalances requires somewhat more time than was envisioned at Bretton Woods.

54. Capital markets and capital flows have expanded rapidly over the past half-century. Access to these markets has expanded from the industrial countries to include a steadily increasing "emerging market" group of developing countries. As a rule, such access has proven beneficial, as countries' growth prospects have been enhanced, especially by flows of foreign direct investment.<sup>21</sup> The growth of capital markets has both positive and negative impacts on countries' need for IMF financing.

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<sup>20</sup>Some of the larger developing countries and most of the small economies maintain pegged exchange rates. (See "Exchange Rate Regimes in an Increasingly Integrated World Economy" SM/99/216, 8/27/99).

<sup>21</sup>For a discussion of the rationale and benefits of capital movements, see IMF, *Capital Account Liberalization—Theoretical and Practical Aspects*, Occasional Paper 172 (Washington: IMF, 1998). For a more skeptical view of the benefits of large gross flows, see Richard N. Cooper, "Should Capital Controls Be Banished?" *Brookings Papers on Economic Activity*, No. 1. (Washington: Brookings Institution, 1999).

55. The explosive growth of capital flows reflects several reinforcing forces. First, government controls on capital movements have gradually been relaxed or eliminated, starting in Europe several decades ago, and spreading more recently to east Asian and other countries. The single European market eliminated statutory barriers to cross-border financial flows in the early 1990s. Second, the phenomenon of emerging market developing countries is a product of increased financial innovation and globalization in the 1990s, which encouraged securitization of financial claims, both private and public, favored macroeconomic and trade reform, and promoted privatization of formerly state-driven financial intermediation. Third, the growth of institutional investors in the advanced countries coincided with an increased appetite for foreign securities. These tendencies were reinforced by advances in financial product innovation and in information technology that reduced transaction costs. These forces are likely to remain powerful stimuli to continued growth of the global capital market.

56. The IMF's liquidity has benefited from the inclusion of some emerging market countries and smaller industrial countries as creditors in the IMF system, where such inclusion can be attributed to their balanced and sustainable macroeconomic policies. Such healthy economic developments have been reflected in these countries' strong external position and their access to capital markets. However, capital flows, particularly portfolio flows and short-term debt, also have the potential for volatility or rapid reversal. The availability of capital market financing has not necessarily reduced a member's potential need for IMF resources, nor has access to capital markets become a reliable indicator of a member's ability to contribute to IMF funding. Instead, the instability of access to such markets occasions the need for IMF surveillance and financing. The potential need for IMF resources arising from capital market instability is likely to be concentrated in an expanding group of emerging market countries, while many other member countries may face payments problems of the more traditional kind.

57. Globalization refers to the ever closer international integration of markets for goods, services, and capital, which may be seen as a resumption of a trend observed in the late 1890s and early 1900s.<sup>22</sup> In the past 30 years, effective tariff rates have fallen sharply, while the number of member countries of the IMF that have liberalized their current account transactions has also risen sharply.<sup>23</sup> The global ratio of trade to GDP has tripled since Bretton Woods (see Table 7). Particularly with respect to the movements of physical and financial capital, and the associated technological advances, today's world is qualitatively very different from that expected to prevail in the post-1945 period. The question naturally arises as to whether these phenomena require a reconsideration of the variables in the quota formulas. This aspect of the quota formulas is discussed further in Chapter VI.

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<sup>22</sup>For historical perspective and a summary of trends since the IMF was established, see *World Economic Outlook* (May 1997), Annex.

<sup>23</sup>The number of countries that have accepted Article VIII obligations of convertibility of currencies for current account transactions has risen from 35 in 1970 (30 percent of the membership) to 149 in 1999 (82 percent of the membership).

58. Contrary to expectations at the time, the “collapse” of the Bretton Woods system of fixed exchange rates in the early 1970s did not lead to a decline in the demand for reserves of the magnitude that had been expected by most economists.<sup>24</sup> There was continued growth in reserves by industrial countries, most of which adopted some form of floating, and by developing countries, most of which continued to peg their exchange rates in the short run and used reserves to accommodate fluctuations in the availability of debt finance. The level of reserve holdings relative to imports has risen since 1970, and the use of reserves by both industrial and developing countries has been relatively large in comparison with their IMF quotas (Table 8). Part of the explanation underlying countries’ reserve behavior lies in the reluctance of governments, even those with floating exchange rates, to rely solely on exchange rate changes to induce relative price adjustments as a means of responding to balance of payments shocks, which also helps explain the practice of managed floats.<sup>25</sup> As under the original Bretton Woods system, the IMF’s financial resources have remained available to members facing payments difficulties that may arise either because of the severity of exogenous disturbances, including those resembling currency runs or characterized as “contagion” effects, or because of policy mistakes.

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<sup>24</sup>See Annex Note 2.

<sup>25</sup>See B. Eichengreen and J. A. Frenkel, “Implications of the Future Evolution of the International Monetary System,” in *The Future of the SDR in Light of Changes in the International Monetary System* (Washington: IMF, 1996), cited in Annex Note 2. While greater flexibility of exchange rates may, by itself, reduce the demand for reserves, the rapid growth of foreign trade, and the even more rapid growth in capital movements, along with their volatility, would tend to increase the demand for reserves.

Table 7. Quotas, SDRs, and Global Indicators 1/

(In billions of SDRs, except as indicated)

	1944	First Review (1950)	Fourth Review (1965)	Fifth Review (1970)	Seventh Review (1978)	Ninth Review (1990)	Eleventh Review (1998)
1. Total IMF quotas	8.0	8.0	21.0	29.0	61.1	135.2	212.0
2. Quantitative economic indicators							
a. Calculated quotas	8	18	19	31	102	330	545
b. Current payments (or imports)	14	46	139	213	718	2,168	3,700
c. GDP (or national income)	214	439	1,031	1,505	4,253	11,083	17,884
d. Reserves	27	36	57	65	185	391	768
e. Variability of current receipts or of exports	5	10	7	7	43	112	173
3. Cumulative SDR allocations 2/	--	--	--	3.4	9.3	21.4	21.4
4. Selected ratios							
a. Quotas to imports	0.58	0.17	0.15	0.14	0.09	0.06	0.06
b. Quotas to GDP	0.04	0.02	0.02	0.02	0.01	0.01	0.01
c. Imports to GDP	0.06	0.10	0.13	0.14	0.17	0.20	0.21

1/ Year in parentheses denotes the year when the quota review was completed, i.e., when the Board of Governors' Resolution on quota increases was approved. The corresponding data shown for 1944 and the indicated quota reviews relate to the most recent period for which data were compiled.

2/ SDR 9.3 billion was allocated in 1970 - 72, and SDR 12.1 billion in 1979 - 81.

Table 8. Selected Industrial and Middle-Income Developing  
Countries: Monthly Changes in Gross Reserves (1985-93)  
Relative to IMF Quota

	Standard Deviation	Maximum Loss (In percent of current quota)	Month/Year of Maximum Reserve Loss
<b>Industrial countries</b>			
Australia	19	56	1/92
Austria	30	108	3/91
Belgium	16	49	9/92
Canada	16	49	9/92
Denmark	61	215	1/93
Finland	60	222	10/91
France	20	64	11/93
Germany	65	281	10/92
Greece	61	116	10/93
Iceland	32	99	9/92
Ireland	54	240	9/92
Italy	36	127	7/92
Japan	22	61	3/90
Netherlands	22	33	3/93
New Zealand	31	97	6/88
Norway	55	240	11/92
Portugal	106	579	9/92
Spain	83	530	9/92
Sweden	78	317	11/92
Switzerland	46	120	1/93
United Kingdom	14	31	9/92
United States	5	13	3/91
<b>Middle-income developing countries</b>			
Argentina	24	57	3/91
Bolivia	18	55	1/90
Brazil	30	60	1/86
Chile	23	35	1/86
Colombia	23	71	10/93
Costa Rica	23	72	5/90
Egypt	34	153	11/90
El Salvador	21	61	5/90
Hungary	27	45	12/92
Indonesia	18	31	5/90
Israel	46	98	10/91
Jordan	57	334	8/91
Korea	58	196	12/89

Table 8 (concluded). Selected Industrial and Middle Income Developing  
Countries: Monthly Changes in Gross Reserves (1985-93)  
Relative to IMF Quota

	Standard Deviation	Maximum Loss (in percent of current quota)	Month/Year of Maximum Reserve Loss
Malaysia	68	193	12/92
Mexico	52	167	11/93
Morocco	20	38	3/89
Paraguay	39	160	10/92
Peru	18	47	9/91
Philippines	30	96	5/93
Poland	15	54	12/90
Singapore	93	161	3/91
South Africa	8	23	9/92
Thailand	37	59	7/92
Tunisia	27	93	4/91
Turkey	36	112	12/93
Uruguay	19	103	11/86
Venezuela	15	28	7/90

Source: IMF staff calculations (reproduced from Paul R. Masson and Michael Mussa, *The Role of the IMF: Financing and Its Interactions with Adjustment and Surveillance*, Pamphlet No. 50 (Washington: IMF, 1995)).

59. The revised Articles of Agreement allow members to choose their exchange arrangements. The IMF's Executive Board has recognized that, irrespective of exchange rate regime, a member's potential eligibility for IMF resources is no longer determined mainly by disturbances in the current account but also by shocks in its capital account transactions.<sup>26</sup>

60. IMF membership has become nearly universal, which has consequences for its operations and the process of quota determination. The IMF had 40 members, when it began operations in 1946, and now has 182. Except for Switzerland, which joined in 1992, practically all industrial countries had joined by 1960. Growth in IMF membership since then has come from developing countries achieving independence and, in the 1980s and early 1990s, from the formerly centrally planned economies.

61. With the attainment of universal membership, the quota formulas would no longer be needed for determining the initial quotas of new members, though the issue of determining new quotas may on occasion arise for the enlargement or the dissolution of countries.<sup>27</sup> Quotas could, however, continue to be a yardstick for assessing the potential demands on IMF resources by various groups of members. In connection with the Eleventh General Review of Quotas, the staff analyzed the long-term trends in demand for IMF resources. The propensity of developing countries to use the IMF was expected to remain near the high points reached in the 1980s, while advanced economies were expected to make no use of the IMF.<sup>28</sup> These projections have held since 1996, with the exception of Korea. The economic factors underlying the staff's projections included the volatility of financing from capital markets, the likelihood that countries would encounter adjustment problems and associated financing requirements that could not be financed from official reserves, and the lack of access to capital markets by many transition and developing economies. Whether such factors might shift or remain unchanged, and whether they should have a bearing on the relative size of members' quotas, are likely to be among the issues for consideration in future periodic quota reviews.

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<sup>26</sup>See Summing Up of EBM/99/125 (November 15, 1999) "Exchange Rate Regimes in an Increasingly Integrated World Economy—Further Considerations."

<sup>27</sup>The former Yugoslavia's quota was redistributed to its successor states in 1992, and China has requested an ad hoc increase in quota to reflect the return of Hong Kong to Chinese sovereignty in 1997.

<sup>28</sup>See "Eleventh General Review of Quotas—Further Considerations Bearing on the Size and Distribution of an Overall Increase in Quotas," EB/Quota/96/4 (2/26/96), pp. 19–21.



## **Elements of continuity**

62. Along with the major changes in the world economy that have a bearing on the IMF's quotas, elements of continuity remain in the institutional features of the system. The nation-state remains the fundamental element in political decision making. The basic division of labor among the international organizations—the IMF, the World Bank and regional development banks, the WTO (formerly GATT), and the United Nations—has not fundamentally changed. Nor has there been a structural change in the extent to which the production and pricing of primary products have remained vulnerable to unpredictable shocks, arising either from the vagaries of weather or from technological change. Several institutional aspects of the IMF have also continued. First, the IMF continues to have a monetary character, in that its lending operations create liquid claims on it that creditor members may draw upon at any time.<sup>29</sup> Second, the IMF created the SDR in 1969 through the first amendment of its Articles as a supplement to existing official international reserves, but the SDR did not, and was not intended to, alter the basic financing mechanism based on quotas that had been devised at the Bretton Woods conference. The SDR financing mechanism uses quotas to determine members' potential creditor and debtor positions in the SDR system. Third, the number of basic votes in the IMF (250 votes per member) has remained at the same level as under the original Articles; proposals to increase the number of basic votes when quotas were increased have not received the necessary broad support. As a consequence, the significance of basic votes has fallen over time, and relative voting power has become almost wholly determined by relative quotas.<sup>30</sup> Finally, the original quota formula used by the IMF, the Bretton Woods formula, with some modifications in 1962-63 and 1983, has continued to influence the Executive Board in determining selective quota increases.

## **Implications on the review of the quota formulas**

63. Given the QFRG's terms of reference, the key question is how changes in the world economy should influence the distribution of quotas or quota increases. In this context, it may be recalled that the considerations that led Professor Mikesell to use the particular variables that went into the original Bretton Woods formula were based on the multiple functions of quotas, even though political factors constrained the weights of the variables and led to the use of the ratio of exports to national income as a multiplier.<sup>31</sup> However, he also

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<sup>29</sup>As discussed in Box 1, creditor positions in the IMF are a form of reserve which, in principle, does not pose an undue financial burden on creditor countries.

<sup>30</sup>For a further discussion, see Annex Note 3.

<sup>31</sup>In order to achieve the preconceived ranking and relative size of quotas of the largest countries, Professor Mikesell experimented and found by trial and error that he could even get closer to his objectives by increasing the results by the ratio of average exports to national income (Mikesell (1994), p. 22).

considered that the use of a single Fund quota to serve three purposes, as provided for in the Articles being negotiated at the time, “was both illogical and unnecessary. There could well have been one quota based on, say, foreign trade and export variability to govern drawing rights, a second quota based on reserves and balance of payments history to govern contributions to the Fund, and a third quota based on economic and political importance to determine voting rights.”<sup>32</sup> In other words, he viewed the size and variability of external transactions, as proxied by trade flows and the fluctuation of exports, as factors that indicated potential need for IMF resources; reserves as a proxy for ability to contribute resources; and national income as a measure of relative economic and political importance. The main question faced by the QFRG today is not different from that faced by Professor Mikesell: what relevant aspects of the global economy have a bearing on the functions of quotas, and how should these be incorporated into a quota formula? This and related questions are dealt with in Chapters V and VI.

## V. STATISTICAL INFERENCES FROM ACTUAL QUOTAS

64. This chapter reports and analyzes the technical findings reached by the QFRG on whether and how economic variables in the existing quota formulas and others not currently included in them might have influenced members’ actual quotas. The questions dealt with include: (a) what economic variables, and in what combination and specific mathematical form, best “explain” actual quotas statistically; (b) what were the positive or negative deviations of members’ initial and subsequent quotas from their calculated quotas; (c) how fast actual quotas were adjusted toward calculated quotas over time; and (d) how close to actual quotas would be the quotas calculated on certain assumptions about the relative size of equiproportional and selective quota increases in past quota reviews, where the method of distributing the selective element is based on attempting to reduce the gap between actual and calculated quotas.

65. This analysis was undertaken to discover as much as possible, statistically, what underlies the structure of actual quotas after the Eleventh Review, and the extent to which actual quotas have converged toward quotas calculated from formulas currently in use. While our recommendations in Chapter VI are made without regard to their detailed distributional consequences, existing quotas reflect the cumulative result of thoughtful deliberation as well as political bargaining, and thus warrant careful analysis of the variables, traditional or not, that may have implicitly played some role in determining them.

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<sup>32</sup>He considered that all three quotas could be adjusted at five-year intervals in accordance with formulas that might be revised every decade or so (Mikesell (1994), p. 38).

## Statistical estimation

66. Quotas as they emerge from a quinquennial review reflect the collective decisions of the IMF about what quotas should be, given the circumstances. It is of interest to discover how well the current quotas can be “explained” statistically using the structure and chosen variables of the original Bretton Woods formula. It is then of further interest to ask whether the statistical explanation can be improved by altering the structure of the formula (e.g., by linearizing it), by adding additional variables, such as the pre-existing actual quota, or by subtracting some of the original variables.

67. Accordingly, the method for statistical investigation is based on estimating a regression equation with actual quotas on the left-hand side and the possible variables to be included in a quota formula on the right-hand side. An initial set of variables would consist of those currently included in the quota formulas, and to this set other variables can be added or existing variables subtracted, and the equation can be estimated in both nonlinear and linear versions. At least two important econometric issues arise with respect to such estimation: the first is a problem of multicollinearity, which becomes more severe as the number of variables included the equation increases; the second is the question of whether the coefficients estimated by this approach are stable from one five-year quota review period to the next. These issues are also dealt with below.

68. The range of new variables considered in the exercise include those that in principle reflect the changes in the world economy and financial system discussed in Chapter IV, variables representing modifications of existing ones, and variables suggested in past reviews of the quota formulas. The first group of variables includes normal net capital flows, external debt, variability of exchange rates, and relative access to capital markets.<sup>33</sup> The second group of variables includes alternative measures of GDP in place of the existing measure of the latest-year GDP converted into SDR equivalent at market exchange rates (PPP-adjusted GDP, five-year averages of GDP), and reserves with gold valued at market prices (instead of the official IMF valuation of SDR 35 p.f.o.). The third group includes population and a dummy variable to distinguish industrial and developing countries. In order to test for structural differences across certain groups of countries, a number of regressions were undertaken using certain subgroups of members as the sample (i.e., the small countries, defined as those with quota shares below 1.0 percent, or the group of developing countries). Linear and nonlinear equations were attempted, as well as variants of a “nested” model, which requires predetermining variables according to whether they represent indicators of external strength or vulnerability. A representative selection of the results of these statistical investigations is presented in Tables 9 through 11.

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<sup>33</sup>The definition of these variables is given in the Statistical Appendix, Part A, Section I.

Table 9. Summary Statistics of Equations Fitted to Actual Quotas  
(T-ratios in parentheses)

		Adjusted R-squared	S.E. of Reg.	Memo Item: Reg. No. 1/
<b>I. Nonlinear Equations</b>				
<i>Benchmark Equation:</i>				
Equation using only the traditional variables	$Q = (0.003Y - 0.034R + 0.009P + 0.529 VC) \times (1 + C/Y)$ (14.29) (-5.60) (3.82) (10.17)	0.96	670.5	1
<i>Memo: "Standard error" of the existing five-formula system</i>				
		...	950.2	
With real effective exchange rate variability times current receipts and payments as an additional variable	$Q = (0.004Y - 0.003R + 0.064P + 0.432VC - 0.057 VREC) \times (1 + C/Y)$ (19.32) (-0.42) (10.09) (9.73) (-9.1)	0.97	555.3	30
With population as an additional variable	$Q = (0.003Y - 0.044R + 0.116P + 0.488VC + 2.632POP) \times (1 + C/Y)$ (15.94) (-8.05) (5.42) (10.69) (7.63)	0.97	580.5	16
Multiplicative term with a dummy variable distinguishing between industrial and developing countries	$Q = (0.0033Y - 0.042R + 0.020P + 0.200 VC) \times (1 + C/Y + DDEV)$ (18.59) (-9.26) (11.78) (6.90)	0.97	605.1	4
With normal net capital flows as an additional variable	$Q = (0.003Y - 0.020 R + 0.005P + 0.462VC + 0.024NCF) \times (1 + C/Y)$ (15.82) (-2.99) (2.21) (9.03) (4.7)	0.97	633.9	29
With debt as an additional variable	$Q = (0.003Y - 0.045R + 0.014P + 0.417VC + 0.011DEBT) \times (1 + C/Y)$ (15.45) (-7.07) (-5.46) (7.44) (4.33)	0.97	639.3	31
With five-year average of GDP, where the conversion factors are centered five-year moving averages of the annual exchange rates, replacing the existing one-year GDP	$Q = (0.003YM5X - 0.032R + 0.007P + 0.518VC) \times (1 + C/Y)$ (15.42) (-5.36) (3.14) (10.36)	0.97	642.7	22
With short term debt as an additional variable	$Q = (0.003Y - 0.047R + 0.011P + 0.499VC + 0.009STDEBT) \times (1 + C/Y)$ (14.62) (-5.90) (4.42) (9.47) (2.44)	0.96	661.2	17
<b>II. Linear Equations</b>				
With current receipts as an additional variable	$Q = 0.003Y + 0.003R + 0.072P + 0.564VC - 0.059C$ (11.52) (0.30) (9.04) (9.36) (-7.41)	0.97	565.2	10
With an openness index as an additional variable	$Q = 0.002Y - 0.045R + 0.017P + 0.628VC + 85.571OPEN$ (9.32) (-5.42) (5.65) (9.22) (2.75)	0.97	633.1	11
Without a multiplicative factor	$Q = 0.002Y - 0.036R + 0.017P + 0.684VC$ (8.76) (-4.46) (5.37) (10.33)	0.97	644.6	9

Table 9 (concluded). Summary Statistics of Equations Fitted to Actual Quotas  
(T-ratios in parentheses)

With both strength and vulnerability variables	$Q = 0.003Y + 0.619VC - 0.014RM + 0.035NNKFL + 2.413POP + 0.009C$ (11.41) (10.06) (-1.46) (6.94) (5.99) (3.01)	0.97	577.79	28
Nested model where a regression of vulnerability variables (represented by the variability of current receipts and population) is estimated first	$Q = 0.003Y + 0.682VC - 0.005RM + 0.033NNKFL + 1.271POP + 0.006C$ (8.58) (53.90) (-0.56) (7.54) (4.36) (2.22)	0.97	590.07	26
With PPP-based GDP replacing GDP at market exchange rates	$Q = 0.002YPPP - 0.034R + 0.023P + 0.610VC$ (8.64) (-4.13) (7.48) (8.43)	0.96	656.3	3
<b>III. Subsample Versions</b>				
For members representing developing countries	$Q = (0.006Y - 0.066R + 0.047P + 0.314VC) \times (1 + C/Y)$ (6.41) (-5.67) (7.33) (5.65)	0.85	380.4	6
For members with quota of equal to or less than 1.0 percent. Reestimated Bretton Woods formula with normal net capital flows as an additional variable	$Q = (0.006Y - 0.015R + 0.000P + 0.363VC + 0.038 NCF) \times (1 + C/Y)$ (6.36) (-3.19) (0.03) (11.74) (3.01)	0.83	220.5	32
For members with quota shares of equal to or less than 1.0 percent. Reestimated Bretton Woods formula with debt as an additional variable	$Q = (0.005Y - 0.013R + 0.002P + 0.374VC + 0.006DEBT) \times (1 + C/Y)$ (4.25) (-3.00) (0.52) (12.57) (3.55)	0.83	218.2	35

Note: The variables in the equations are defined as follows:

Q = estimated quota, in millions of SDRs

Y = GDP in 1994

R = average monthly reserves in 1994

P = annual average current payments over the 1991–1994 (five years) period

C = annual average current receipts over the 1991–1994 (five years) period

VC = variability of current receipts, defined as one standard deviation from a five-year moving average over the 1982–1994 (13 years) period

VREC = real effective exchange rate variability times current receipts

POP = population in 1994

DDEV = dummy variable distinguishing between industrial and developing countries. It is equal to 1 if a country is a developing or a transitional economy

NCF = normal capital flow proxied by a four-year moving average of actual net private capital flows (inclusive of errors and omissions)

DEBT = total external debt owed to non-residents repayable in foreign currency, goods and services. It is the sum of the public, publicly guaranteed and private non-guaranteed debt, use of IMF credit, and short-term debt

YM5X = is the five-year average of GDP from 1990 to 1994 where the conversion factor is a centered five-year moving average of the annual exchange rate

STDEBT = short term debt at the end of 1994

OPEN = openness index defined as  $1 + (5 - \text{capital market accessibility})$ . The countries' capital market accessibility is based on the WEO classification

RM = average monthly reserves with gold valued at market rates in 1994

NNKFL = four-year moving average of net private capital flows

1/ As numbered in the Statistical Appendix, Part A, Section II.

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Table 10. Relative Contributions of Variables to Calculated Quotas  
(In percent)

	Relative Contribution of Variables *											
	GDP	Reserves	Current Payments	Current Receipts	Var. of Curr. Rept.	Ratio of Curr. Rept. to GDP	New variable	New variable	New variable	Adj. R Squared	Memo item Regress. no	
<b>I. Non-linear Equations</b>												
<i>Benchmark Equation:</i>												
Equation using only the traditional variables	27.5	-13.7	17.8	--	47.6	20.8	--	--	--	0.96	1	
<i>Memo: Existing five formulas</i>	28.9	3.9	33.3	4.4	13.4	16.1						
With real effective exchange rate variability times current receipts as an additional variable 14/	32.3	-1.0	120.6	--	38.2	20.6	-110.8	--	--	0.97	30	
With population 5/	25.8	-17.0	21.4	--	42.2	20.4	7.2	--	--	0.97	16	
Multiplicative term; a dummy variable distinguishing between industrial and developing countries 1/	29.3	-16.0	37.5	--	17.2	32 16/	--	--	--	0.97	4	
With normal net capital flows as an additional variable	30.5	-7.9	10.4	--	41.7	20.7	4.6	--	--	0.97	29	
With debt as an additional variable 15/	27.6	-17.1	25.8	--	36.1	20.4	7.3	--	--	0.97	31	
With a five-year average of GDP, where the conversion factors are centered five-year moving averages of the annual exchange rates, replacing the existing one-year GDP 10/	--	-12.6	14.3	--	46.6	20.7	31.0	--	--	0.97	22	
With short term debt 6/	29.0	-18.9	21.4	--	45.2	20.9	2.3	--	--	0.96	17	
<b>II. Linear Equations</b>												
With current receipts	23.5	1.1	137.0	-111.6	50.1	--	--	--	--	0.97	10	
With an openness index 2/	20.5	-16.6	30.3	--	52.0	--	13.8	--	--	0.97	11	
Without multiplicative factor	20.2	-14.6	32.1	--	62.3	--	--	--	--	0.97	9	
Both strength and vulnerability variables 3/, 5/, 9/	23.1	--	--	16.6	53.7	--	-6.7	6.6	6.6	0.97	28	
Nested model where a regression of vulnerability variables (represented by the variability of current receipts and population) is estimated first 3/, 5/, 9/	22.7	--	--	10.6	59.3	--	-2.5	6.3	3.5	0.97	26	

Table 10 (concluded). Relative Contributions of Variables to Calculated Quotas  
(In percent)

	Relative Contribution of Variables *										Memo item
	GDP	Reserves	Current Payments	Current Receipts	Var. of Curr. Rcpt.	Ratio of Curr. Rcpt. to GDP	New variable	New variable	New variable	Adj. R Squared	
With PPP-based GDP replacing GDP at market exchange	19.6	-12.9	42.1	--	51.1	--	--	--	--	0.96	3
III. Subsample Version											
For members representing developing countries	27.6	-26.4	51.2	--	25.8	21.7	--	--	--	0.85	6
Members with quota shares of equal to or less than 1.0 percent. Re-estimated Bretton Woods formula with normal net capital flows as an additional variable 13/	31.9	-8.2	0.2	--	41.9	26.2	8.1	--	--	0.83	32
Members with quota shares of equal to or less than 1.0 percent. Re-estimated Bretton Woods formula with debt as an additional variable 15/	24.6	-7.3	3.3	--	42.5	26.2	10.7	--	--	0.83	35

\* The relative contribution is equal to the estimated coefficient applied to the variable, summed over all members and expressed in relation to the total "estimated" quotas.

1/ Dummy variable distinguishing between industrial and developing countries (DDEV) is equal to 1 if a country is a developing country or a transitional economy.

2/ OPEN is an openness index defined as  $1 + (5 - \text{capital market accessibility})$ . The countries' capital market accessibility is based on the WEO classification, as submitted to QFRG on September 10, 1999 (item 7)

3/ RM is average monthly reserves with gold valued at market rates in a recent year (1994)

5/ POP is population in 1994.

6/ STDEBT is short term debt at the end of 1994.

9/ NNKFL is the four-year moving average of net private capital flows (1991-1994)

10/ YM5X is a five-year average of GDP from 1990-1994 where the conversion factor is a centered 5-year moving average of the annual exchange rate.

13/ NCF is normal capital flow proxied by a four-year moving average of actual net private capital flows (inclusive of errors and omissions)

14/ VREC is the real effective exchange rate variability times current receipts where the variability of real effective exchange rate is defined in terms of the deviation of real effective exchange rate from a five-year moving average over a recent 13-year period (1982-1994)

15/ DEBT is total external debt owed to non-residents repayable in foreign currency, goods and services. It is the sum of public, publicly guaranteed, and private non-guaranteed debt, use of IMF credit, and short-term debt.

16/ The variable includes a dummy variable distinguishing between industrial and developing countries (DDEV)

Table 11. Estimated Quota Shares for Country Groups by WEO Classification 1/  
(In percent)

	Advanced Economies	Developing Countries	Transition Economies	Memo Item: Regression No. 2/
I. Nonlinear Equations				
<i>Benchmark Equation:</i>				
Equation using only the traditional variables	69.54	21.43	9.03	1
<i>Memo: Existing five formulas,</i>	75.48	19.22	5.30	
<i>Existing quotas</i>	63.20	29.21	7.60	
With real effective exchange rate variability times current receipts as an additional variable (update of 1994 estimation)	68.70	23.36	7.94	30
With population as an additional variable	65.80	25.22	8.98	16
Multiplicative term with a dummy variable distinguishing between industrial and developing countries	65.64	25.28	9.08	4
With normal net capital flows as an additional variable (update of 1994 estimation)	69.43	22.38	8.19	29
With debt as an additional variable (update of 1994 estimation)	66.24	24.99	8.78	31
With five-year average of GDP, where the conversion factors are centered five-year moving averages of the annual exchange rates, replacing the existing one-year GDP	69.43	21.71	8.86	22
With short term debt as an additional variable	70.11	21.05	8.85	17
II. Linear Equations				
With current receipts as an additional variable	68.55	23.99	7.46	10
With an openness index as an additional variable	64.59	25.86	9.55	11
Without a multiplicative factor	69.78	21.65	8.57	9
With both strength and vulnerability variables	65.28	26.74	7.98	28
Nested model where a regression of vulnerability variables (represented by the variability of current	65.87	25.90	8.23	26



Table 11 (concluded). Estimated Quota Shares for Country Groups by WEO Classification 1/  
(In percent)

	<b>Advanced Economies</b>	<b>Developing Countries</b>	<b>Transition Economies</b>	<b>Memo Item: Regression No. 2/</b>
and population) is estimated first				
ased GDP replacing GDP at market exchange rates	65.95	25.20	7.86	3

WEO country classifications, advanced economies include the industrial countries of North America and Europe, Japan, and two newly industrialized (Australia and Singapore). The countries in transition include the 15 members that were formerly part of the Soviet Union, the successor countries to the former Soviet Republics of Czechoslovakia, Albania, Hungary, Poland, Romania, and Mongolia. The rest of the members are classified as developing countries.

1: Statistical Appendix, Part A, Section II, and Part B, Section

## Estimation results

69. For the purpose of evaluating the estimation results, a reference “benchmark equation” is the reestimated Bretton Woods formula.<sup>34</sup> This equation uses the existing variables that enter into the quota formulas (GDP, reserves, current payments, variability of current receipts, and the ratio of current receipts to GDP as a multiplier) and estimates the weights attached to these variables by minimizing the root mean square error against actual (Eleventh Review) quotas.<sup>35</sup> The following are the basic characteristics of this equation:

- It provides a reasonably good overall approximation of actual quotas, as measured by the R-square and standard error statistics. In particular, the standard error of regression from the benchmark is about one third smaller than the corresponding “standard error” calculated for the results of the existing quota formulas, as can be seen in Table 9.
- The structure of the coefficients in the benchmark differs from that in the existing quota formulas. As can be seen in Table 10, the relative contribution of GDP is smaller in the benchmark than that in the existing formulas, while the opposite is the case with respect to the variability of current receipts. In other words, a reestimated Bretton Woods formula has a much higher weight for variability and a smaller one for GDP. The estimated coefficient for reserves, surprisingly, is negative and statistically significant.<sup>36</sup>
- The coefficients of the benchmark equation were tested for stability over a relatively long period of about 30 years, using data from the Sixth through Eleventh Reviews.

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<sup>34</sup>The variables used are those compiled in connection with the Eleventh General Review of quotas, for which data end in 1994. The data collected for potential new variables were also from the same or similar time periods as those for existing variables.

<sup>35</sup>No attempt has been made to replicate the existing multi-formula system by estimating a number of equations simultaneously, though a variant of a two-equation system is attempted using a “nested models” approach (see paragraph 72). The benchmark results using one equation should therefore be interpreted as an approximate benchmark for the existing multi-formula approach.

<sup>36</sup>These are generally features of reestimated Bretton Woods quota formulas. In fact, had Professor Mikesell used regression methods in 1944, he would have derived a coefficient of 0.03 for GDP, instead of 0.02; a coefficient of 0.17 for variability of exports, instead of 0.10; and a statistically insignificant negative coefficient of -0.003 for reserves, instead of 0.05. A reestimation of the original Bretton Woods formula, using the same data used in 1944 by Professor Mikesell, is given in the Statistical Appendix, Part A, Section II, and Part B, Section I (Regression No. 37).

These tests indicate that the coefficient estimates generally vary over time.<sup>37</sup> In other words, the equation estimated using Eleventh Review data differs significantly from that estimated on Seventh Review data.

70. Multicollinearity is a major concern.<sup>38</sup> Multicollinearity is associated with the variables that have common underlying trends, and it sharply reduces the precision of coefficient estimates, making it difficult to disentangle the relative influences of the explanatory variables, and makes the estimates very sensitive to alternative data sets used as the sample. GDP and current payments or current receipts have significant multicollinearity, as do reserves and current payments or variability of current receipts. These effects are not surprising, given the economic relationships between a country's trade and GDP, between its reserves and imports, and for developing countries, between reserves and variability of exports. The addition of a new variable that is highly correlated with any of these variables compounds the problem of collinearity that already exists in the formulas. As can be seen in Table 9, among the equations that presented severe multicollinearity problems were one that includes the variability of real exchange rates, and an equation estimated using the group of developing countries, rather than all members, as the sample. The results from the latter example are indicative of the high correlation for developing countries of their reserves with the variability of current receipts, which made the estimated coefficient of reserves very large and negative.

71. Among the augmented Bretton Woods formulas estimated for the whole membership, the equations with reasonably good statistical fit were those that include as new variables normal net capital flows, external debt, or population. Similar results were obtained with the substitution of a five-year average of GDP for the latest GDP, where the conversion factors were themselves centered five-year moving averages of market exchange rates, and with the substitution of PPP-based GDP for GDP at market exchange rates. In these equations, the standard error of the regression was smaller than that of the benchmark equation, and the estimated coefficients were all statistically significant (though the sign of the coefficient on reserves was negative). Significantly, the relative contribution of GDP in these equations is essentially unchanged from that in the benchmark equation, while that for variability of current receipts falls somewhat, and the relative contribution of each new variable is not

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<sup>37</sup>Chow and Wald tests were used to test for stability, where the latter test was indicated by the systematic tendency of actual quotas to fall over time in relation to GDP or external trade (see Statistical Appendix, Part A, Section III).

<sup>38</sup>Indicators of the presence of multicollinearity are: (a) insignificant t-ratios on variables that a priori should have a significant coefficient; (b) regression estimates that change substantially when an explanatory variable is deleted; and/or (c) high correlation between two variables included in the equation (see D. Belsley, E. Kuh, and R. Welsch, *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*, (New York, John Wiley, 1980)).

large, ranging from less than 5 percent of calculated quotas for normal net capital flows to around 7 percent for external debt or population.

72. Linear equations generally resulted in somewhat lower contributions for GDP and significantly higher coefficients for variability when compared with the benchmark (nonlinear) equation, though the results in terms of goodness of fit were broadly similar. A number of interesting results were found from linear equations that were estimated from the nested model approach, which attempts to combine indicators of external strength and vulnerability in an ordered manner.<sup>39</sup> In these equations, the estimated negative coefficients for reserves fall toward zero, and the overall goodness of fit improves with the simultaneous introduction of population and normal net capital flows as new variables. The combined weight of the new variables is of the order of 10–12 percent of calculated quotas, which is reflected mainly in a reduction in the estimated coefficient for the current receipts variable.

73. Several other observations may be made with respect to the weights of the variables in the estimated quota formulas. The relative contribution of variability of current receipts remains high in almost all of the equations, close to 50 percent of calculated quotas in some cases, while that of GDP is broadly of the order of 25 percent. The estimated relative contribution of the multiplier (one plus the ratio of current receipts to GDP) and of current payments, combined, is broadly somewhere between the relative weights of GDP and variability (i.e., 25 to 50 percent). These broad orders of magnitude are somewhat overstated because of the negative estimated weight for reserves, which, as noted above, are correlated especially with current payments and variability of current receipts.

74. When previous actual quotas are included as a right-hand variable in the estimating equation, its coefficient captures the strong effect of the equiproportional component to the quota increase, and the goodness of fit improves sharply.<sup>40</sup> Nonetheless, the coefficients of the existing variables in the Bretton Woods formula continue, in general, to be significant. With most of the explanatory power attributable to the previous actual quotas, the coefficient for reserves is small but positive, and, significantly, the relative contributions of GDP, variability of current receipts, and ratio of current receipts to GDP are roughly equal to one another. Furthermore, in a linear variant of the Bretton Woods formula which also includes short-term debt, trade and population, the relative contributions of the existing variables in the formulas are not reduced significantly, that for trade increases, and those for short-term debt and population are quite modest.

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<sup>39</sup>As explained in the Statistical Appendix, Part A, Section IV, the nested model is a way of reducing a two-equation system (one equation using strength indicators, and the other using vulnerability variables) to a single-equation model.

<sup>40</sup>See equations 19, 20, 24, and 25 in the Statistical Appendix, Part A, Section II and Part B, Section I.

75. In sum, the statistical investigation undertaken to examine the “revealed preference” underlying the Executive Board decisions regarding actual quotas under the Eleventh Review yields results that generally confirm the usefulness of the traditional variables in the quota formulas, except for reserves. However, the relative contributions of these variables are significantly at variance with their contributions in the existing quota formulas. In particular, the statistical exercise suggests that variability of current receipts has strong explanatory power, particularly when compared with the role of current payments. The introduction of new variables also improves statistical explanation for normal net capital flows, external debt, or population, but the estimated weights for these variables are quite small in relation to those for existing variables. These results suggest that the quota formulas could be improved somewhat, but not greatly, on the basis of statistical criteria, if the effort is to replicate actual quotas. As noted above, however, the statistical investigation is subject to substantial errors in the variables, to problems of multicollinearity, and to variation in the estimated coefficients over time. Some statistical results also abstract from the fact that existing quotas are a major determinant of actual quotas under a review.

#### **Deviations of members’ initial quotas from their calculated quotas**

76. While it is well known that the initial actual quotas of members were not strictly determined by formula, as discussed in Chapter III above, it is interesting to examine the extent to which they deviated from the formula. To the extent that members’ actual quotas at membership were consistently above or below their corresponding calculated quotas, the resulting relative quota shares are possibly still evident in the current quota distribution, given the predominance in subsequent quota increases of equiproportional increases. Such deviations may also give an indication of variables that were omitted from the existing formulas. Statistical testing of the deviations between actual initial and calculated quotas are reported in the Statistical Appendix.<sup>41</sup>

77. For the original members that joined at the IMF’s inception, the statistical investigation found no overall deviation between actual and calculated quotas, despite large deviations for many individual members. The group of members that joined in the 1947–65 period generally received quotas that were below their calculated quotas. This finding reflects in large part the fact that the initial quotas of five relatively large countries (Italy, Japan, Germany, Sweden, and Argentina) were on average about 15 percent lower than their

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<sup>41</sup>See Statistical Appendix, Part A, Section II. The statistical testing was conducted by regressing actual quotas against calculated quotas for three groups of members: those Bretton Woods conference participants that joined the IMF at inception, those joining in 1947–65 before the multi-formula approach was adopted, and those joining after 1965. To detect for deviations, the calculated quotas were normalized to sum to the same total as that of the actual quotas of existing members. The test for significance was made at the 5 percent level.

calculated quotas.<sup>42</sup> For members joining after the multi-formula approach came to be of widespread use, initial quotas were about 40 percent higher than their calculated quotas. This deviation reflects mainly three factors. First, a large number of these members were small countries considered to be comparable with existing members that had earlier joined under the small-quota policy of the 1950s, under which a minimum quota operated as a floor that was significantly higher than the calculated quota. Second, the transition economies that joined in the early 1990s were given quotas that were adjusted upward to compensate in part for inadequacies in the data that went into the quota formulas. Third, the quota of one large country (Switzerland) also reflected its relative financial importance, a factor not taken into account in the existing quota formulas.

### **Convergence of actual to calculated quotas**

78. As described in Chapter III, each quota increase has an equiproportional component and a selective component. The latter component sometimes reflects recognition of particular anomalies; more generally it attempts to reduce the gap between the actual quotas and the quotas as calculated by the accepted formulas. For example, in the Eleventh Review, 60 percent of the selective element was distributed in proportion to members' shares in calculated quotas, which uniformly reduced the gap between members' actual and calculated quota shares. The balance of the selective increases was distributed only to the 38 members whose calculated quota shares exceeded their actual quota shares, thereby speeding up the adjustment of their relative quota positions toward those indicated by the quota formulas. It is of interest to know to what extent actual quotas have converged to (ever-changing) calculated quotas over time.

79. The convergence of actual quotas to calculated quotas has been slowed down by the preponderant equiproportional component, about 70 percent in past quota reviews, though it has also been sped up by ad hoc quota increases that were agreed from time to time.<sup>43</sup> The selective element was raised to 60 percent of the overall increase (the largest in the IMF's history) in the Eighth Review. As a result, the deviations between actual and calculated quotas, which had been rising through the Seventh Review, fell. Deviations have risen again under the Tenth and Eleventh Reviews because there was no quota increase under the former, and the equiproportional element was, at 75 percent, relatively high in the latter review.

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<sup>42</sup>Italy and Japan later received ad hoc increases in quotas that partly compensated for their relatively low initial quotas, though in the case of Japan, its ad hoc increase was not agreed until 1990 in the context of the G-7 rearrangement under the Ninth General Review of Quotas.

<sup>43</sup>The effect of ad hoc increases was most evident in the results of the G-7 rearrangement under the Ninth General Review (see Chapter III). For further detail on statistical measures of the deviation between actual and calculated quotas, see Annex Note 4.

80. Because the relative calculated quotas of individual members may be expected to change at every quota review, gaps between actual and calculated quota shares are likely to emerge in a subsequent quota review, even if actual and calculated quota shares were to start out being fully aligned with each other. After the latest round of quota adjustments, the aggregate deviation between actual and calculated quota shares is of the order of 15 percent, which is sizeable (but not the largest) in historical terms.

81. As a means of further assessing the adjustment of quota shares over time, hypothetical quotas were simulated for the Sixth through the Eleventh Reviews under alternative assumptions on the distribution of quota increases (fully equiproportional, fully selective keyed to calculated quotas, or evenly divided between these two elements).<sup>44</sup> In these simulations, the size of the overall quota increase agreed in past quota reviews was taken as given, and the selective element was distributed in proportion to members' shares in calculated quotas, which was the method used for selective increases under the Eighth and Ninth Reviews and for three-fifths of the selective element of the Eleventh Review.<sup>45</sup> The simulation of a 50/50 split of equiproportional/selective increases comes reasonably close to replicating the actual outcomes of quotas today, though there are some significant differences for Saudi Arabia and Japan, which benefited from ad hoc quota increases that were not captured in the simulations (both these countries' quotas are smaller in the simulations than their actual quotas). (See Statistical Appendix, Part A, Section V, Summary Table.)

## VI. PROPOSALS FOR CHANGE IN THE QUOTA FORMULAS

82. The main task in our review is to seek a quota formula which would better reflect the underlying changes in the functioning of the world economy and the international financial system, take account of the increasing globalization of markets, and simplify the existing formulas. Throughout the IMF's history, the quota formulas have never been viewed as perfect, but it has also proved impossible for the IMF membership to agree to more than incremental or marginal changes in them. Major differences of opinion within the membership as regards how the formulas might fundamentally be changed could not be resolved, and the quota determination process has relied less on the formulas and more on the equiproportional element in past quota reviews. Consequently, actual quotas have remained

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<sup>44</sup>See Statistical Appendix, Part A, Section V. The choice of the Sixth Review as the starting point is solely for the purpose of illustration, using a large enough but "constant" sample of the membership to show the hypothetical shifts in quota positions over a long period. Total membership has in fact risen over time.

<sup>45</sup>Another part of the selective element of the Eleventh Review was distributed in a manner that was concentrated only on the members whose calculated quota shares exceeded their then-existing quota shares, as discussed in Chapter III.

some distance from the quota formulas. That divergence, however, was not accidental, but the result of the deliberate and conscious actions of the membership, reflecting compromises.

83. The proposals for change discussed in this chapter have been evaluated taking into account our terms of reference (Chapter II) and the discussion in Chapter IV on the relevance of changes in the world economy, while acknowledging certain constraints. In particular, proposals that would require an amendment of the IMF's Articles of Agreement are excluded from consideration. Thus, we recognize that quotas will continue to serve multiple functions in the IMF, and that any change in quota of any member requires 85 percent majority support, although a member has the option of not consenting to any change (increase or decrease) in its quota.<sup>46</sup> We have also avoided addressing the question of the absolute level of quotas as distinguished from their relative apportionment among member countries.

84. The QFRG considers that there should be well-defined criteria for assessing any proposals for change in the quota formulas. Since our terms of reference do not give guidance as regards any particular outcome on the distribution of quota shares, we have proceeded on the assumption that a new formula should be devised without reference to any preconceived results in terms of the shares of any individual country or groups of countries. We recognize that Board discussions have often focussed on whether developing countries as a group have sufficient voice in the Fund and any decision on the quota formula for the future will have impact on this issue. However, since our terms of reference do not make any reference to developing countries as a group, we have not taken this aspect into account in recommending a quota formula. Our recommendations are based on the following:

(a) Any new quota formula should have a sound economic basis and should reflect the relevant changes in the world economy;

(b) The form and content of any new quota formula should be consistent with the several functions of quotas;

(c) The variables contained in a quota formula should not give incentives to members to adjust their policies adversely to IMF principles or affect their economies in a manner that is not consistent with normal objectives of growth and economic management and is designed mainly to improve their relative quota shares;

(d) Any new quota formula should be more transparent and easier to comprehend than the existing set of formulas; and

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<sup>46</sup>As noted in Chapter III, the process whereby quota increases are available for consent by members is through quotas proposed in a Board of Governors' resolution. In other words, the proposed quota for a country, approved by the necessary 85 percent majority, normally sets the ceiling on the country's relative share in quotas.



(e) Any modification of the quota formulas should be feasible, and where problems of data quality or availability arise, such modification should be contingent on the resolution of these problems.

85. The QFRG was asked to take into account, in framing its recommendations, each member's "relative position in the world economy." This concept is necessarily vague and open to more than one interpretation. We are also aware that it is somewhat charged within the IMF. To quantify it would require giving the term greater precision, which in turn could legitimately lead in several quite different directions. We do not try to resolve it in a definitive way, but feel that our recommendations are consistent with the general injunction.

### **Variables in the quota formula**

86. Important considerations in devising a new quota formula are that of endowing it with economic structure, and its practical application or feasibility, taking into account the functions of quotas. The supply of IMF resources is reflected in creditor positions in the IMF, which are based on quotas and represent a form of each member's official reserves. Accordingly, a quota formula that would be applicable to potential creditor countries would rely on variables that tend to represent those countries' ability to contribute. For potential debtor countries, use of IMF credit is positively correlated with economic variables that measure their external vulnerability, such as instability in their external receipts or their access to the capital markets. The following paragraphs discuss the views of the QFRG on the merits of particular variables for inclusion in the quota formulas, as well as the manner by which they might be included in the formulas.

#### ***Ability to contribute***

87. The QFRG agreed unanimously that the single most relevant variable for measuring a country's ability to contribute to the IMF resources is GDP. However, the group differed on how GDP measured in domestic currency should be converted into a common currency to determine relative ability to contribute. The majority favored conversion at market exchange rates, averaged over several years, but a minority preferred to measure GDP for purposes of quota calculations using PPP-based exchange rates.<sup>47</sup>

88. The minority favoring PPP-based conversions argued that market exchange rates do not necessarily equalize prices of tradable goods across countries, even after allowing for quality and transport costs, and this creates an index number problem in which GDP in developing countries is understated relative to developed countries if market exchange rates are used. It was noted that although real growth rates in these countries have been

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<sup>47</sup>See Annex Note 5 for further background on the method of converting GDP into a common currency.

significantly higher than in industrialized countries, the expected increase in relative size of GDP of the developing countries is eroded by exchange rate depreciation when market exchange rates are used. The minority view therefore was that GDP should be measured on the basis of PPP-based exchange rates.

89. The majority held that while PPP-based conversion rates were appropriate for measuring relative per capita income for comparing economic well-being across countries, they were not appropriate for indicating a country's ability to contribute to international endeavors. The IMF is a monetary institution, requiring financial resources for use when members are in financial difficulties in their relations with the rest of the world. A country's ability to contribute is therefore determined by its capacity to provide funds at market exchange rates.

90. In the view of the majority, PPP-based GDP has several limitations. First, the use of PPP-based GDP as a measure of ability to contribute would produce some serious anomalies at present, suggesting, for example, that China could contribute one third more than Japan, or that India could contribute more than France. Moreover, if exchange rates were actually set at calculated PPP rates, they would reveal serious external imbalances. Second, market prices properly reflect the costs of moving goods from one place to another, and equating prices of equivalent goods regardless of location, as is done in PPP calculations, gives a seriously misleading indicator of ability to contribute to international undertakings. Third, that countries growing more rapidly than their trading partners experience depreciating currencies is a well-established result of growth in an open economy, except when the growth is generated primarily by exports or other special circumstances obtain, and this does not argue for replacing market exchange rates with PPP exchange rates.

91. All members agreed that at present there are serious data problems in using PPP-based GDP conversions. At present, PPP calculations are available for only 117 countries, representing about 95 percent of world GDP, and some of these calculations are based on fragmentary information, so that their use is not practical in the near future. Of course, with effort data deficiencies can be eliminated over time.

92. The use of market exchange rates to convert GDP could be criticized because of their volatility, including occasional overshooting, and because foreign-currency denominated GDP declines sharply just after a large currency depreciation. This problem could be mitigated by averaging over time. To avoid undesired influence of such changes in market exchange rates and also of short-run variations of economic activity in the base year used for quota calculations, GDP should be averaged over a number of years, say three, for entry into the quota formula.

93. Apart from GDP, openness of a country's economy is a further indicator of its ability to contribute. Openness is also relevant to IMF activities and therefore could be positively correlated with quota shares. Furthermore, openness can be considered as an indicator of potential need for IMF resources (see paragraph 100). Conceptually, openness would be

measured by value added in the sector of tradeables (possibly augmented by data on long-term capital flows), but such data are not available at present.

94. Openness could be proxied by current receipts and payments (augmented, when available, by receipts and payments of long-term capital).<sup>48</sup> Such a measure of openness is highly correlated with GDP across countries, but would give greater relative weight to those countries with higher ratios of exports to GDP. In the view of the majority, this measure of openness is subject to reservations arising from their measurement at gross value rather than in value added terms, and from the growing prevalence of preferential trading arrangements, as discussed further below. A minority believes that this measure of openness would still be useful because open countries, measured in this way, may take a deeper interest in (or benefit more from) the prevention of financial disturbances.

### *Need for IMF resources*

95. The IMF in recent years has demonstrated considerable flexibility, when circumstances warranted, in lending to members outside the bounds of quota ceilings, which themselves are altered from time to time. Such flexibility could be continued and even enlarged in the future, subject, of course, to adequate resources being available. With such flexibility in possibilities for members' borrowing from the IMF, a case could be made for basing the quota formula exclusively on indicators of ability to contribute to IMF resources. This point is reinforced by the recent use of the quota distribution to allocate the currencies to be drawn among countries whose currencies are eligible for use. However, there is some merit in having presumptive quota limits on countries' borrowings from the IMF.

96. Under the Articles of Agreement, the quota now also effectively determines voting rights. The IMF's cooperative nature suggests that potential debtor countries should continue to have a significant voice in IMF decision-making, a feature that would be dropped by basing quotas solely on ability to contribute (unless redressed by increasing substantially the fixed or basic votes to which each country is entitled, which now account for about 2 percent of total votes—a change that would require amendment of the Articles). With quotas, and hence voting power, based solely on ability to contribute, some feel that the perspective of actual or prospective borrowing countries might not be properly reflected in the management of the IMF.

97. The single most relevant variable for measuring a country's vulnerability to external economic disturbances is the variability of its international receipts, measured at present as the standard deviation from trend of current account receipts over a 13-year period, with the trend measured by the centered five-year moving average. This measure could be refined in several ways, by netting from the receipts highly correlated payments (as for inputs into export processing industries) or by adding to receipts some measure of autonomous net

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<sup>48</sup>For a broader discussion of data on capital account variables, see Annex Notes 6 and 7.

inflows of capital, e.g., net long-term borrowing plus foreign direct investment, assuming that reasonably accurate information was available on a timely basis (see Annex Note 8).

98. This particular measure of vulnerability also captures the ability to contribute in periods of exceptionally large receipts, a point that has occasionally been important, e.g., during periods of high oil prices, enabling oil-exporting countries to contribute, through the IMF, to the financing of payments deficits in oil-importing countries.

99. Quotas could not of course be based on measures of vulnerability alone, since without significant change in its practices (e.g., by borrowing in the capital market), the IMF would then lack resources for lending. But strength and vulnerability could be combined into a single formula, with weights chosen to achieve the dual purpose of assuring the IMF with adequate lending resources and assuring potential debtors a continuing significant voice in IMF deliberations. And of course the roles of contributor and borrower can change over time, so that all countries can conceive of themselves of playing either role.

#### *Other possible variables*

100. Many additional variables could also be considered for determining IMF quotas. Variables that have been used in existing formulas, or suggested for future inclusion, include official reserves, current payments, ratio of exports to GDP, per capita income or population, external debt, share of food and energy in imports, access to capital markets, and variability of exchange rates. Of course, if additional variables are added to the formula, weights must be chosen for them, and criteria for the choice of weights therefore would need to be specified. Brief comments on each of these possible variables follow:

(a) A case can be made for considering **official reserves** as an indicator of a nation's ability to contribute to IMF activities. Certainly, in the short run, reserves measure a country's capacity to respond to an IMF call for currencies usable for international transactions, as well as its capacity to withstand balance of payments pressure. Reserves may, however, fluctuate substantially from year to year, and may reflect heavy international short-term borrowing. The former point could be addressed by averaging the data over several years, and the latter by taking reserves net of short-term external borrowing, if accurate measures of such borrowing were available. A standard convention would have to be agreed for valuing gold reserves, or agreement reached to exclude them altogether.

(b) **Current payments** could serve as an alternative measure of vulnerability, or as a supplementary measure, albeit one highly correlated with GDP and with **current receipts**, both of which measure ability to contribute. Both payments and receipts suffer, however, from being recorded on the basis of gross value rather than value added, thus giving greater weight to those countries heavily engaged in processing imports for re-export.

Moreover, when countries form an economic union, as 15 European countries have done, slicing of productive processes into many layers is likely to be carried even further, with substantial “double-counting” of cross-border trade relative to value added in economic activity. The question therefore arises whether intra-union trade should be counted as foreign trade for the purpose of calculating IMF quotas; a case could be made for excluding it entirely from the measure of current payments. Of course, this concern arises whenever there is close economic integration between two or more countries, not just when a formal economic union has been established.<sup>49</sup> Asking countries to report foreign trade in terms of value-added runs against the long-standing statistical conventions of reporting the gross values of imports and exports, and would impose additional resource requirements on many countries.

(c) The **ratio of exports to GDP**, as a rough measure of openness, could augment GDP as an indicator of ability to contribute, as discussed above, but it could also reflect potential vulnerability to external shocks. It would give greater weight in the formula to countries that are more open on this measure. It however suffers from several of the weaknesses of exports and imports mentioned in the preceding paragraphs, because, as global integration deepens, countries will record ever-rising export-to-GDP ratios, reflecting cross-border refinement of production as well as increased exposure of the national economy to world economic developments. Moreover, inclusion of this ratio in a quota formula, either multiplicatively as in the Bretton Woods formula or even linearly, has the apparently perverse consequence that, with sufficiently high ratios, an increase in the non-export components of GDP would lead to a lower calculated quota.

(d) **Per capita income** could be included in a quota formula (with a negative coefficient) on the grounds that IMF quotas provide a contingent substitute for holding international reserves, and the opportunity cost of holding reserves is (very roughly) inversely proportional to per capita income, reflecting relative capital shortage among other economic conditions.<sup>50</sup> However, per capita income does not bear directly on international monetary issues. An alternative way to capture an influence for per capita income would be to include **population** in addition to GDP at market prices. The inclusion of a separate population variable would give greater weight to more populous countries, which perhaps could be justified on the grounds that the international community should move toward a system in which individuals begin to count as such in global decision-making.<sup>51</sup> However, like per capita income, population does not bear directly on international monetary issues, and of course a country’s relative size (including population) is already captured by GDP.

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<sup>49</sup>See Annex Note 9 for a related discussion on the European Union.

<sup>50</sup>Including per capita income could entail a non-linear form, such that countries where per capita GDP is below the average would receive a somewhat higher quota than those with per capita GDP above the average. The differentiation in quota could be scaled appropriately.

<sup>51</sup>A similar effect is achievable through using GDP converted at PPP exchange rates.

(e) **External debt** and associated debt servicing represent a claim on the export earnings of debtor countries, especially when the debt is in foreign currency. For many countries, it is a relatively steady and foreseeable claim, except for floating interest rate debt in periods of volatile interest rates, and the principal vulnerability should be adequately captured by volatility in export earnings. Moreover, to date data on total external debt have been notoriously unreliable. Also, if foreign debt is used as an indicator of vulnerability, a moral hazard arises; countries may be more tolerant if their foreign debt rises.

(f) **Share of food and energy in imports** represents a crude measure of essential imports for many countries, and thus could be considered a measure of vulnerability. Both food import requirements and world energy prices are somewhat volatile, and countries more dependent than others on imports require larger reserves or potential augmentation of temporary import financing from the IMF, even for countries with relative stable export earnings. However, legitimate claims for essentiality could undoubtedly also be made for other products. The Compensatory Financing Facility is, moreover, designed to deal directly with this issue.

(g) **Access to capital markets**, conferred on countries whose policies and performance are seen to be satisfactory by would-be investors in their securities, would seem to reduce the need for official reserves and IMF drawing rights and would enhance the ability of such countries to contribute to IMF resources. The drawbacks are that financial markets can be fickle, and can dry up just when a borrowing country most urgently needs the funds. Access to capital markets that is not thoroughly secure in all circumstances thus represents a source of vulnerability, insofar as a country has come to rely on a steady or steadily increasing inflow of funds and may have reduced its reserves in response to the normal availability of foreign capital. Moreover, measuring access to capital markets accurately is no easy task; and experience suggests that past inflows, especially those of a short-term nature, may be a poor guide to the future. However, the variability of the autonomous component of net capital flows is a likely useful component of a redefined measure of variability.

(h) **Changes in exchange rates** provide an alternative source of adjustment to reliance on reserves and official borrowing to deal with payments imbalances, and on that account higher variability of exchange rates might be associated with lower quotas. On the other hand, high variability may also reflect a greater frequency and/or magnitude of shocks to a country's international payments, and on that account might be an indicator of a greater need for reserves or official lines of credit. The implications for IMF quotas of high exchange rate variability are unclear.

### *Data weaknesses and other issues*

101. The data on some of the variables considered for inclusion in the quota formulas are subject to **statistical weaknesses**. This is particularly the case with respect to data on capital transactions, external debt, and PPP-based GDP, as discussed earlier. Capital transactions have major problems because of imperfect measurement as well as varying degrees of netting across different types of such transactions, and there remain substantial gaps in country

coverage with respect to data on external debt. Inclusion or use of these variables in the quota formulas should be premised on resolving their known data weaknesses.

### **On EMU**

102. It has been suggested that the creation among 11 European countries of an economic and monetary union (EMU), with a single currency, should alter the relationship of the participating countries to the IMF, and in particular that EMU should be treated as a single economic unit, like a country.

103. Without addressing the relative representation of some members in the Executive Board, an issue beyond our terms of reference, we disagree with this suggestion. First, under the current Articles, only states, not other entities, can be members of the IMF (in this respect, it differs from the WTO). Second, sharing a currency with one or more countries does not imply that a member cannot run into balance of payments difficulties of a type with which the IMF can help, or would never be tempted, on balance of payments grounds, to take measures that threatened the prosperity of its trading partners. So while the creation of EMU and indeed extensive arrangement of deep economic integration among members creates some problems for measuring and interpreting trade flows, as discussed above, it does not, per se, undermine the value of current arrangements between the IMF and its member countries.

### **The linearity problem**

104. It has been observed for many years (Jacques Polak pointed it out in 1949) that the multiplicative coefficient in the original Bretton Woods formula (one plus the ratio of exports to GDP) carried the anomalous implication that for sufficiently high values of the ratio an increase in GDP, other things equal, would reduce the calculated quota. With the rapid growth of exports relative to GDP, the point is no longer hypothetical: 48 percent of current members are subject to the condition.

105. This result seems undesirable, especially in view of the fact, discussed, that exports are measured at gross value, while GDP is based on value added; and the fact that exports to GDP is only an imperfect measure of openness, which covers all of an economy subject to foreign competition.

106. What is less well appreciated is that the same criticism also applies even if the ratio of exports to GDP is entered linearly rather than multiplicatively. The higher the ratio, the greater the weight attached to it, and the smaller the weight attached to GDP, the more likely

the anomalous result. This potential problem is likely to become more acute over time. Thus, we recommend dropping this ratio variable altogether.<sup>52</sup>

### **Concluding remarks and basic recommendations**

107. The QFRG is of the view that the search for a new quota formula or formulas for determining relative quota shares is inherently difficult, not just because of technical reasons but also because no quota formula in its relative form can exceed 100 percent over all member countries. It should also be recognized that there is a basic problem in trying to achieve multiple (quota) objectives with one instrument (formula). However, taking into account the criteria listed in paragraph 84 above, the group recommends a simplification and modernization of the current quota formulas. Simplification can be achieved through the use of a single linear equation containing no more than two variables, one representing ability to contribute to the IMF's resources and the other a measure of external vulnerability.<sup>53</sup> As indicated earlier, GDP represents ability to contribute, but it should be averaged over three years to level the fluctuations of GDP and to avoid problems of exchange rate variability observed in recent years. A measure of vulnerability could be the existing measure of variability of current receipts, i.e., a standard deviation from trend, but it could be extended to take account of the increasing importance of the long-term capital flows in countries' external financing, by adding to current receipts net inflows of long-term capital.

108. Judgement will have to be exercised regarding the relative importance of the two variables. The group suggests that the variable indicating ability to contribute resources should have the relatively larger weight, twice that of the indicator of external vulnerability. Thus, the QFRG majority proposes the following linear formula:

$$Q = \mathbf{a} \text{ GDP} + \mathbf{b} \text{ Variability},$$

with  $\mathbf{a} = 2\mathbf{b}$  and where  $Q$ ,  $GDP$ , and  $Variability$  are data expressed in relative shares.<sup>54</sup> Some members of the QFRG suggest that the GDP variable should be defined as the higher

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<sup>52</sup>As noted below, two members support the use of a measure of openness that would be included in a linear manner.

<sup>53</sup>Two members of the group propose a three-variable formula where openness (measured by the average of current receipts and payments and direct investment inflows and outflows) is a third variable. This indicator partly substitutes GDP. Equal weights of one third each are suggested for GDP, the openness measure, and the vulnerability variable.

<sup>54</sup>It may be noted that the input data for each country is expressed in terms of its share in global totals for GDP and variability. For the country, variability is the standard deviation  
(continued...)



annual value from a recent two-year period, with the chosen figure converted into a common currency using a three-year average of exchange rates centered on the sample year, in order to reflect recent economic growth.

109. The simple one-equation two-variable formula could be extended in several ways. Some members of the QFRG felt, for instance, that adding a third variable would not unduly compromise the criterion of simplicity. No single third variable commanded wide support. As already noted, an openness measure in the form of the average of current receipts and payments (perhaps augmented by direct investment inflows and outflows, respectively) was suggested. Official reserves and population (as a proxy for per capita income) also had advocates.<sup>55</sup> Of course, weights would have to be assigned to any additional variable.

110. Another variant from the basic recommendation is to have two formulas, each containing the measures of GDP and vulnerability described above, but with different weights. For example, in the first equation the weight of GDP could be twice that of vulnerability while in the second equation these relative weightings could be reversed. Quotas would be assigned to countries based on the larger of the two calculations, calibrated so that the formulas yield the same total of quotas thought desirable. Such a two-formula procedure would give greater weight in overall quotas to economically large countries and to countries with high variability of external receipts, and less to "average" countries, than would a single formula.<sup>56</sup> The majority of the group did not favor this approach.

111. As just noted, the inclusion of additional variables in the quota formula can be accomplished only by assigning specific coefficients or weights to them. That requirement in turn raises the question of what criteria should be used to assign the weights. Economic criteria for assigning weights to the factors that have been mentioned above are not at all obvious, and would require either arbitrary assignment of weights or strong input of political considerations in the selection of weights.

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from trend of current receipts plus net long-term inflow of capital, measured in SDRs. Furthermore, the relative weights  $\hat{a}$  and  $\hat{b}$  are fixed and, unlike the weights of variables in existing formulas, are invariant with respect to changes in the economic data in between the five-yearly quota reviews.

<sup>55</sup>One member stressed the need for a variable, such as population, that would capture relative political importance and give poor countries a larger voice, given that the basic votes, which have dwindled in impact, can be adjusted only by amending the IMF Articles.

<sup>56</sup>One member noted that giving less weight in overall quotas to "average" countries may increase internal conflicts and prove destabilizing for the IMF.

112. Whatever new quota formula or combination of formulas is chosen, it is not necessarily desirable to change actual quotas rapidly. Yet to freeze them would fail to recognize the constantly changing world economy, and the continual relative change of the circumstances of individual members within the world economy. Provision can be made for convergence toward any chosen quota formula over a period of time, by determining to close a certain fraction of the difference between existing quotas and (ever changing) newly desired quotas at each five-yearly quota review. For future quota increases, the group has no precise recommendation on the speed of such convergence. The group believes that the new quota formula would nonetheless help to foster a continuing renovation of the quota structure to reflect changing times and realities. Obviously, if significant convergence is desired, the equiproportional element should not be as large as it has been in the past.

## BIOGRAPHICAL NOTES ON QFRG MEMBERS

### **RICHARD N. COOPER** **(Chairman of the Group)**

Maurits C. Boas Professor of International Economics at Harvard University. He served in the U.S. Government on several occasions, including as Under-Secretary of State for Economic Affairs (1977–81). He has written extensively on issues of international economics, including *The Economics of Interdependence* (1968), *Economic Stabilization and Debt in Developing Countries* (1992), and *Environment and Resource Policies for the World Economy* (1994).

### **JOSEPH L. S. ABBEY**

First Executive Director of the Center for Policy Analysis (CEPA), a private, non-profit economic think-tank sponsored by USAID (Ghana) and the Harare-based African Capacity Building Foundation (ACBF). He was head of Ghana's Statistical Service from 1974–78. He was appointed Chief Economic Advisor to the Commissioner for Economic Planning in 1975 and subsequently became Commissioner (Minister) in 1979. Over the last ten years, Dr. Abbey has served as an economic ambassador for Ghana in Canada, the United Kingdom, and the United States. He has also served as a member of the Government's Economic Management Team.

### **MONTEK SINGH AHLUWALIA**

Currently serving as a Member of the Planning Commission, Government of India. Earlier, he was Finance Secretary in the Ministry of Finance (1993–98). Mr. Ahluwalia has served in various other capacities in the Government of India including, Commerce Secretary and Special Secretary to the Prime Minister. Before joining the Government of India, he served in the World Bank staff, holding various positions including Chief of the Income Distribution Division. Mr. Ahluwalia holds a M. Phil (Economics) and a M.A. from Oxford University and a B.A. (Hons.) from Delhi University. He has published several papers in professional journals on issues in economic development, international economics, and India's economic problems.

**MUHAMMAD S. AL-JASSER**

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