(c) **"be consistent with the several functions of quotas,"** including the provision of financial resources to the Fund, the distribution of voting power in the Fund, and the determination of the demand for Fund resources.

(d) **"be more transparent and easier to comprehend than the existing set of formulas."**

- Transparency would be enhanced by a normatively chosen formula for which the economic rationale is clear. However, since each member can only have one quota under the Articles, transparency will remain inherently limited by the problem that results from a single quota serving multiple functions. That is, since there is not a separate instrument to determine each function of quotas in the Fund, a compromise inevitably needs to be struck among the different functions. The choice of weights assigned to the variables related to each function in the formula represents an implicit compromise.

- The criterion of simplifying the formulas is particularly compelling. Simplification would mean that any formula should satisfy the **principle of parsimony**, with a few key variables used to determine quotas. The current set of formulas is certainly not simple, even though the calculated quota of the majority of members is determined by just one formula (the Bretton Woods formula).

(e) "**be feasible [to implement], and where problems of data quality or availability arise, such modification [to the formulas] should be contingent on the resolution of these problems."** As quota formulas are to be used to determine calculated quotas, proposed modifications of the formulas should be "feasible" in the sense that it should be possible to apply them using timely, high-quality, and widely available data. In particular, minimizing the amount of estimation needed to produce the data underlying quota calculations should be an important criterion in the choice of variables, although due regard could be given to likely statistical improvements in the future.

(f) "**not give incentives to members to adjust their policies adversely."** The staff considers the possible adverse incentive effects from the quota formulas to be minimal.

IV. Evaluation of QFRG Proposals

21. **The QFRG recommends a linear, one-equation, two-variable formula comprised of GDP and the variability of current receipts and net long term capital flows** (¶107–08). The central proposal of the QFRG, made with several caveats to be sure, represents a major reform of the quota formulas and raises several important issues which are discussed below.

A. Specification

22. **The QFRG's proposed formula is mathematically simple and a more transparent compromise between the different quota functions than the current five-formula system**. However, there may be analytical and other factors which would merit consideration of other alternatives regarding the number of formulas, their mathematical form, and the variable weights.

Number of formulas

23. **The single formula proposed by the QFRG incorporates the multiple functions of quotas by including variables which bear on both the supply of, and demand for, Fund resources**. Such a single formula could be interpreted as a weighted average of two formulas, each addressing a single quota function. In this sense, the QFRG formula could be seen as a weighted average of a supply formula which would contain GDP and a demand formula which would contain variability, as well as GDP, which is also an important indicator of the size of a country's potential demand for resources.

24. **The QFRG notes the possibility of a two-formula system with the second formula having the same variables and specification as the first, but with the weights of the variables reversed** (¶110). In discussing its two-formula variant, the QFRG proposes that a member would get the higher of the two quotas calculated by the formulas. This may be seen as an attempt to address the problem of multiple functions of quotas noted above, in that it would assign a more demand-related formula to members more likely to demand resources from the Fund, and a more supply-related formula to those members more likely to supply resources to the Fund. As quotas are recalculated periodically, it would be possible for a given member's calculated quota to be determined by a different formula over time.

Mathematical form

25. **The current formulas**, in which the openness ratio (current receipts as a proportion of GDP) enters multiplicatively, **can produce the anomalous result that, at the margin, a calculated quota declines when GDP increases**. Moreover, with a nonlinear formula, a straightforward interpretation of the relative weights given to the variables can be difficult.

26. **A linear formula can address both of these problems**. A linear specification is appealing in that it is amenable to a fairly straightforward interpretation in terms of the relative weights given to the variables in the formula.[10] However, entering GDP linearly in a formula might be considered to lead to too wide a dispersion of calculated quotas due to the very wide dispersion of nominal GDP across countries. One alternative which would dampen the degree of dispersion would be to enter the right-hand side variables in logs, which would

[10] An openness ratio, even if entered additively instead of multiplicatively, can still lead to the anomalous result just noted. In such a case, the formula would not, of course, be linear in GDP.

permit a nonlinear relationship between the untransformed variables and calculated quotas. Another alternative would be a log-linear functional form (where both quotas and the right-hand side variables are entered in logs) which would have the appealing interpretation that the coefficients of the variables would represent the constant elasticities of quotas with respect to each of the determining variables.

Variable weights

27. **The weights in the original Bretton Woods formula were devised to approximate a specific, politically determined result**. In the reforms which introduced the current multiple-formula system during the Fourth Quinquennial Review (1963–65), the weights in the non-Bretton Woods formulas were to some extent derived normatively to give more importance, relative to the Bretton Woods formula, to external trade and the variability of exports. However, positive factors played a role in the choice of weights as well in that, among the variety of weighting schemes considered, the ones which were chosen were those which produced calculated quotas that best fit the then-existing quotas.

28. **The choice of variable weights in the formula is difficult, given the absence of a clear analytical framework which could be brought to bear on the issue**.[11] The QFRG suggests assigning a larger weight to the GDP variable, "twice that of the indicator of external vulnerability" (¶108) reflecting the QFRG's *a priori* judgements about the relative importance of the various functions which quotas perform. The staff also believes that giving more weight to the function of providing resources to the Fund (by assigning a larger coefficient to GDP than variability), as the QFRG's proposal does, is appropriate, although a decision on the precise weighting is a matter of judgement.

B. Proposed Variables

29. **The proposed variables, GDP and the variability of current receipts and net long-term capital account transactions, satisfy several of the selection criteria discussed above**. They can be justified on an economic basis and they clearly reflect an attempt to incorporate relevant changes in the world economy because of the inclusion of capital flows. The QFRG's proposed variables, as well as other possibilities, are discussed below.

GDP

30. **The QFRG "agreed unanimously that the single most relevant variable for measuring a country's ability to contribute to the IMF resources is GDP"** (¶87). The QFRG proposes to retain the central importance of GDP in the quota formula. GDP tends to have a relatively large influence on the calculated quota for those members under the original Bretton Woods formula, and has provided the biggest contribution to calculated quotas for many members. Moreover, GDP represents the total amount of resources generated by an

[11] A similar issue of weights arises if multiple formulas are combined in a weighted average to generate a single calculated quota.

economy, and therefore remains the best single distillation of a member's ability to contribute resources to the Fund. Finally, GDP is also likely to be correlated with the amount of financial resources required to deal with a member's balance of payments problems, and therefore could be considered a reasonable element in a quantification of potential demand for Fund resources.

31. **The QFRG considers that GDP should be averaged over several years to mitigate the effects of sharp swings in exchange rates and short run variations in economic activity** (¶92, ¶107). There is a tradeoff in choosing a GDP measure between using a single year, which better reflects recent conditions, and using a multiple-year average, which lessens the possibility that members' single-year GDPs could be observed at different points in the business cycle, or that the exchange rate used might be a misaligned one. On balance, choosing a representative measure would seem to be more important than choosing a current one, and a multiple-year average of GDP instead of the single-year GDP currently included in the quota formulas may be a more appropriate measure.

32. **The QFRG majority argue that GDP converted at market exchange rates is the most relevant measure of a country's ability to contribute resources to the Fund**. GDP converted at market rates into SDRs (or any other common currency) provides a measure of the international market value of resources generated by an economy. The ability of a member to finance the Fund as measured in SDRs is clearly related to this value. Similarly, possible demands for financing from the Fund would be closely correlated with the general level of international flows of goods and services converted at market rates.

33. **Staff would note that GDP converted at PPP rates is appropriate for cross-country comparisons of the real value of output produced by an economy**.[12] However, the use of PPP rates in the context of quotas would yield a measure of GDP that is misleading as an indicator of a member's ability to contribute to the Fund, as well as of potential need for Fund resources.[13] There would also be practical drawbacks to using PPP rates, as they are still not available for all Fund members, can be quite out of date, and are subject to measurement error.

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[12] For this reason, the Fund's World Economic Outlook (WEO) uses GDPs converted at PPP rates as weights in aggregating individual countries' GDP growth rates to calculate world output growth.

[13] The empirical finding that, for developing countries, GDP based on market exchange rates is generally lower than PPP-based GDP is attributed to the relatively lower productivity levels in these countries' tradable sectors, which translate into lower wages in these countries and lower prices in their nontradable sectors (Annex Note 5). The PPP methodology essentially assigns one and the same price to a given good or service, no matter where produced. Since, in developing countries, these assigned prices for nontradables are higher than the market prices (in a common numéraire), such countries' GDPs are raised when PPPs are used for conversion.

Balance of payments variability

34. **The QFRG considers that there is a compelling case for including some measure of capital flows in the quota formula**, if this is feasible. Staff is of the same opinion. The QFRG points out that "the size and volatility of private capital flows across national borders have greatly increased" (¶53) since the Fund was founded, and recent balance of payments crises have highlighted the increasing role of sudden reversals of capital flows in causing balance of payments difficulties.

35. The QFRG proposes to define variability as the **variability of current receipts and net long-term capital flows (**¶97 and Annex ¶93). The QFRG's variability variable focuses on the vulnerability of a country to exogenous real shocks, such as a shift in the terms of trade. In that sense, it is in line with the measure of variability that is currently in the quota formula, which is based on current receipts only. However, the QFRG's variability measure is not the only possible measure and no theoretical or empirical analysis is provided for it. Alternative measures of variability could take into account other components of the balance of payments, such as current payments or short-term capital flows.

36. **An important source of vulnerability to balance of payments difficulties is not captured by the QFRG's variability variable.** By the balance of payments identity, the sum of current receipts and net long-term capital flows is equal to the sum of current payments, net short-term capital flows, and changes in official reserves.[14] Vulnerability resulting from sudden reversals of short-term capital flows could leave the QFRG's variability variable directly unaffected in the short run (although there could be indirect effects, for example on current receipts, as occurred in recent crises in Mexico and Asia). If there were a sudden net outflow of short-term capital, the adjusting variable in the short run would generally be, in a fixed exchange rate regime, official reserves, or, in a floating exchange rate regime, imports. In either case, the QFRG's variable would be unaffected.

Other variables considered by the QFRG

37. **Openness** (¶93, ¶100). **The QFRG notes that openness can serve as both an indicator of ability to contribute resources and of vulnerability to external shocks**. While stressing that open economies reap substantial benefits from their exposure to foreign markets, staff would emphasize the link of openness to vulnerability, especially for developing countries, since the more an economy depends on trade, the more vulnerable it tends to be to disruptions in trade. This vulnerability arises because, when an economy is relatively more open, the achievement of external balance through exchange rate adjustments is accompanied by larger changes in internal price levels. If an openness variable were retained in the quota formula, it should reflect the openness of the capital account as well as

[14] That is, $X-M+K_L+K_S=R$, where X, M, K_L, K_S and R represent current receipts, current payments, net long-term capital flows, net short-term capital flows, and the change in official reserves, respectively. Rearranging to put the QFRG's proposed variable on the left-hand side gives $X+K_L = M-K_S+R$.

the current account to take account of the increasing importance of capital flows. In any case, as noted by the QFRG (¶106), a measure of openness should not be included in the form of a ratio (to GDP) because of the anomalies that occur with a non-linear formula.

38. **The QFRG's variability measure, however, suffers from a basic disadvantage: it only captures vulnerability if the measurement period contains a shock**. A level variable such as openness, measured as, e.g., the average of current and long-term capital receipts and payments (¶94, ¶109), would not suffer from this drawback, and may be a reasonable indicator of the vulnerability associated with greater integration into global markets.[15]

39. **Official Reserves** (¶100). The QFRG points out that a case can be made that reserves provide a measure of a member's ability to finance the Fund. However, reserves are not a good measure of the ability to contribute resources for the subset of creditors that provide the bulk of the Fund's resources and whose currencies are used as international reserves. These countries are able to finance their balance of payments through the issuance of liabilities and are unlikely to hold a stock of international reserves commensurate with their financing capacity.[16] This situation is very different from that at the inception of the Fund, when reserves comprised mainly members' holdings of gold. In those circumstances, reserves accurately reflected members' ability to finance the Fund, and it made good economic sense to include reserves in the quota formula. Also, the use of reserves may have the effect of treating countries differently depending on their exchange rate regime, since, everything else equal, countries with pegged exchange rates would tend to hold more reserves than countries with floating rates.

40. **Current payments** (¶100). While current payments could serve as an alternative measure of vulnerability, the QFRG observes that current payments (and current receipts) can overstate the degree of economic activity related to the external sector because it gives greater weight to countries heavily engaged in processing imports for re-export. This is in contrast to GDP, which includes only net exports. Nonetheless, as noted above, current

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[15] While a relatively large country would tend to have a relatively large amount of current and capital transactions in absolute terms, openness as a variable in the quota formula would be scaled by the global total of the variable. Unlike the current set of quota formulas, which derives absolute amounts of quotas, the QFRG's proposed formula derives quota shares, and variables are entered as shares in global totals (¶108).

[16] This may be a reason why, in its empirical estimations, the QRFG consistently finds that the coefficient on reserves appears with a negative sign in equations with actual quotas as the dependent variable. For example, in the "benchmark equation" (Table 9), the coefficient on reserves is –0.034 and statistically significantly different from zero (t-ratio of 5.60). Staff believes that the negative and significant coefficient on reserves obtained by the QFRG is due to the inclusion of the subset of creditors whose currencies are used as international reserves. Rerunning the QFRG benchmark equation with identical data, but omitting just the United States, shrinks the coefficient to -0.001 and makes it statistically insignificant (t-ratio of 1.55).

payments (or current receipts) could be a component in an openness variable measured in levels.

41. **Per capita income** (¶100), entered with a negative sign. The QFRG considers that the relevance of per capita GDP to an institution concerned with international monetary issues is rather tenuous. As the QFRG observes, the rationale for using per capita income (or **population**, entered with a positive sign) is to give greater weight to more populated countries "on the grounds that the international community should move toward a system in which individuals begin to count as such on global decision-making." However, per capita income and population are unlikely to be strongly correlated with the ability to supply resources to the Fund or with the potential need for financing balance of payments equilibria. It would be preferable to address such governance-related issues by means other than through the variables in a quota formula.

42. **External debt** (¶100). The QFRG does not consider external debt to be an appropriate measure of external vulnerability, noting that, among other things, the use of such a variable would raise moral hazard issues. Staff considers moral hazard to be a minor concern in the context of quota formulas, and notes that the level of debt may, in fact, be clearly correlated with a need for balance of payments financing. A high degree of debt may, for example, leave countries more vulnerable to balance of payments crises, since debt servicing flows are difficult and costly to adjust (e.g., through rescheduling) in the face of shortfalls of resources to finance such debt service. Also, depending on the contractual terms of the debt, sharp exchange rate and interest rate changes may be disruptive to a member's ability to continue to service such debt. The more that debt is concentrated at short maturities and is composed of unhedged foreign currency obligations, the higher the risk associated with sharp reversals of capital flows. However, as the QFRG points out, accurate data on foreign currency debt, especially short-term debt, continue to be hard to obtain on a consistent basis.[17]

43. **Share of food and energy in imports** (¶100). As the QFRG notes, other products could also lay legitimate claims to "essentiality," and the Compensatory Financing Facility (CFF) is already designed to deal directly with the need for temporary financing arising from volatility in cereal imports. Staff would agree with the first point, but would note that the second point is invalid because access to the CFF is tied to quotas. However, staff would add that a country may have a high ratio of food imports to total imports, but low ratios of (i) imports to GDP, and (ii) food and energy imports to total food and energy consumption. Such a country's balance of payments would not be very vulnerable to adverse changes in world food or energy prices.

44. **Access to capital markets** (¶100). As the QFRG points out, a key issue is to find an appropriate variable to measure such access. The difficulties of measuring access are

[17] It could also be considered to include the stock of external assets in the quota formula. Apart from any conceptual considerations, data problems would appear to be at least as severe as with debt variables.

reflected in the available international classifications, e.g., of sovereign risk. Such classifications can change rapidly, and it is not clear that use of historical ratings data would be very relevant in the context of quota calculations. Moreover, these classifications raise issues of availability, comprehensiveness, and the difficult question of whether Fund quotas should be based in any way on the judgements of private sector companies. Also, the various international classifications may not be compatible with each other, giving rise to the issue of which classification to use in such circumstances.

45. **Exchange rate variability** (¶100). The QFRG notes that "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." Staff agrees with this conclusion and would add that, in comparison with other variables, exchange rates also may occasionally be subject to fluctuations and misalignments unrelated to changes in economic fundamentals.

C. Implications of EMU

46. The QFRG does not agree with the notion that the eleven countries comprising the European Economic and Monetary Union (EMU) should be treated as a single economic unit for purposes of quota calculations (¶102–03). The QFRG rightly points out that, under the Fund's Articles of Agreement (Article II), only countries may be members of the IMF. The QFRG also argues that a monetary union among several countries does not imply that a member cannot run into balance-of-payments difficulties of a type with which the IMF can help. These issues were discussed by the Executive Board in the context of its consideration of the implications of EMU for the Fund. At the time, it was noted that while the identification of balance of payments need is likely to be more difficult than in the case of a member with its own currency, circumstances could arise where such a need could be discerned, based on various indicators such as exceptional financing and movements in interest rate premia.

D. Data Limitations

47. **The QFRG refers to statistical weaknesses associated with some of the variables considered above**. The staff believes that timely, high-quality and widely available data are needed to apply any proposed quota formula and derive calculated quotas. The data requirements are formidable because they apply equally to all 182 members and involve consistent, long time series.

48. A degree of data estimation has been accepted in previous reviews despite the inherent arbitrariness involved, but the order of **magnitude of data estimation that would currently be necessary to compute capital account variables would appear to be**

markedly higher than with the variables used in previous quota reviews.[18] As noted previously by staff, and recalled in the QFRG's report (Annex ¶61), capital transactions are recorded with varying degrees of netting and coverage across countries and individual capital account items. Furthermore, about 55 members do not provide timely and comprehensive data on capital and financial transactions for publication in the IMF's Balance of Payments (BOP) statistics. The QFRG notes that the extent of further work involving area departments and staff estimation to complete the data base needed for quota calculations would be comparable with that undertaken in the past with respect to current account transactions (Annex ¶70). Staff disagrees with this assessment. The current account data required in the past have been simple aggregates of receipts and of payments, and, even for countries that do not provide data for the Fund's BOP data base, current account data are routinely included in the IMF's country Staff Reports and maintained in the WEO data base from data submissions by area departments, making these data to a large extent readily available (albeit often subject to reliability and comparability problems). By contrast, the required long-term capital data cover particular categories in the capital and financial accounts which are not routinely provided by national authorities, nor are they collected by area departments or others, so that even a minimal basis on which to build the required data for countries with missing data in the IMF's BOP statistics is lacking.

49. A pragmatic **operational definition of net long-term capital flows** would probably include direct investment, long-term debt securities (i.e., bonds and notes in terms of the IMF's BOP classification), and long-term loans and other investments.[19] Thus, short-term flows would include capital transfers, short-term debt securities (money market instruments and financial derivatives), short-term loans, trade credits and other investments, and net errors and omissions. Equity securities might be included in short-term flows on the basis of their high degree of liquidity.

50. **Preliminary investigation by the staff indicates that assembling and/or constructing a complete data set on capital flows conforming to the QFRG's definition would be challenging**. Data on capital flows for the years 1982–94 (the period used in the Eleventh Review computation of variability)[20] are, as already noted, generally not available in the BOP statistics data base for about one-third of the Fund's membership and there is in

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[18] For a number of variables that could conceivably be included in the quota formula, such as short-term capital flows, debt, or access to capital markets, data problems would be particularly severe.

[19] In principle, consideration could be given to excluding official net capital flows from the definition of net long-term capital. However, in terms of their liquidity characteristics, official capital flows probably share generally the same properties as private medium and long-term flows, and therefore the case for excluding them is not clear cut.

[20] Variability is measured over the 9-year period 1984–92 by comparing the observation for each of these years with the 5-year averages centered on the respective years. This implies that data for a period of 13 years are needed.

fact hardly any country for which all the required capital and financial account data are available to compute the QFRG's proposed variability variable. Moreover, the data that are available are not always comparable across countries because national accounting procedures and definitions of variables differ. If capital account variables were to be included in quota formulas, a major effort by the membership would be required to collect the required data in the years to come. In the meantime, a very considerable degree of data verification and estimation by staff would be required.

51. **The QFRG views foreign trade variables as less appropriate indicators** of the importance of international trade for closely integrated countries (such as within the European Union) than for countries that are not as well integrated, as such variables are measured by statistical convention on a gross value basis (¶94, ¶100, ¶103). Therefore, these variables may tend to "double count" cross-border trade relative to value added in economic activity. Staff would point out that while there may be some conceptual validity to this point, trade data on a value added basis are highly unlikely to be assembled in the foreseeable future, even by countries with a relatively sophisticated statistical apparatus.

52. **The staff considers that a key criterion for a quota formula is that it produces results that are reasonable and widely accepted**. Therefore, and despite considerable data limitations, staff has undertaken calculations of quota shares based on a partial version of the QFRG formula. For this purpose, the data for the Eleventh Quota Review were used (ending in 1994). However, the staff calculations do not include the variability of net long-term capital flows, and GDP was averaged for 1992–94.[21] Thus, staff would caution that the calculations are preliminary and illustrative.

53. The results of this limited application suggest that the QFRG formulas could produce calculated quota shares that differ substantially from either current actual shares or those derived from the present five-formula approach for individual members, country groupings (Commentary Appendix Tables 1–3). In particular, the major industrial countries, especially the largest economies, would gain share relative to current actual shares and, to a lesser extent, when compared with the five-formula approach. The smaller advanced economies would generally have QFRG calculated shares that are lower than both current shares and those based on the current formulas. A number of emerging market countries would have QFRG calculated shares that are higher than those derived from present formulas, but lower than current shares.

[21] In the absence of the necessary data on capital flows, the variability of current receipts was used. Variability is defined as a one-standard deviation from trend during 1982–94, where trend is a centered five-year moving average .