

INTERNATIONAL MONETARY FUND

Alternative Quota Formulas—Further Considerations

Prepared by the Treasurer's and Statistics Departments

(In Cooperation with Other Departments)

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May 3, 2002

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I. INTRODUCTION

1. **This paper is the latest in a series which have considered issues related to the possible revision of the formulas used by the Fund in helping to determine quotas of members.** The report of the Executive Board to the Board of Governors on the increases in quotas under the Eleventh General Review of Quotas recommended “that the formulas used to calculate quotas be reviewed promptly after the completion of the Eleventh General Review.”¹ Previous papers considered by the Executive Board in several seminars include a report by a group of external experts and an accompanying staff commentary and a staff paper discussing basic considerations relating to the choice of variables, formula specification, and weights of variables.²
2. The Executive Board has agreed that any new quota formula should be simple and transparent, and that the traditional variables employed in the existing formulas continue to reflect the financial functions of quotas but should be updated. The Board also agreed that the weights assigned to variables and the specification of the formulas is a matter of judgment that depends importantly on achieving a quota distribution that could command wide support. Most Directors further recognized that issues related to the governance of the Fund are unlikely to be resolved solely through revisions of the quota formulas.
3. **The current paper builds on progress made during the Board discussion in October 2001.** Section II discusses the specification of the variables in a quota formula in light of comments by Executive Directors at the October seminar. Sections III and IV discuss possible approaches to setting the weights of variables in formulas. Section V considers how governance issues could be taken into account. Section VI provides conclusions and issues for discussion.

II. VARIABLE DEFINITION AND DATA ISSUES

4. **During the October 2001 seminar, Directors generally endorsed the use in quota formulas of variables that have traditionally been considered to reflect the Fund’s financial functions.**³ However, Directors noted that these variables need to be modernized to take account of changes in the world economy—in particular, the large and growing role of

¹ *Eleventh General Review of Quotas—Draft Report to the Board of Governors and Proposed Resolution* (SM/97/289, 12/19/97).

² *Report to the IMF Executive Board of the Quota Formula Review Group* (EBAP/00/52, 5/01/00 and Supplements 1, 2, and 3, all 5/01/00), *Staff Commentary on the External Review of the Quota Formulas* (EBAP/00/66, 6/07/00), *External Review of Quota Formulas—Quantification* (EBAP/01/29, 4/13/01), and *Alternative Quota Formulas—Considerations* (SM/01/293, 9/27/01). These papers are available on the Fund’s web site.

³ Concluding Remarks by the Acting Chair—Alternative Quota Formulas, Executive Board Seminar 01/08, October 15, 2001 (BUFF/01/171, 11/05/01).

international capital flows. Directors also provided a number of suggestions for the appropriate definition of the variables.

A. GDP

5. **Directors supported the inclusion of GDP in quota formulas, as an indicator of countries' economic size and potential to either provide resources to the Fund or use Fund resources.** There was also broad agreement that a better balance between the objectives of using timely data and smoothing for possibly large cyclical and exchange rate fluctuations would be achieved by utilizing data averaged over a number of years rather than the current approach of using the latest year. However, views differed on the averaging period, with some Directors favoring a 3-year average and others a 5-year period.

6. **The distribution of GDP averaged over 3 or 5 years (ending in 1999 in both cases) is virtually identical at the level of broad country groups** (Table 1, columns 2 and 3).⁴ At the level of individual countries differences can be more pronounced, depending on the rate of GDP growth countries have experienced (Statistical Appendix, Annex, Table 1).⁵ In particular, countries that are growing relatively fast have a higher share in world GDP using a shorter averaging period.

7. **A range of views has been expressed regarding the method for converting domestic currency GDP into a common base for quota calculations.** Most Executive Directors considered that market exchange rates should continue to be used to convert GDP to a common currency as the most appropriate measure of the total amount of resources generated by a country that would be available for external use. These Directors also were concerned that reliable data on purchasing power parities (PPP) were not available for many countries.

8. However, other Directors favored using purchasing power parities for conversion because prices of similar nontradable goods and services vary significantly across countries and conversion on the basis of PPP would better reflect the real value of total output produced. At the request of these Directors, staff have compiled available information on GDP based on PPP. These data are developed from a number of different price surveys that are carried out periodically, but do not cover all members; for example, the latest price surveys were carried out between 1993 and 1996 for 106 countries. Surveys for a few other countries (including China) stem from the 1980s. PPP has been estimated for 68 countries

⁴ Country groups are as defined in the current WEO, except that Korea and Singapore are included under Asia in developing countries.

⁵ Distributions by country group are shown in text tables while country-by-country results are shown in *Alternative Quota Formulas—Further Considerations: Statistical Appendix*, issued concurrently with the present paper.

Table 1. Distribution of Variables in World Totals: GDP and Openness
(In percent and SDR million)

	Actual	GDP		PPP-GDP 2/	Openness 3/	Investment
	Quotas 1/	1997-99	1995-99	1997-99	1995-99	Income 4/
	(1)	(2)	(3)	(4)	(5)	(6)
Distribution of variables (in percent)						
Advanced economies	61.6	77.3	77.5	53.7	72.0	87.3
Major advanced economies	46.0	66.4	66.4	45.5	51.9	67.4
Of which: United States	17.4	29.5	28.1	21.5	15.3	20.8
Other advanced economies	15.6	10.9	11.1	8.2	20.1	19.9
Developing countries	30.9	20.0	19.7	40.3	24.0	11.3
Africa	5.5	1.7	1.7	3.7	1.9	0.9
Asia 5/	10.3	8.9	8.9	22.8	13.8	4.4
Middle East, Malta and Turkey	7.6	3.0	2.9	5.3	3.4	2.1
Western Hemisphere	7.5	6.4	6.2	8.5	4.9	3.9
Transition economies	7.5	2.7	2.8	6.0	4.0	1.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
Average size of variables (in SDR million)						
Advanced economies	5,063	648,825	626,411	606,588	319,997	55,500
Major advanced economies	14,053	2,070,163	1,993,247	1,910,667	857,107	159,044
Of which: United States	37,149	6,430,333	5,910,284	6,314,954	1,769,304	343,612
Other advanced economies	1,751	125,174	122,840	126,138	122,115	17,352
Developing countries	511	33,788	32,001	91,879	21,454	1,448
Africa	230	7,129	6,929	21,286	4,299	303
Asia 5/	733	64,462	62,113	223,774	53,049	2,439
Middle East, Malta & Turkey	1,019	41,214	37,449	96,851	24,750	2,119
Western Hemisphere	498	43,805	41,004	78,248	17,526	2,008
Transition economies	576	21,428	21,142	62,720	16,685	824
Total	1,168	119,279	114,791	160,545	63,141	9,032

Sources: *International Financial Statistics*; World Economic Outlook database; and staff estimates.

1/ Except for the nine countries that have not yet consented to their quota increases, for which 11th Review proposed quotas are used.

2/ Except for the 11 members without PPP-GDP data in the WEO database, for which GDP at market prices is used.

3/ Sum of current receipts and payments, not adjusted for official transfers, reexports, and international banking interest.

4/ Sum of receipts and payments, not adjusted for international banking interest.

5/ Including Korea and Singapore.

that are not covered in the price surveys, and for all countries for years in which no price surveys were carried out (Statistical Appendix, Section I).⁶ Converting GDP on the basis of PPP generally raises the share of GDP of developing countries in world totals compared to GDP converted at market exchange rates (Table 1, columns 2 and 4).⁷ The PPP methodology generally raises developing countries' GDP because it essentially uses international market prices to value countries' GDP, and these prices tend to be higher than domestic market prices in developing countries. Differences between these two methods are sizable for individual countries, in particular for large, relatively closed, developing economies, where PPP-GDP can be more than four times higher than GDP at market prices.

9. **Staff has used GDP converted at market exchange rates for the illustrative quota calculations in this paper.** As discussed in previous papers by the staff and external experts, the measure of GDP converted at market exchange rates is more closely related to the financial functions of quotas and recent data on this measure are widely available. The measure of GDP converted at PPP is much less related to the financial functions of quotas and suffers from considerable data availability problems. Moreover, in light of past Board discussions, using PPP-GDP is unlikely to receive the needed broad consensus.

B. Openness

10. **A measure of openness has traditionally been included in the quota formulas to reflect countries' integration in the world economy.**⁸ Many Directors supported the continued inclusion of an openness variable and considered the sum of current receipts and current payments to be an appropriate measure of the resources generated in a country from transactions with the rest of the world and of the amount of resources devoted to consumption of goods and services created elsewhere. Thus, both receipts and payments have a direct bearing on the supply side and the demand side functions of quotas.

11. **A few Directors supporting an openness variable suggested including a measure of financial openness in quota formulas as an indicator of countries' integration in the international financial system.** A country's financial openness could be measured by the size of its financial cross-border flows or by its accumulated foreign financial assets and

⁶ PPP-GDP for 1997–99 in Table 1 is derived as an extrapolation by the WEO on the basis of real growth rates in GDP converted at market exchange rates.

⁷ While the tables follow the WEO categorization, the text includes transition economies with developing economies for simplicity.

⁸ Two of the five existing quota formulas include the sum of current receipts and payments as a variable, and the other three include current payments, in both cases averaged over a five-year period.

liabilities. However, as discussed previously, measures of the volume of gross or net financial cross-border flows have the following drawbacks:⁹

- Gross flows may be inflated by “churning,” i.e., by the inclusion of purchase and sale transactions relating to securities trading and diversification, settlements through the banking system, etc. Furthermore, data on gross flows are not available on a consistent basis for most countries.
- Net flows are more widely available but the netting obscures the underlying degree of activity in the capital account.

12. **A stock measure based on a country’s foreign financial assets and liabilities could be considered an indicator of financial openness.** Countries with large net foreign asset positions would as a rule be in a better position to contribute resources to the Fund than those with smaller or negative net positions.¹⁰ However, the netting in this case also could obscure the underlying financial position: some large developed countries have a small or negative net foreign asset position but are recognized to be very open financially and able to contribute resources to the Fund. Instead, the asset and liability sides of the international investment position could explicitly be viewed as having a bearing on the supply and demand side functions of quotas. Both could be taken into account by using the sum of foreign assets and liabilities as an indicator of financial openness. However, at this stage, such measures are available for no more than 78 countries and are subject to compilation difficulties.¹¹

13. **The lack of data on the international investment position of countries can, to some extent, be overcome by using cross-border investment income flows as a proxy, as suggested by some Directors.** Receipts and payments of investment income, which are included in a country’s current account, represent the return on a country’s stock of foreign financial assets and liabilities. However, since rates of return on similar investments can vary considerably across countries, investment income is an imperfect substitute for the stock measure. Moreover, there are also statistical problems with measures of investment income (Box 1).

⁹ *Alternative Quota Formulas—Considerations* (SM/01/293, 9/27/01), ¶35.

¹⁰ Major exceptions include the United States and Canada.

¹¹ Countries that report their international investment position statistics to *International Financial Statistics* derive estimates by using stock measures if available and supplementing them by the cumulation of capital flows, with valuation adjustments (Table 2). The data can be characterized as comprehensive for about three quarters of the 78 countries for which any data are available.

Box 1. Investment Income Data

A long-standing problem with investment income data is the significant under-recording of investment income receipts, due to the recognition by debtor, but not creditor countries of a large amount of cross-border assets.^{1/} This is especially apparent for portfolio and other investment income flows, where recorded payments have exceeded recorded receipts by US\$125 billion a year during 1994–2000.^{2/} To the extent that capital flight contributed to the discrepancy in the investment income account, investment income receipts of developing countries would be understated. Discrepancies also exist in other components of the global current account, but they typically are not as large as the imbalance in the investment income account.

There is no accurate way to distribute the statistical discrepancy in the income account across countries. However, the Fund-sponsored Coordinated Portfolio Investment Survey is expected to lead to improvements in data on portfolio investment positions and related investment and income flows in the future.^{3/} Also, the BIS international banking statistics on nonbank claims on nonresident banks could be used to improve recorded bank-related financial and associated income flows.

Another difficulty with investment income as a stand-alone variable in a quota formula is that **some of its credit and debit components are recorded on a net basis** in the balance of payments statistics, in accordance with the fifth edition of the Balance of Payments Manual. For example, reinvested earnings reflect net profits or net losses for, on the credit side, direct investment abroad, and, on the debit side, foreign direct investment in the reporting country. Recording can similarly take place on a net basis for dividends and interest related to certain direct investment (e.g., reverse investment).

^{1/} *Report on the World Current Account Discrepancy* (IMF, 1987), and *World Economic Outlook*, October 2000 (Section I, Appendix II).

^{2/} *Annual Report of the IMF Committee on Balance of Payments Statistics, 2001*.

^{3/} The results from the 2001 Coordinated Portfolio Investment Survey are expected to become available later this year.

14. **Data on investment income receipts and payments suggest that the share of advanced economies in world totals is larger than their share in openness based on the sum of current receipts and payments or in GDP.** Defining financial openness as the sum of investment income debits and credits averaged over a 5-year period would parallel the definition of openness as the sum of current receipts and payments. In the distribution of data on financial openness, thus defined for 1995–99 and based on *IFS* and *WEO* data, advanced economies account for about 87 percent of the total (Table 1, column 6).

Table 2. Distribution of International Investment Position of Reporting Members
(In percent)

	Actual Quotas 1/	International Investment Position 2/			Number of Non- Reporting Members 3/
		Assets	Liabilities	Assets plus Liabilities	
Advanced economies	61.6	95.8	94.5	95.2	6
Major advanced economies	46.0	77.2	75.3	76.3	0
Of which: United States	17.4	26.0	29.7	27.9	0
Other advanced economies	15.6	18.6	19.2	18.9	6
Developing countries	30.9	3.5	4.4	3.9	102
Africa	5.5	0.3	0.6	0.5	41
Asia 4/	10.3	2.0	1.9	2.0	26
Middle East, Malta and Turkey	7.6	0.6	0.8	0.7	13
Western Hemisphere	7.5	0.6	1.0	0.8	22
Transition economies	7.5	0.7	1.1	0.9	12
Total	100.0	100.0	100.0	100.0	120

Source: *International Financial Statistics*.

1/ Except for the nine countries that have not yet consented to their quota increases, for which 11th Review proposed quotas are used.

2/ Average 1995-99.

3/ Members with fewer than 3 years of data during 1995-99. There are 15 members with 1 or 2 years of data.

4/ Including Korea and Singapore.

15. **Financial openness as measured by investment income is included in the openness indicator measured by current receipts and payments, but could be separated out as an additional variable in a quota formula.** The average sum of investment income debits and credits in 1995–99 is SDR 9 billion, which is about one sixth of the average sum of current receipts and payments excluding investment income over this period (SDR 54 billion). The effect on the distribution of calculated quotas of individual countries would depend on how the relative weights of financial and “real” openness (i.e., openness excluding investment income) differed from their implicit one-to-six weighting in the combined measure of openness. The weight of financial openness could be changed if financial openness were to be included as a separate variable in a quota formula together with “real” openness, but this is a second order of importance issue which is not pursued in this paper.

C. Variability

16. **A measure of variability has also been included in the quota formulas from the Fund's earliest days and most Directors supported the continued inclusion of such a measure, albeit updated to take account of capital flows.** For this purpose, Directors agreed that the measure of variability in the existing five formulas based on current receipts should be augmented by a measure of capital flows, and that the present definition of variability as the standard deviation from a trend using annual data should be continued.¹² Most Directors supported using a 3-year trend instead of the present 5-year trend in order to capture shorter trends in capital flows.

17. **As suggested by some Directors, staff has developed alternative measures of variability.** Average variability using a 3-year trend is smaller than average variability based on a five-year trend (SDR 1.5 billion versus SDR 2.0 billion), but the effect on the distribution of variability over broad groups of members is small (Table 3, columns 2 and 3). However, the difference between the two methods varies considerably by country (Statistical Appendix, Annex, Table 3). Using the variability of capital flows as a stand-alone measure to avoid combining gross and net concepts also does not produce a markedly different distribution in terms of broad country groups, although the effects for some individual members are sizable (Table 3, column 5 and Statistical Appendix, Annex, Table 3).¹³

D. Official Reserves

18. **A number of Directors considered that external reserves should be retained as an indicator of capacity to provide resources to the Fund.** They noted that reserves have been included in quota formulas from the inception of the Fund, retain a central role in the Fund, including in the Articles of Agreement, and continue to be an important element of external strength for many members. However, other Directors argued that with the increased role of international capital markets, reserves have become less important as an indicator of the ability to supply resources to the Fund. Furthermore, members whose currencies are used as international reserves tend to hold a relatively small stock of international reserves that is not indicative of their ability to finance the Fund.

¹² To capture variability of capital flows, where reversals can be quite sudden and sometimes short-lived, shorter-term data, such as quarterly, applied over a shorter period might be more appropriate. At this stage, however, the choice of methods is in large part constrained by data availability. For example, quarterly data are available only for a subset of the membership.

¹³ The variability of capital flows may be seen as an alternative measure of variability of the current account and reserves, due to the balance of payments identity.

Table 3. Distribution of Variables in World Totals: Variability and Reserves
(In percent and SDR million)

	Variability 2/					
	Actual Quotas 1/	Current Receipts and Net Capital Inflows		Current Receipts	Net Capital Inflows	Reserves 3/
		3-Year Trend	5-Year Trend			
		(1)	(2)				(3)	(4)	(5)	(6)
Distribution of variables (in percent)						
Advanced economies	61.6	60.0	58.4	57.7	58.6	49.2
Major advanced economies	46.0	39.9	39.2	36.7	40.9	32.8
Of which: United States	17.4	15.4	11.1	9.8	17.2	4.8
Other advanced economies	15.6	20.1	19.2	21.0	17.7	16.4
Developing countries	30.9	30.3	32.4	31.0	33.2	45.6
Africa	5.5	3.5	3.4	4.2	3.1	2.5
Asia 4/	10.3	12.5	13.3	13.5	11.9	27.4
Middle East, Malta and Turkey	7.6	8.7	8.6	9.0	11.2	5.9
Western Hemisphere	7.5	5.7	7.1	4.3	7.0	9.8
Transition economies	7.5	9.7	9.2	11.3	8.2	5.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Average size of variables (in SDR million)						
Advanced economies	5,063	6,226	8,089	3,917	4,194	21,794
Major advanced economies	14,053	15,363	20,165	9,251	10,872	53,897
Of which: United States	37,149	41,477	40,102	17,223	32,035	55,026
Other advanced economies	1,751	2,860	3,640	1,952	1,734	9,966
Developing countries	511	635	906	424	479	4,072
Africa	230	184	241	144	112	557
Asia 4/	733	1,121	1,601	795	741	10,509
Middle East, Malta and Turkey	1,019	1,463	1,931	995	1,298	4,277
Western Hemisphere	498	484	800	238	410	3,535
Transition economies	576	931	1,181	709	545	2,136
Total	1,168	1,475	1,968	964	1,017	6,293

Sources: *International Financial Statistics*; World Economic Outlook database; and staff estimates.

1/ Except for the nine countries that have not yet consented to their quota increases, for which 11th Review proposed quotas are used.

2/ Standard deviation from centered 3-year trend, 1987-99 (5-year trend where indicated).

3/ Average end-month international reserves in 1999.

4/ Including Korea and Singapore.

19. **As agreed at the October seminar, the staff has compiled data on the reserve holding of members for possible use in quota calculations.** Advanced economies hold a relatively small share of world reserves compared to their share in either actual quotas or other economic variables (Table 3, column 6). This distribution results from a very low share of the United States in world reserves of 5 percent reflecting the unique role of the U.S. dollar in international transactions.

20. **In light of the conclusions in earlier Board seminars and the information developed for the current paper, the following three variables are used in all calculations described in the subsequent sections:**

- **GDP**, converted into SDRs from domestic currency at market exchange rates, and averaged over the period 1997–99.
- **Openness**, defined as the average sum of current receipts and payments in SDRs over the period 1995–99.
- **Variability**, defined as the standard deviation of a 3-year centered moving average of the sum of current receipts and net capital inflows in SDRs over the period 1987–99.¹⁴

21. **Additionally, formulas are presented which also include reserves.** Reserves are defined as the average of end-month official international reserves in 1999 with gold valued at SDR 35 per ounce, which is the same definition used in the existing five-quota formulas.

22. **The data used for the illustrative calculations have been updated from the earlier staff papers.**

- Data are drawn from the *IFS* and WEO.¹⁵ *IFS* data were chosen because *IFS* provides a relatively consistent set of official data across countries. Gaps in data series and member coverage were filled by using WEO information, and in a few cases, data from staff reports. The available data are judged to be of sufficient quality to be used in illustrative calculations despite the sometimes-incomplete data in *IFS* and inconsistencies between *IFS* and area department data.
- Some data adjustments that at times were included for selected countries in the past (reexports, international banking interest) have not been made in this paper (Box 2). Official transfers have also not been excluded from current account data in this paper.

¹⁴ The staff has excluded errors and omissions, use of Fund credit and loans, and exceptional financing from the variability measure and included reserve liabilities for conceptual, methodological, and data reasons (see Annex I in *Alternative Quota Formulas—Considerations* (SM/01/293, 9/27/01)).

¹⁵ For details of the composition of the data see Annex I in *Alternative Quota Formulas—Considerations* (SM/01/293, 9/27/01). The present paper uses data available as of end-October 2001.

Box 2. Trade and International Banking Interest Adjustments

In past quota reviews, current account data for some countries have been adjusted for certain types of trade and for international banking interest (IBI).^{1/} The rationale for the trade adjustment has been that current receipts and payments are measured on a gross basis. Without any adjustment, entrepôt trade and other similar transactions would have the same effect on measured international trade as transactions that involve higher value added and greater impact on the country's balance of payments. Furthermore, as openness has a high weight in the existing five quota formulas, in part because of a multiplier in some of the formulas, a higher than perhaps justified degree of measured openness boosts a country's calculated quota shares derived from the existing formulas. However, the availability of comparable and comprehensive data on entrepôt trade and other similar transactions is limited.

Trade adjustments were made only for a small number of countries. Trade adjustments that were made in the past included reductions in current receipts and payments for reexports (entrepôt trade), maquiladora trade (trade to large export- processing zones), diamond trade (Israel only), and trade in nonmonetary gold. No specific criteria were used to determine for which country an adjustment in trade data should be made, and the group of 13 countries adjusted in the Eleventh Review only partly overlaps with the group of 23 members adjusted in the Ninth Review. The adjustments in the trade data were relatively small for some countries, while in other countries that were not adjusted “goods for processing” (which less than one third of countries report to *IFS*) accounts for a large share of trade.

Adjustments for IBI also were limited. The rationale for adjusting current account data for certain IBI flows is that, when nonresident deposits with domestic banks are used to make loans to nonresidents, only the net interest earnings would be indicative of the relative size of the country's external transactions in this respect. However, while there is a similarity between these financial transactions and entrepôt trade, money is fungible and goods are not, which means that it is more difficult to trace these financial flows—indeed, only the United Kingdom published the IBI data used in the Eleventh Review. IBI flows are normally included on a gross basis in current transactions data, including for some countries with significant international and/or offshore banking activity. For such countries, interest receipts by domestic banks on borrowings by nonresidents and interest payments by domestic banks on deposits held by nonresidents can be high relative to the value added and the balance of payments impact. In the Eleventh Review, current account data were adjusted for IBI flows for the G-10 (excluding Germany) plus Luxembourg.

Using current account data without adjustments for trade or IBI leaves certain members with relatively high measured international transactions. This is particularly the case for Singapore because of its large reexports and Luxembourg because of its role as a financial center. For other members the difference between adjusted and unadjusted current account data would likely not be as large as for these two members, although comprehensive data are lacking to confirm this conjecture.

^{1/} See Annex I in “*Alternative Quota Formulas—Considerations*,” (SM/01/293, 9/27/01)

III. WEIGHTS OF VARIABLES IN QUOTA FORMULA

23. **The distribution of the data for the variables chosen for the quota formulas and the weights assigned to each variable will determine calculated quota shares for each formula.** Therefore, in addition to the choice and definition of variables, a key consideration for the Executive Board is the weights to be applied to the variables.

24. In the October 2001 seminar, Executive Directors generally supported two approaches suggested by staff for assigning weights to the variables for the illustrative calculations.

25. **The first approach is to apply weights to the variables on a priori grounds, seeking to choose weights that reflect Executive Directors' views of the relative importance of individual variables.** However, the traditional variables are measured in nominal terms and their high correlation makes it difficult to interpret the relative impact of variables on calculated quotas based on the assigned weights (Box 3). This correlation needs to be carefully considered by Executive Directors when reaching decisions on the weights of the variables. Staff present two illustrative examples: under the first variant, equal weights are applied to the variables included in the formula, and under the second variant, larger weights are applied to certain variables, such as GDP.

26. **Under the second approach, weights are chosen in such a manner that the resultant distribution of calculated quota shares by broad country groups achieves a predetermined, illustrative outcome.** To illustrate the effects of this approach the quota share of advanced economies as a group is targeted to be reduced by 3 percentage points from the current actual share.

27. **Staff wishes to emphasize again that the judgments to be made under either of the above approaches must be made by Executive Directors and that the calculations presented in this paper are purely illustrative.**¹⁶

¹⁶ Both the linear and multiplicative formulas are considered, with variables formulated as shares in world totals. Calculated quotas are derived as shares and not absolute quota amounts—a country's calculated quota share is a weighted average of the country's shares in the world totals of the variables in the formula. The average is the arithmetic average in the case of the linear formula and the geometric average in the case of the multiplicative formula with weights summing to one. Under the multiplicative formula, calculated quota shares are identical if variables are expressed in monetary values instead of shares because the scaling of variables has no effect on results in relative terms. Under the linear formula, calculated quota shares would also be identical with variables formulated in monetary values as long as the variable coefficients had been adjusted to compensate for the changed dimension of the variables.

Box 3. Implications of Correlated Variables in Quota Formulas

In previous Executive Board discussions there was broad support that revised quota formulas should include updated versions of the traditional variables reflecting the financial functions of quotas: GDP, openness, and variability (and possibly reserves). These variables have been measured in nominal terms as the size of domestic and external transactions are important considerations in the supply of and demand for IMF resources. However, these traditional variables are closely correlated and do not represent independent measures of concepts such as size, openness and variability which makes it difficult to interpret the impact of each variable on calculated quotas based on the assigned weights.

A number of approaches could be considered to mitigate the correlation among variables or its effects in the functioning of the formulas:

- In some of the current formulas, a ratio of current receipts to GDP is used as a multiplicative factor. The ratio is not a measure of size and has a low correlation with the other variables in the formulas, but produces the counter-intuitive result that a country with increasing GDP could experience a reduction in calculated quota.¹
- A non-linear quota formula with weights totaling less than unity could be used to decrease the impact of size that occurs due to the correlation between quota formula variables. This approach compresses the distribution of the variables primarily by reducing the values associated with the largest members so mitigating the effect of correlation on the functioning of the formulas. The approach is also very sensitive to decisions on the sum of weights which tends to dominate the effect of individual variables and weights (see ¶39–40).
- Transformed variables that would not be correlated could be derived as residuals in appropriate regressions with the traditional variables. However, the use of regression residuals instead of plain data in a quota formula would represent a substantial break from past practice. Moreover, such regression residuals are sensitive to the particular choice of regression model that is used to generate them, and there are no obvious criteria that would determine the best regression in this context. Thus, the debate on the “best” quota formula would merely be extended by a new a debate on the “best” way of constructing the variables that enter into it.

The correlation among the traditional variables should be taken into account in decisions regarding the assigned weights of the variables in order to achieve the intended impact on the distribution of calculated quotas. Approaches which seek to mitigate the effects of correlation can create similar difficulties of interpretation, including results that may be counter-intuitive, as well as being less transparent than the traditional approach.

¹ See ¶21 in *Alternative Quota Formulas—Considerations* (SM/01/293, 9/27/01).

A. Illustrative Variable Weights Based on a priori Judgments

Variant One

28. **Under variant one, an assumption is made to assign equal weights to the variables** (Table 4). Thus, the weight of each variable is one third if there are three variables in the formula and one fourth if there are four variables.¹⁷

29. **The resulting distribution of calculated quota shares for broad country groups reflects the distribution of the underlying data and results in a calculated quota share of advanced economies that is higher than their actual share because these countries account for a high share in world totals for most of the variables.**¹⁸ In particular, with a three-variable formula excluding reserves, the advanced economies have a calculated quota share that is 8 or 9 percentage points higher than their actual quota share.

30. **The inclusion of reserves as a fourth variable with the same weight as each of the other three variables reduces the calculated quota share of the advanced economies but leaves it above the actual share.** The decline is attributable in large measure to the reduction in the calculated quota share of the United States (by 4 or 5 percentage points) due to the relatively small reserves held by the United States, which reflects the reserve role of the U.S. dollar in the system. Correspondingly, Asian countries gain about 4 percentage points of calculated quota share when reserves are included with equal weight.

Variant Two

31. **Choosing equal coefficients avoids an explicit judgment about the relative importance of the variables for the financial functions performed by quotas.** However, during the seminar in October 2001, many Directors argued that GDP was the most important variable as an indicator of both the ability to supply resources and the size of possible demand for resources. This would suggest assigning a larger weight to GDP than to other variables. Moreover, assigning a weight for reserves that is as large as for other variables would represent a significant shift from current practice where the weight is low and could be considered inconsistent with the reduced role of reserves in the system.¹⁹ Similarly, many Directors argued that variability should have a significant weight in order to reflect its importance as an indicator of vulnerability and potential demand for resources.

¹⁷ The standard assumption of weights summing to one is followed because there is no economically sound reason to divert from this a priori. The multiplicative and linear formulas yield similar calculated quota shares for most countries in this case.

¹⁸ The same is true with the existing five formulas, which yield a calculated quota share of advanced economies that is 7 percentage points higher than their actual quota share.

¹⁹ The average contribution of reserves to members' Eleventh Review calculated quotas was 4 percent (see "*External Review of Quota Formula*," (EBAP/00/52, 5/1/00), Table 3-A).

Table 4. Calculated Quota Shares: Equal Weights of Variables

	Actual Quota Shares 1/	Existing Five Formulas 2/	Linear Formula		Multiplicative Formula	
			Including Reserves	Excluding Reserves	Including Reserves	Excluding Reserves
Weights of variables						
GDP	...	...	0.25	0.33	0.25	0.33
Openness	...	...	0.25	0.33	0.25	0.33
Variability	...	...	0.25	0.33	0.25	0.33
Reserves	...	...	0.25	...	0.25	...
Sum	...	...	1.00	1.00	1.00	1.00
Calculated quota shares (in percent)						
Advanced economies	61.6	68.9	64.6	69.8	65.8	71.0
Major advanced economies	46.0	49.7	47.7	52.7	48.7	54.3
Of which: United States	17.4	16.6	16.2	20.0	15.3	20.5
Other advanced economies	15.6	19.2	16.9	17.0	17.1	16.7
Developing countries	30.9	26.0	30.0	24.8	29.3	24.2
Africa	5.5	2.2	2.4	2.3	2.2	2.2
Asia 3/	10.3	14.4	15.6	11.7	15.5	11.8
Middle East, Malta and Turkey	7.6	4.3	5.3	5.0	4.6	4.4
Western Hemisphere	7.5	5.0	6.7	5.7	7.1	5.8
Transition economies	7.5	5.1	5.4	5.5	4.9	4.8
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Staff estimates.

1/ Based on actual quotas except for the nine countries that have not yet consented to their quota increases, for which 11th Review proposed quotas are used.

2/ Computed as traditionally specified, except that current receipts and payments have not been adjusted for official transfers, reexports, and international banking interest.

3/ Including Korea and Singapore.

32. **Based on these considerations, computations are presented with illustrative variable weights of 0.4 for GDP, 0.25 for variability, 0.25 for openness, and 0.1 for reserves** (Table 5).²⁰ In the three-variable variant excluding reserves, the weight of reserves is redistributed equally between variability and openness, so that the weights are 0.4 for GDP, 0.3 for variability, and 0.3 for openness.

33. **The relatively high share of advanced economies in the data for the variables is also reflected in the calculation carried out with these alternative weights.** The calculated quota share of advanced economies in these calculations is 7 to 10 percentage points higher than the actual quota share. As in the previous set of calculations, including reserves in the formula reduces the calculated quota share of advanced economies and raises the share of Asian economies, although the effect is smaller.

34. **During the Board seminar in October 2001, the importance of increasing the role of developing countries, notably but not exclusively in Africa, in the governance of the Fund was noted.** The calculations in this section do not achieve this objective. This is largely a consequence of the distribution of the data for the quota variables across countries, with a relatively high share for advanced economies.

B. Illustrative Variable Weights that Target a Certain Distribution of Quota Shares

35. **An alternative approach to obtaining illustrative weights of variables is to select them on the basis of the distribution of calculated quota shares that results from their application.** The aim of this approach is to examine whether shifts in quota shares by broad country groups could be achieved through an appropriately specified formula. The starting point in this approach is a target distribution of calculated quota shares, which would be for the Executive Board to decide.²¹

36. **At the Board seminar in October 2001, many Executive Directors were of the view that the governance structure of the Fund would be strengthened by raising the quota share of developing countries, which would require formulas that produced calculated quota shares for advanced countries that were lower than their actual quota share.** To illustrate the implication of such an outcome for the quota formulas,

²⁰ If a particular variable is included in a quota formula, its weight should not be negligible since that would run counter to the rationale for including the variable in the first place. Staff has operationalized this notion for illustrative purposes by imposing a minimum weight of 0.1 for each variable. Somewhat different variable weights than used in these illustrative calculations would not lead to qualitatively different distributions of calculated quota shares over broad country groups. The direction of change in the calculated quota share of individual members when variable weights are changed marginally is discussed in Statistical Appendix , Section II.

²¹ This would entail decisions on the composition of groups of members as well as their shares. For individual countries it would make a difference to which group they were assigned.

Table 5. Calculated Quota Shares: GDP with Largest Weight

	Actual Quota Shares 1/	Existing Five Formulas 2/	Linear Formula		Multiplicative Formula	
			Including Reserves	Excluding Reserves	Including Reserves	Excluding Reserves
Weights of variables						
GDP	...	...	0.40	0.40	0.40	0.40
Openness	...	...	0.25	0.30	0.25	0.30
Variability	...	...	0.25	0.30	0.25	0.30
Reserves	...	...	0.10	...	0.10	...
Sum	...	...	1.00	1.00	1.00	1.00
Calculated quota shares (in percent)						
Advanced economies	61.6	68.9	68.8	70.5	70.2	71.7
Major advanced economies	46.0	49.7	52.8	54.1	54.2	55.7
Of which: United States	17.4	16.6	19.9	21.0	19.6	21.4
Other advanced economies	15.6	19.2	16.1	16.4	16.0	16.1
Developing countries	30.9	26.0	26.1	24.3	25.4	23.7
Africa	5.5	2.2	2.3	2.3	2.1	2.1
Asia 3/	10.3	14.4	12.8	11.4	12.7	11.5
Middle East, Malta and Turkey	7.6	4.3	4.8	4.8	4.1	4.2
Western Hemisphere	7.5	5.0	6.2	5.7	6.4	5.9
Transition economies	7.5	5.1	5.0	5.2	4.5	4.6
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Staff estimates.

1/ Based on actual quotas except for the nine countries that have not yet consented to their quota increases, for which 11th Review proposed quotas are used.

2/ Computed as traditionally specified, except that current receipts and payments have not been adjusted for official transfers, reexports, and international banking interest.

3/ Including Korea and Singapore.

staff examined a range of reductions in the share of advanced economies from 1 to 5 percentage points, implying a calculated quota share of advanced economies of 56.6 percent to 60.6 percent. The resulting weights of variables were broadly similar. For simplicity, Table 6 only includes the variable weights resulting from targeting a calculated quota share of advanced economies that is 3 percentage points lower than the present actual share, i.e., 58.6 percent.

37. To obtain a unique set of variable weights an optimization procedure is applied.

An aggregate share of the advanced economies of 58.6 percent could be obtained with a range of variable weights, depending on the formula used and any restrictions imposed on the variable weights or their sum. The optimization procedure minimizes the squared percentage differences between calculated and targeted quota shares for all countries, subject to the constraint that the share of advanced economies is 58.6 percent and, in some variants, the sum of variable weights is one. Negative variable weights are excluded to eliminate the possibility that an increase in the value of a variable for a member could reduce that member's calculated quota share. For illustrative purposes, a minimum weight of 0.1 is used. Targeted quota shares for all countries are actual quota shares that have been proportionally lowered (in the case of advanced economies) or raised (for all other members) to be consistent with the aggregate share of advanced economies of 58.6 percent.

38. The targeted reduction in the share of advanced economies cannot be achieved with weights for the traditional variables summing to one (in the case of the three-variable formula), or only with very low weights for GDP and openness and high weights for variability and reserves (Table 6). This reflects the distribution of the data for the variables across countries and the higher shares of advanced economies in GDP and openness than in variability and reserves. In particular, GDP cannot be retained with a significant weight if the calculated quota share of advanced economies is to be reduced.

39. With a sum of weights of less than one, the targeted reduction in the share of advanced economies is achieved through a reduction of the share of the largest members. A feature of the multiplicative formula is that the smaller the sum of weights, the more compressed the distribution of calculated quota shares becomes.²² The compression of the distribution of calculated quota shares has the greatest effect on the United States (the largest economy) resulting in a calculated quota share well below 15 percent. At the other end of the distribution, which is characterized by a long "tail," the effects are less strong. The calculated quota share of African countries remains below their actual share, implying that quota increases based on the formula would lead to a continued decline of the actual quota share of these countries. Members that are in the middle of the distribution are less affected by the compression.

²² The compression results from the nonlinearity of the multiplicative formula. Compression does not occur in the linear formula.

Table 6. Calculated Quota Shares: Targeting a Specific Distribution of Quota Shares 1/

	Actual Quota Shares 2/	Existing Five Formulas 3/	Linear Formula		Multiplicative Formula			
			Including Reserves	Excluding Reserves	Including Reserves	Excluding Reserves	Including Reserves	Excluding Reserves
			Sum of weights= 1			Sums of weights <1		
Weights of variables								
GDP	...	...	0.12	0.10	0.10	0.10	0.25	0.29
Openness	...	...	0.10	0.10	0.10	0.10	0.10	0.10
Variability	...	...	0.34	0.80	0.33	0.80	0.21	0.39
Reserves	...	...	0.44	...	0.47	...	0.31	...
Sum	...	...	1.00	1.00	1.00	1.00	0.87	0.78
Calculated quota shares (in percent)								
Advanced economies	61.6	68.9	58.6	62.9 4/	58.6	63.9 4/	58.6	58.6
Major advanced economies	46.0	49.7	41.2	43.7	40.8	44.7	40.3	39.4
Of which: United States	17.4	16.6	12.4	16.8	10.8	17.2	11.2	13.1
Other advanced economies	15.6	19.2	17.4	19.2	17.8	19.2	18.3	19.2
Developing countries	30.9	26.0	35.1	28.7	35.7	28.3	35.2	33.3
Africa	5.5	2.2	2.7	3.1	2.5	3.0	3.4	4.7
Asia 5/	10.3	14.4	18.7	12.2	19.4	12.5	16.9	13.0
Middle East, Malta and Turkey	7.6	4.3	6.3	7.6	5.8	7.0	5.9	7.2
Western Hemisphere	7.5	5.0	7.5	5.7	8.1	5.9	9.0	8.3
Transition economies	7.5	5.1	6.3	8.4	5.7	7.8	6.2	8.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Memorandum items:								
Smallest 25 members	0.12	0.11	0.10	0.10	0.09	0.10	0.17	0.29
Smallest 75 members	2.10	1.36	1.60	1.91	1.38	1.68	1.99	2.99
Members included in Financial Transactions Plan	72.4	82.2	76.7	76.4	77.0	77.2	74.4	71.1

Source: Staff estimates.

1/ The illustrative target is a calculated quota share of advanced economies of 58.6 percent, 3 percentage points below the actual quota share.

2/ Based on actual quotas except for the nine countries that have not yet consented to their quota increases, for which 11th Review proposed quotas are used.

3/ Computed as traditionally specified, except that current receipts and payments have not been adjusted for official transfers, reexports, and international banking interest.

4/ Targeted share not achieved.

5/ Including Korea and Singapore.

40. A wide range of variable weights can achieve the targeted adjustment in calculated quota shares, provided the sum of weights is appropriately scaled. The scaling effect is so powerful that weights can be chosen a priori (within wide ranges) for all but one variable, with the weight of the last variable derived to achieve the 58.6 percent.

While it is possible to achieve broad shifts in quota shares, the individual variable weights are nearly indeterminate.²³

41. **In summary, achieving broad shifts in the quota share distribution requires that GDP (and, to a lesser degree, openness) have a relatively low weight, although GDP has generally been considered the most important variable in relation to the financial functions of quotas.** In the case of the linear formula, the calculated quota share distribution reflects the distribution of the data for the variables, in which advanced economies have a high share. In the case of the multiplicative formula, the ability to compress the distribution of calculated quota shares to achieve specified shares for particular groups of countries tends to overwhelm the impact of the specific variables included in the formula and of their individual weights.

IV. ADDITIONAL APPROACHES

42. **This section considers additional approaches for arriving at judgments about the weights of variables that could result in a broad adjustment of calculated quota shares.** The first approach predetermines calculated quota shares for defined broad groups of members and allocates shares within the groups based on an agreed formula. The second aims to adjust shares, without having to define groups of members, by allowing a member to choose between the results of formulas with different specifications (i.e., multiple formulas). This section also discusses which members have actual quota shares that are most out of line with calculated quota shares.

A. Predetermination of Quota Shares

43. **Broad shifts of quota shares can be achieved most directly by assigning calculated quota shares to particular groups of members.** These groups could be any that the membership might be interested in, including those that have been discussed by the Board in the context of quota formulas (developing countries, Africa). A quota formula could be applied subsequently to determine the relative positions of members within their respective group (as a within-group share). The calculated quota share of each Fund member in the overall distribution would be derived on the basis of these relative positions and the calculated quota share of the group to which it belonged. An illustration of the approach would be to assign a calculated quota share of 58.6 percent to the advanced economies (i.e., a share that is 3 percentage points lower than the actual share), and apply an illustrative formula from the previous section to determine the relative positions within groups (Table 7).²⁴

²³ For a small country, an increase in the weight of the variable where it has the highest share can be dominated by the scaling effect, so that its calculated quota share falls (see Statistical Appendix, Section II).

²⁴ The multiplicative formula is used because its results are invariant to the definition of variables as shares in world totals or group totals. The same formula is derived to obtain within-group shares for each of the two groups of members.

Table 7. Calculated Quota Shares: Predetermination

	Actual Quota Shares 1/	Existing Five Formulas 2/	Multiplicative Formula (GDP with Largest Weight)		Predetermined Group Shares and Formula- Determined Shares within Groups 3/	
			Including Reserves	Excluding Reserves	Including Reserves	Excluding Reserves
			Weights of variables			
GDP	...	...	0.40	0.40	0.40	0.40
Openness	...	...	0.25	0.30	0.25	0.30
Variability	...	...	0.25	0.30	0.25	0.30
Reserves	...	...	0.10	...	0.10	...
Sum	...	...	1.00	1.00	1.00	1.00
Calculated quota shares (in percent)						
Advanced economies	61.6	68.9	70.2	71.7	58.6	58.6
Major advanced economies	46.0	49.7	54.2	55.7	45.2	45.5
Of which: United States	17.4	16.6	19.6	21.4	16.4	17.5
Other advanced economies	15.6	19.2	16.0	16.1	13.4	13.1
Developing countries	30.9	26.0	25.4	23.7	35.2	34.7
Africa	5.5	2.2	2.1	2.1	2.9	3.1
Asia 4/	10.3	14.4	12.7	11.5	17.6	16.8
Middle East, Malta and Turkey	7.6	4.3	4.1	4.2	5.7	6.1
Western Hemisphere	7.5	5.0	6.4	5.9	8.9	8.6
Transition economies	7.5	5.1	4.5	4.6	6.2	6.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
Memorandum item:						
Members included in Financial Transactions Plan	72.4	82.2	81.9	82.4	74.9	74.3

Source: Staff estimates.

1/ Based on actual quotas except for the nine countries that have not yet consented to their quota increases, for which 11th Review proposed quotas are used.

2/ Computed as traditionally specified, except that current receipts and payments have not been adjusted for official transfers, reexports, and international banking interest.

3/ The calculated quota share of advanced economies is set at 58.6 percent, 3 percentage points below the actual quota share.

4/ Including Korea and Singapore.

44. **The resulting calculated quota distribution leads, by the very design of the approach, to a shift in quota shares in a desired direction.** This would be achieved independently of the quota formula that would be used. However, **prerequisites for the application of this approach include broad agreement on:**

- **the exact composition of the groups** for which calculated quota shares would be predetermined. Criteria would need to be developed for selecting the countries that would be included in each group that could be sustained over a long period.
- **the exact calculated quota share of each group** once the composition of groups had been determined.

A related difficulty is that countries that are dissimilar in terms of economic development but otherwise similar could have calculated quota shares that differed only because they fell in different groups.

B. Multiple Formulas

45. **An approach similar to the existing five-formula system can be devised with the type of formulas discussed in this paper, although this approach would not be as simple as a single formula.** With the existing formulas, the calculated quota share of each member is determined based on the outcome of the calculations of all five formulas. This approach avoids categorization of countries and allows self selection based on objective criteria. If, for example, two different quota formulas were used of the type illustrated in this paper, a rule could be applied that each member would be assigned the higher of the two calculated quota shares.²⁵ The resulting shares would need to be scaled proportionally to ensure that they sum to exactly 100 percent.

46. **To illustrate this approach, two very distinct formulas are used, including a formula with a weight of 0.4 for GDP and 0.25 or 0.3 for openness (as in Table 5) and a formula with a high weight (0.8) of variability/reserves.** In the calculated quota distribution resulting from the second illustrative formula (reserves included), developing countries have a higher share (39.2 percent) than in the distribution resulting from the first illustrative formula (29.8 percent) because developing countries have a higher share in variability and reserves (Table 8). The calculated quota distribution that follows from assigning the higher of the two quota shares to each member, and then normalizing all shares so that they sum to 100 percent, lies between the distributions resulting from the application of each of the formulas—in this illustration the calculated quota share of advanced economies is 64.7 percent (reserves included).

²⁵ Each of the two calculated quota share distributions would sum to 100 percent.

Table 8. Calculated Quota Shares: Two Formulas

	Actual Quota Shares 1/	Existing Five Formulas 2/	Including Reserves			Excluding Reserves			
			Two Formulas	Highest 3/	Two Formulas	Highest 3/			
Weights of variables									
GDP	...	...	0.40	0.10	...	0.40	0.10	...
Openness	...	...	0.25	0.10	...	0.30	0.10	...
Variability	...	...	0.25	0.50	...	0.30	0.80	...
Reserves	...	...	0.10	0.30	...	...	...	...
Sum	...	...	1.00	1.00	...	1.00	1.00	...
Calculated quota shares (in percent)									
Advanced economies	61.6	68.9	70.2	60.8	64.7	71.7	63.9	66.9	
Major advanced economies	46.0	49.7	54.2	42.5	48.1	55.7	44.7	49.4	
Of which: United States	17.4	16.6	19.6	13.1	17.4	21.4	17.2	19.0	
Other advanced economies	15.6	19.2	16.0	18.3	16.6	16.1	19.2	17.5	
Developing countries	30.9	26.0	25.4	33.0	29.7	23.7	28.3	26.2	
Africa	5.5	2.2	2.1	2.6	2.3	2.1	3.0	2.7	
Asia 4/	10.3	14.4	12.7	16.9	15.1	11.5	12.5	11.6	
Middle East, Malta and Turkey	7.6	4.3	4.1	6.1	5.7	4.2	7.0	6.3	
Western Hemisphere	7.5	5.0	6.4	7.4	6.6	5.9	5.9	5.6	
Transition economies	7.5	5.1	4.5	6.3	5.6	4.6	7.8	6.9	
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Memorandum items:									
Members included in Financial Transactions Plan	72.4	82.2	...	...	79.5	...	...	79.0
Applicable formula (number of members)									
Advanced economies	...	...	11	15	...	12	14	...
Major advanced economies	...	...	7	0	...	7	0	...
Other advanced economies	...	...	4	15	...	5	14	...
Developing countries	...	...	16	113	...	22	107	...
Africa	...	...	10	41	...	6	45	...
Asia 4/	...	...	3	27	...	8	22	...
Middle East, Malta and Turkey	...	...	2	14	...	1	15	...
Western Hemisphere	...	...	1	31	...	7	25	...
Transition economies	...	...	1	27	...	0	28	...
Total	...	...	28	155	...	34	149	...

Source: Staff estimates.

1/ Based on actual quotas except for the nine countries that have not yet consented to their quota increases, for which 11th Review proposed quotas are used.

2/ Computed as traditionally specified, except that current receipts and payments have not been adjusted for official transfers, reexports, and international banking interest.

3/ The highest of the two shares is selected for each member. Selected shares are proportionally reduced so that they sum to 100 percent.

4/ Including Korea and Singapore.

47. **It is not possible to obtain distributions of calculated quota shares that are more extreme than the share distributions resulting from each of the multiple formulas by themselves.** This is a general result that applies to all systems of multiple quota formulas. Using more than two formulas would therefore not significantly alter the results in Table 8. Furthermore, the distribution of calculated quota shares would tend to be farther away from any of the distributions resulting from the individual formulas the greater is the difference between the formulas.

48. **To achieve broad shifts of quota shares using multiple formulas, some of the formulas would have to include very high weights for those variables for which data are distributed in favor of the groups that would be the intended beneficiaries.** Even if such formulas were included, the shifts obtained might not be large because of the counter balancing effect of the other formulas. Indeed, while the existing five formulas include formulas with large weights of variability and reserves (in particular Schemes IV, M4, and M7), the five formulas would currently give the advanced economies a calculated quota share of 68.9 percent.²⁶

C. Out-of-Lineness

49. **In the Eleventh General Review of Quotas, ad hoc quota increases were given to a small group of countries that had actual quota shares significantly out of line with calculated quota shares.**²⁷ The criterion used for determining this group was based on the ratio of their calculated to actual quota shares using the existing five formulas. While the results for many individual countries differ significantly depending on the specific formulation used, the various alternative formulas considered in this paper could provide a useful additional source of information about the relative position of countries. Specifically, staff has examined the degree of out-of-lineness of actual versus calculated quota shares under the different formulas to determine whether general conclusions about certain countries or groups of countries can be drawn.

50. **Under the 16 different formula variants considered in this paper, actual quota shares are consistently among the lowest relative to calculated quota shares for a small group of members.** These eight members are Bahrain, Botswana, Ireland, Korea, Luxembourg, Singapore, Thailand, and Turkey.^{28 29} A number of other members, including

²⁶ The current five formulas do not assign the highest quota calculation to a member, but the higher of the Bretton Woods formula and the average of the two lowest of the other four formulas. This filters out the highest calculated quotas from the four non Bretton Woods formulas.

²⁷ Korea, Luxembourg, Malaysia, Singapore, and Thailand (see “*Eleventh General Review of Quotas—Final Quota Calculations Based on 1994 Data*,” EB/CQuota/97/7 (11/20/97)). These members were also participants in the NAB.

²⁸ These eight members are selected using an illustrative indicator of out-of-lineness. The indicator counts the number of times (out of 16) that members have one of the, say, 10 lowest ratios of actual to calculated quota

(continued)

emerging market countries, also have actual quota shares that are lower than their calculated quota shares, although the degree of out-of-lineness based on the approaches utilized in this paper is not as great as for these eight members.

V. BASIC VOTES

51. **A number of Directors have argued that issues of governance should be considered as part of any revision of the quota formulas.** While there are a number of aspects to governance of the Fund, in the present context the distribution of the quota shares of members is relevant as it directly affects the determination of voting power.³⁰ Members' voting power can be altered by changing their quota shares and/or by modifying the provisions that determine a member's relative share in votes, including changes in basic votes (Box 4). The previous sections have illustrated the difficulties of achieving broad shifts of calculated quota shares to developing countries through the specification of a new quota formula that includes variables reflecting the financial functions of quotas. This section considers the effects of possible changes in basic votes. In earlier Board discussions, the suggestion was made that the inclusion of a constant in the quota formulas could have effects that are similar to an increase in basic votes without the necessity of an amendment of the Articles of Agreement. However, the increase in quotas would be very large for smaller members, which would have significant implications for access (Box 5). Consequently, the illustrative calculations in this paper have not included a constant.

52. **The effect of an increase in basic votes is to increase the voting power of those members whose voting power is below the average voting power in the Fund.** Table 10 illustrates the impact on groups of members of two hypothetical increases in basic votes. The impact would be particularly significant for the voting shares of African countries, many of which have small quotas.³¹

shares, and members with the most occurrences are selected. The results are not sensitive to the specific cut-off point of having one of the 10 lowest ratios. The same eight members have the most occurrences of low ratios in the 16 formula variants when the cut-off point is set in the range of 6 to 17 lowest ratios. The results for Luxembourg and Singapore may have been affected by their high degree of measured openness (see Box 2).

²⁹ Using the existing five formulas, these members, except for Thailand and Turkey, have one of the eight lowest ratios of actual to calculated quota.

³⁰ Each member has 250 "basic" votes plus one vote for each SDR 100,000 of quota.

³¹ See Annex II in "*Twelfth General Review of Quotas—Preliminary Considerations and Next Steps*," SM/02/22 (1/22/02), which discusses issues related to basic votes. Table 10 differs slightly from Annex Table 2 in that paper because Table 10 is based on Eleventh Review quotas and related voting power, instead of on actual quotas and voting power.

Box 4. Mr. Kelkar's Voting Power Proposal

In the Board seminar on October 15, 2001, Mr. Kelkar proposed that voting power be based on a weighted average of *quotas* (75 percent), *population* (12.5 percent), and *basic votes* (12.5 percent).

The inclusion of population and the increased share of basic votes would result in a significant redistribution of voting power from advanced to developing and transition countries, particularly those countries with large populations and/or very small quotas (see Table 9 and Statistical Appendix, Annex, Table 9). The use of PPP-GDP for the calculation of quotas, as Mr. Kelkar also proposes, would further increase the redistribution to developing and transition countries, particularly large, relatively closed economies (not shown here).

Table 9. Mr. Kelkar's Current Voting Power Proposal
(In percent)

	Current Voting Shares 1/	Mr. Kelkar's Proposal (Current Quotas: 75 Percent, Population and Basic Votes: 12.5 Percent) 1/
Advanced economies	60.6	49.8
Developing countries and Transition economies 2/	39.4	50.2
Total	100.0	100.0

Source: Staff estimates.

1/ Derived on the basis of actual quotas except for the nine countries that have not yet consented to their quota increases, for which Eleventh Review proposed quotas are used.

2/ Including Korea and Singapore.

53. **Proposals for changes in basic votes have traditionally been considered in the context of general quota reviews because increases in either quotas or basic votes have implications for voting power and both require an 85 percent majority vote.**³² Therefore,

³² A change in basic votes also requires an amendment of the Articles.

Box 5. A Constant in the Quota Formula

Raising the voting power of members in a way that emulates an increase in basic votes could, in principle, be achieved, by including a constant in the quota formula(s). A constant would have the effect of distributing part of a general increase of quotas equally to all members, and in this way would begin to raise the voting power of members as an increase in basic votes would. The smaller a member's quota, the greater the impact of the constant on voting power would be.

However, unlike an increase in basic votes, a constant in the quota formulas would have a direct impact on the minimum quota in the Fund, and thus would also affect access. The effect would be large and be greater the smaller the size of the quota and the larger the constant. Given that basic votes currently represent just over 2 percent of total voting power, and amounted to over 11 percent at the inception of the Fund, a meaningful illustrative size of the constant in the quota formulas could be on the order of 5 to 10 percent of calculated quotas for the membership as a whole. A constant of 5 percent would represent 0.027 percent of calculated quota share for each member (5 percent distributed over 183 members). To place this in perspective, 34 members have a current—Eleventh Review—quota share that is smaller than 0.027 percent, and a constant of 0.027 percent in the quota formula would range up to 19 times larger than the current actual quota share for small members. The constant would represent a minimum calculated quota, with the current size of the Fund, of SDR 58.4 million, compared to a smallest current actual quota of SDR 3.1 million. Using a quota formula with such a constant would entail large increases in the quotas of small members when parts of general quota increases were distributed on the basis of calculated quota shares, with attendant implications for their access to Fund resources.

staff have provided illustrative calculations of the effects on voting power of various increases in basic votes when combined with a hypothetical increase in total quotas of 50 percent distributed selectively on the basis of an illustrative calculated quota distribution based on a two-formula approach including reserves (Table 8).³³ The shift in quota shares is combined with either a doubling of basic votes or an increase of basic votes that would restore the 1945 share of basic votes at 11.3 percent of the total (Table 11).

54. **The effects on voting power of this variant may be illustrated by examining the group of advanced economies.** On the one hand, the voting power of this group increases because a high calculated quota share contributes to an increased actual quota share. On the other hand, an increase in basic votes tends to mitigate the effect of an increased quota. In particular, a doubling of basic votes almost fully offsets the impact of higher quotas, resulting in only a slight increase in the voting share of advanced countries in this illustration. A restoration of basic votes to the Bretton Woods level reduces the voting share of the

³³ Such a quota increase entirely devoted to selective increases was also used for illustrative purposes in Box 6 of *Alternative Quota Formulas—Considerations* (SM/01/293, 9/27/01). It results in new quota shares that reflect the actual quota share distribution with a weight of two thirds and the calculated distribution with a weight of one third.

Table 10. Illustrative Voting Shares: No Change in Quotas and Increased Basic Votes
(In percent)

	Current (250 Basic Votes per Member)		500 Basic Votes per Member		1488 Basic Votes per Member 2/	
	Voting Shares 1/	Basic Votes as Percent of Total	Voting Shares 1/	Basic Votes as Percent of Total	Voting Shares 1/	Basic Votes as Percent of Total
Advanced economies	60.6	0.5	59.6	1.0	56.2	2.9
Major advanced economies	45.1	0.2	44.3	0.4	41.3	1.0
Of which: United States	17.0	0.1	16.7	0.1	15.5	0.4
Other advanced economies	15.5	1.4	15.4	2.8	15.0	7.8
Developing countries	31.7	4.7	32.5	8.9	35.3	22.5
Africa	6.0	9.8	6.4	17.8	8.0	39.3
Asia 3/	10.4	3.3	10.5	6.4	11.0	16.9
Middle East, Malta and Turkey	7.7	2.4	7.7	4.7	7.8	12.7
Western Hemisphere	7.7	4.8	7.9	9.1	8.6	23.0
Transition economies	7.7	4.2	7.9	8.0	8.4	20.5
Total	100.0	2.1	100.0	4.1	100.0	11.3

Source: Staff estimates.

1/ Based on actual quotas except for the nine countries that have not yet consented to their quota increases, for which 11th Review proposed quotas are used.

2/ Basic votes equal to the 1945 share of 11.3 percent of total votes.

3/ Including Korea and Singapore.

advanced countries by some 3 percentage points and correspondingly increases the voting share of developing countries, particularly the smaller countries.

VI. CONCLUSIONS AND ISSUES FOR DISCUSSION

55. **This paper has shown that it is possible to devise updated quota formulas that represent improvements over the existing five-quota formula system in terms of modernization, simplicity, and transparency.** The updated formulas employ broadly agreed variables that reflect the financial functions of quotas and that have been modernized to take account of the importance of international capital flows. Results can be achieved that are not very different from the calculated quota shares resulting from the existing five quota formulas at the level of broad country groups. Moreover, it is possible to achieve these results with (slightly) different alternative versions of a simple and transparent single formula.

Table 11. Illustrative Voting Shares: General Quota Increase and Increased Basic Votes
(In percent)

	Current Voting Shares 1/ Shares 1/		Reserves Included				Reserves Excluded			
			Calculated Quota Shares (Table 8)	New Quota Shares 2/	Voting Shares		Calculated Quota Shares (Table 8)	New Quota Shares 2/	Voting Shares	
					500 Basic Votes	2232 Basic Votes 3/			500 Basic Votes	2232 Basic Votes 3/
Advanced economies	60.6	61.6	64.7	62.6	61.3	57.2	66.9	63.4	62.0	57.8
Major advanced economies	45.1	46.0	48.1	46.7	45.5	41.9	49.4	47.2	46.0	42.3
Of which: United States	17.0	17.4	17.4	17.4	16.9	15.5	19.0	17.9	17.4	16.0
Other advanced economies	15.5	15.6	16.6	15.9	15.8	15.3	17.5	16.2	16.0	15.6
Developing countries	31.7	30.9	29.7	30.5	31.6	35.0	26.2	29.3	30.4	34.0
Africa	6.0	5.5	2.3	4.4	5.1	7.1	2.7	4.6	5.2	7.2
Asia 4/	10.4	10.3	15.1	11.9	12.0	12.4	11.6	10.7	10.9	11.4
Middle East, Malta and Turkey	7.7	7.6	5.7	7.0	7.0	7.2	6.3	7.2	7.2	7.4
Western Hemisphere	7.7	7.5	6.6	7.2	7.5	8.3	5.6	6.8	7.1	8.0
Transition economies	7.7	7.5	5.6	6.9	7.1	7.8	6.9	7.3	7.6	8.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Staff estimates.

1/ Votes of all members are included in the calculation, the total of which is different from the actual total votes of the Fund.

2/ General quota increase of 50 percent distributed on basis of calculated quota shares, resulting in new quota share distribution that reflects the calculated quota share distribution with a weight of one third.

3/ This would restore the share of basic votes in the total voting power to the level in 1945, i.e., 11.3 percent.

4/ Including Korea and Singapore.

56. **The paper has demonstrated that a quota formula which includes GDP with a weight consistent with the generally accepted view of the importance of GDP for the financial functions of quotas would result in a calculated quota share for advanced economies that is generally higher than their current actual quota share. Consequently, efforts to increase significantly the calculated quota share of developing economies necessitates a formula in which the weight of GDP (and to a lesser extent openness) is reduced substantially.** However, decisions on the appropriateness of particular assigned weights of the variables will need to take account of the correlation among the broadly agreed variables in order to achieve the intended impact on the distribution of calculated quotas.

57. **The paper has further illustrated that the membership could predetermine, by some political decision-making process, the quota share of broad country groups, and then apply a formula to derive the calculated quota share distribution for individual countries within these broad country groups.** A key issue in this approach would be the criteria for selecting the countries that would be in each group, particularly as the effect of being in a particular group could have important consequences for the calculated quota of the member. However, a two-formula approach would provide a mechanism that allows self-selection by members and, appropriately specified, could increase the calculated quota share of developing countries

58. **A more direct means of achieving a change in voting power that would not require approaches that focus on quota shares would be an amendment of the Articles of Agreement to increase basic votes.**

59. **The various illustrative formulas considered in the paper (as do the existing formulas) all show that there is a relatively small group of members, which is constant across formulas, whose actual quota shares are farthest below calculated quota shares.**

60. **Further work on possible new quota formulas requires guidance from Executive Directors.** What comments do Directors have on the basic conclusions reached by staff? What direction should future work on the quota formulas take, in the view of Directors?