

Measuring Vulnerability: Capital Flows Volatility in the Quota Formula

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Abstract

This paper discusses a proposal to include capital flows volatility as an additional variable in the quota formula. The motivation is to capture macroeconomic volatility associated with capital accounts shocks as well as countries' vulnerabilities to balance of payment crisis. A proposal to this effect was requested by the G-24 Ministers in the Communiqué of October 2004 and also introduced in recent quota reviews at the IMF.

However, the methodology put forward by IMF staff papers measures capital flows volatility in dollar terms. This measure does not fully captures vulnerabilities to balance of payment crises because it does not take into account the differential macroeconomic impact of volatility among developing and industrial countries. In particular, fluctuation in capital flows implies a bigger real adjustment for developing countries since capital flows to these countries represent a larger share of their economies and tend to be more volatile.

We propose an alternative measurement of capital flows volatility based on the volatility of net capital flows as a proportion of GDP and argue that it is a more appropriate measure to capture the economic effects of capital flows volatility. We also measure volatility in exports and capital flows altogether as a share of GDP to capture countries' total vulnerabilities to balance of payment crisis arising not only from capital account shocks but also from current account shocks, i.e. commodity shocks.

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Introduction

This paper discusses a proposal by the G-24 Ministers and also by the IMF to include capital flows volatility as an additional variable in the quota formula. The objective is to capture countries' vulnerabilities to both capital account shocks and balance of payment crisis.

In the Communiqué of October 2004 Ministers of the G-24 stated that enhancing the representation of developing countries requires a new quota formula that:

"(...) takes into account the vulnerabilities of developing countries to movements in commodity prices, the volatility of capital movements, and other exogenous shocks."
Paragraph 10, Communiqué October 2004.

A proposal to this effect was introduced in recent quota discussions at the IMF¹. This issue is important given the increasing number of financial crises that many Fund members have faced since the late 1980s and during the 1990s.

The current quota formula estimates country's vulnerability to current account shocks as it includes variables such as trade openness and export volatility². However, during the 1980s and 1990s, crises episodes have been related to capital account reversals, often linked to exogenous factors, i.e. contagion and "sudden stops".

The current account indicators that are currently included in the quota formula are only partially and imperfectly related to the potential effects of changes in capital flows on an economy. In particular, the quota formula takes into account variables that are important in what are called "first generation" models of financial crises, which link countries' vulnerabilities to domestic fundamentals and economic fragility³.

The inclusion of capital flows volatility in the quota formula constitutes an effort to incorporate variables that better reflect the growing integration of financial markets. Since the early 1990s, balance of payments and currency crises episodes have been related to developments in financial markets, often exogenous to the economies affected. For example,

¹ See the following sections for further details.

² See Appendix I quota formulas.

³ Like fiscal imbalances and monetary expansion leading to current account deterioration.

self-fulfilling crises (second generation models) and crises related to moral hazard and imperfect information (third generation models) may take place irrespective of countries' good fundamentals. In addition, models of sudden stops and contagion, which reflects a sudden reversal of capital flows have been also identified as a potential cause of balance of payment crises as a result of investors behavior in the financial centers⁴.

The first section in this paper presents the stylized facts on capital flows as reported by the data and empirical studies. The next section describes the methodology proposed in recent IMF staff papers to measure capital flows volatility and their inclusion in the quota formula. Next, we analyze shortcomings of the proposed methodology and develop an alternative method for the measurement of volatility of capital flows. We also measure volatility in exports and capital flows altogether to capture countries' overall vulnerabilities to balance of payment crisis. Finally, we analyze the impact of our proposed new methodology across countries and within country groups.

Stylized Facts on Capital Flows

The literature identifies a series of stylized facts on capital flows. They can be summarized in the following list:

- As a result of international financial integration, capital flows increased sharply in volume during the 1990s for both industrial and developing countries.
- Capital pulled out from developing countries during the Russian crises.
- On average capital flows represent a higher proportion of GDP in developing countries than in industrial countries.
- Volatility of capital flows has increased during the 1990s for both groups.
- Volatility of capital flows, measured as a proportion of GDP, is higher for developing countries than for industrial countries. However, it appears to be smaller for developing countries if it is measured in absolute (dollar) terms, given the smaller size of these flows.

⁴ For a brief description of the different models of currency crises see Kaminsky (2004). For a description of alternative approaches to financial crises see Calvo et al. (2004), Calvo (1996) and Mendoza (2001).

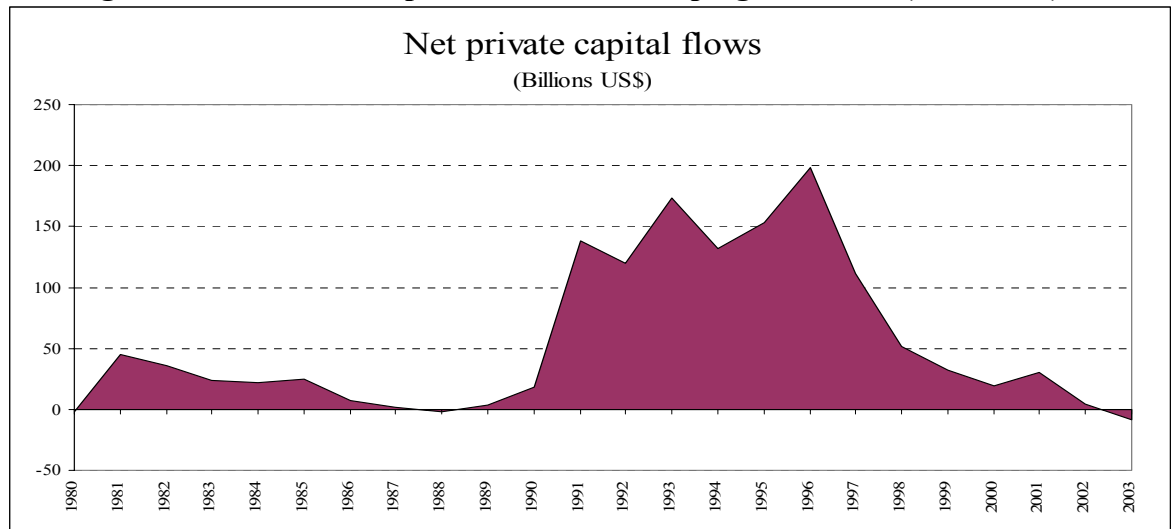
- Capital flows behave procyclically.
- Volatility in capital flows contributes to a more volatile macroeconomic environment in the case of developing countries due to the procyclicality of capital flows and their limited market access.

Capital Flows in the 1990s

Financial flows have increased sharply among industrial countries, in particular, after members of the European Community eliminated capital controls during the 1980s, and also after the Russian crisis in 1998. Following the closing of the markets after the debt crises during the 1980s, the volume of capital flows to developing countries also increased during the 1990s, a period of increasing financial integration which led to a number of currency crises in Asia, Russia and Latin America.

As can be seen in Figure 1, following the resolution of the Latin American debt crisis of the 1980s, capital flows to emerging markets (EM) rose sharply during the 1990s reaching a maximum of US\$200 billions in 1996, then fell by about half after the Asian crisis and continued to decline after 1998 following the Russian crisis, with only a small recovery during 2001-2002.

Figure 1. Net Private Capital Flows to Developing Countries (1980-2003)

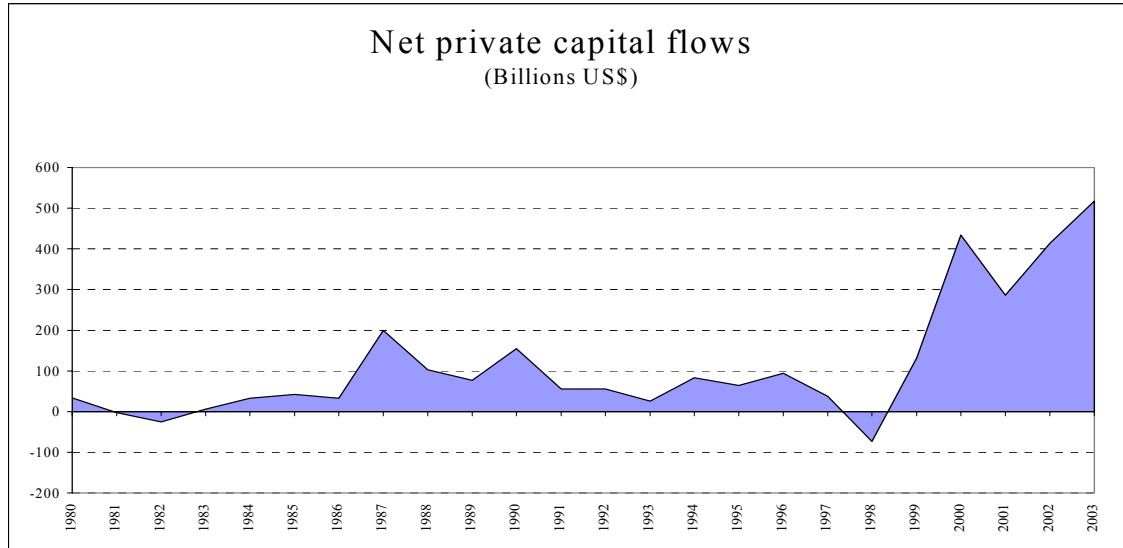


Source: IMF, *International Financial Statistics*.

In contrast, after receiving net private capital inflows in the amount of US\$100 and US\$200 billions during the 1980s, industrial countries experienced a surge in flows more recently, starting in 1999. Possibly, this is related to a reevaluation of EM risk following the

Russian crisis. Since then, capital flows reached a maximum of US\$500 billions dollars between 2000 and 2003 (Figure 2).

Figure 2. Net Private Capital Flows to Industrial Countries (1980-2003)



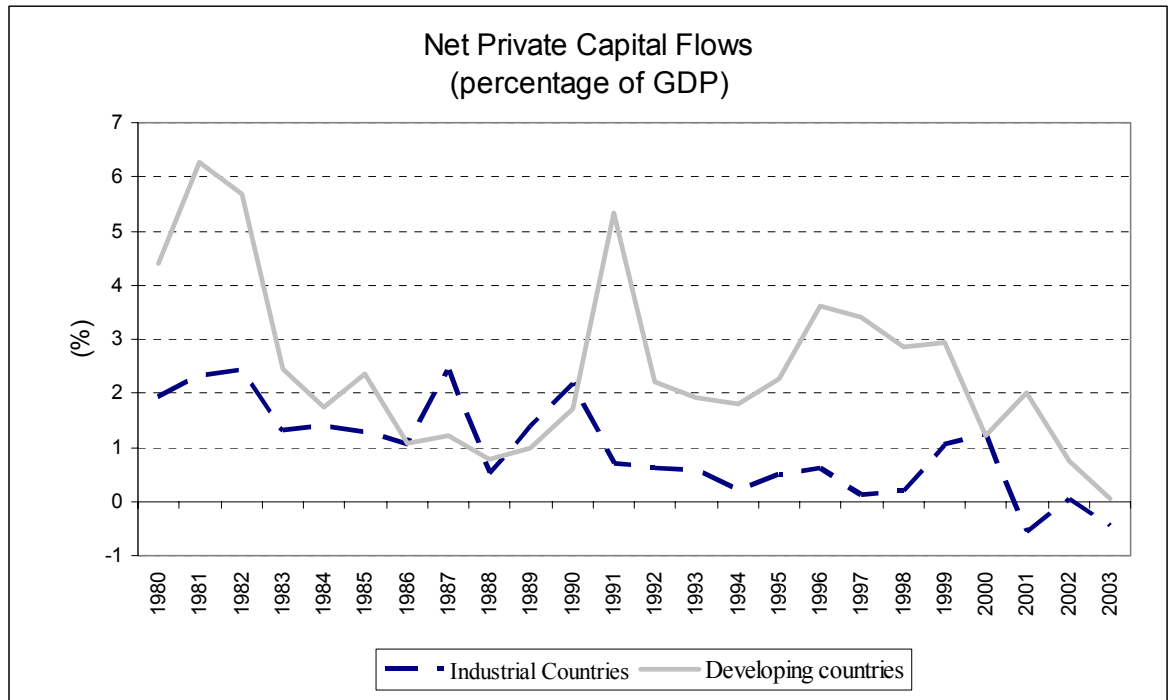
Source: IMF, *International Financial Statistics*.

Capital Flows as a Proportion of GDP

Figure 3 compares the share of net private capital flows as a percent of GDP for industrial and developing countries. In contrast to Figures 1 and 2 notice that when measured as a share of GDP, capital flows have been larger in the case of developing than for industrial countries.

As shown in Figure 3, while inflows as a percentage of the GDP started to increase at the beginning of the 1990s for both groups of countries, for developing countries, these flows declined steadily after 1997. In the case of developing countries, private flows reached a maximum of 5 per cent of GDP during the 1990s and more recently declined to 2 per cent and 1 per cent. For industrial countries, capital flows reached a maximum of 2 per cent and have remained at between 0 and 1 per cent of GDP in recent years.

**Figure 3. Net Private Capital Flows (% of GDP):
Advanced Economies and Developing Countries (1980-2003)**



Source: IMF, *International Financial Statistics*.

Volatility and Procyclicality of Capital Flows

Volatility of net capital flows has increased for both industrial and developing country groups during the 1990s as compared to 1980s (Table 1). In addition, notice that capital flow volatility, measured in dollar terms, appears to have been higher for industrial countries because their flows are larger. However, when measured as share of GDP, volatility is considerably higher for developing countries.

**Table 1. Volatility of Net Capital Flows (1980s and 1990s)
(Standard Deviation)**

Volatility	1980-89	1990-99
<i>Std. Dev. Of Net Capital Flows</i>	<i>(billions dollars)</i>	
Industrial Countries	38.6	44.4
Developing Countries	7.1	27.6
<i>Std. Dev of Net Capital Flows/GDP</i>	<i>(%)</i>	
Industrial Countries	0.54	0.33
Developing Countries	0.58	0.87

Source: IMF, *International Financial Statistics(IFS)*.

Capital flows have behaved procyclically⁵ for both industrial as well as for developing countries. That is, when the economy is growing capital is flowing in. During recessions capital inflows either slow down, or in many cases, a capital flight from the economies occurs. Table 2 presents the correlation between the cyclical component of net capital flows and real GDP for different levels of income.⁶ Capital flows have behaved procyclically for both groups of countries, but procyclicality has been higher for middle-high income countries.

Table 2. Correlation between the Cyclical Components of Net Capital Flows and Real GDP.

Countries	Correlations	
	HP Filter	Band-Pass Filter
OECD	0.30(*)	0.25(*)
Middle-High Income	0.52(*)	0.26(*)
Middle-Low Income	0.24(*)	0.20(*)
Low Income	0.16(*)	0.10(*)

Note: (*) denotes statistical significance as the 10% level.

Source: IMF, *IFS*. This table is from Kaminsky (2004).

As the table and figures above illustrate, capital flows have behaved procyclically for both groups of countries. Also, procyclicality has been higher for middle-high income countries and capital flows represent a bigger share of developing countries' economies. These factors make developing countries more vulnerable to changes in the amount of capital

⁵ Procyclical capital inflows occurred when capital inflows are positively correlated with domestic business cycle or real GDP cycle. For further analysis of procyclicality see Kaminsky, Reinhart and Végh (2004)

⁶ Kaminsky (2004).

flows, resulting in a more volatile macroeconomic environment. Furthermore, in extreme cases, they can explain why developing countries have been more prone to balance of payments crises, including cases of sudden changes in capital flows. Gavin and Hausmann (1996) in a study of developing countries, find that there is a significant and positive association between the volatility of capital flows and output volatility. In contrast, O'Donnell (2001) finds that higher financial integration in OECD countries is associated with lower output volatility.

As a result, lower correlation between capital flows and GDP among industrial countries imply lower volatility and lower financing needs when the economy is in a recession, therefore requiring lower real adjustments. In contrast, the fact that procyclicality of capital flows is higher among developing countries requires larger macroeconomic adjustment. In extreme cases, developing economies can even lose access to financial markets.

Table 3 presents the magnitude of the sudden reversals in capital flows as proportion of GDP for several developing countries. Reversal in capital flows represented between 7 and 26 percent of the countries' economies. As stated above, this illustrates how emerging markets tend to have sharper real adjustments, usually associated with large real currency depreciations, banking crises and output collapses.

**Table 3. Selected Large Net Capital Flows Reversals
(% of GDP)**

Country/Episode	Reversal	% of GDP
Argentina,	1982-83	20
Ecuador,	1995-96	19
Malaysia	1993-94	15
Mexico,	1981-83	12
Philippines,	1996-97	7
Venezuela,	1992-94	9
South, Korea	1996-97	11
Thailand,	1996-97	26
Turkey,	1993-94	10

Source: From Calvo and Reinhart (2000)

Furthermore, the possibility of sudden stops amplify the impact of volatile capital inflows among developing countries⁷. For example, for the period 1990-2001, 63 per cent of all devaluations in developing countries have been associated with a sudden reversal in capital flows, compared with only 37% for developed countries⁸.

Capital Flows Volatility in the Quota Formula

Recent IMF quota reviews emphasized the need of a more transparent and simpler quota formula and the need to include a measure of capital flows volatility⁹. The inclusion of additional variables such as capital inflows and terms of trade volatility have also been discussed at the G-24 ministerial meetings, as mentioned in October 2004 Communiqué.

Currently, the quota formula computes country's vulnerability through current account variables¹⁰, for example, trade openness and export volatility. As a result of Board discussions, there is a broad support "to include capital flows into the traditional variability measure to capture more fully countries' vulnerability to balance of payments shocks".¹¹ In recent publications¹², the IMF Finance Department describes a broad agreement among Board members to incorporate in the quota formula two new variables: capital flows volatility and financial integration.

The proposed measure -as described in the publications¹³- incorporates volatility in capital flows, computing the standard deviation from a centered 3-year moving average trend in dollar value capital flows. The data used for these estimates is as follows:

⁷ Calvo and Reinhart (2000 and 2002) document the impact of currency crises and sudden reversals in capital inflows on output. Also, see Kaminsky (2003)

⁸ Calvo, Izquierdo and Fernando-Mejia (2004). Although they cannot predict the causality they explain that there is some evidence that capital flows reversals may precede high real devaluations as in their sample 67% of all devaluations in developing countries were preceded by a sudden stop in capital flows.

⁹ For a discussion on the Quota Formula see IMF, 2001; 2002a; 2002b; 2003; 2004.

¹⁰ In the five quota formula, two include the sum of current receipts and payments and the other three include current payments and openness ratio (current receipts divided by GDP). See IMF, 2002a; 2002b.

¹¹ IMF, 2003, pp 7 paragraph 11.

¹² IMF, 2003; IMF, 2004.

¹³ *Op. cit.*

- Current receipts (export in goods, services, income, and current transfers) for 13 years (1990-2002), defined as the credit component of all economic transactions between residents and nonresidents entities other than those relating to financial transactions and reserves.
- Net capital flows for 13 years (1990-2002). Capital flows relate to cross-border transactions in all foreign financial assets and liabilities except reserve assets, Fund credit and loans, and exceptional financing. Errors and omissions have not been included in the measure of variability of current receipts and net capital inflows.

Table 4 compares volatility of current receipts (exports in goods, service, income and current transfers) as they are currently considered in the quota formula (column 1) with the IMF staff proposed methodology described above (column 2).

**Table 4. Volatility in Exports and Net Capital Flows¹ (1990-2002)
(in percent)**

	(1) Variability of Current Receipts (in percent)	(2) Variability of Current Receipts plus Net Capital Flows (in percent)	(2)-(1)
Advanced Economies	58.1	60.8	2.7
Major Industrial	40.5	43.2	2.7
<i>Of Which U.S.</i>	13.4	20.8	7.4
Other Industrial	17.6	17.6	0.0
Developing	32.6	31.5	-1.1
Africa	4.3	3.7	-0.7
Asia	14.9	12.8	-2.1
Middle East	8.0	7.6	-0.4
West Hemisphere	5.4	7.4	2.0
Transition economies	9.3	7.7	-1.6
	100.0	100.0	

Source: IMF, (2004).

¹Standard Deviation from centered 3-year trend. Shares represent the regional distribution of the volatility in dollar terms.

As shown in column 2, about 61 per cent of the volatility in exports and capital flows is explained by industrial countries, 32 per cent by developing countries and about 8 per cent by transition economies.

Column 3 compares the difference in percentage points between the methodology currently in place and IMF staff calculations including capital flow volatility. Notice that by including volatility in capital flows, industrial countries would gain about 3 percentage points in the total volatility shares. Developing and transition economies would lose about 1 and 2 percentage points respectively.

An Alternative Measurement of Capital Flows Volatility

The problem with the IMF staff calculations is that it does not capture the countries' macroeconomic vulnerability to capital account shocks. As a result, it is not a good measurement for the amount of resources potentially required to stabilize a given country. For example, if two countries experience the same volatility in absolute (dollar) terms, its impact will impose a greater burden on the smaller economy. The natural alternative is to compare net capital flows as a proportion of the size of the economy, which is the alternative evaluated in this paper by measuring volatility of capital flows as a proportion of GDP¹⁴.

An additional factor to consider is the cyclical nature of capital flows, as it key in assessing their macroeconomic impact. For example, two countries having the same volatility in capital flows would have very different macroeconomic effects depending on their behavior along the business cycle. Countercyclical flows would have a stabilizing effect, and the opposite would hold true in the case of procyclical flows. The fact that procyclicality is much higher among developing countries implies that for a given identical volatility of capital flows in dollar terms, developing countries will have greater financial needs, as compared to industrial countries .

In addition, more intense procyclicality among developing countries may result in the under estimation of the real volatility of capital flows as a share of GDP, since capital flows behave procyclically with output. The reason for this is that the macroeconomic effect of capital flows would be included in the denominator. With our proposed measure, countries in

¹⁴ We compute net flows in order to measure what would be the real adjustment required, that is, the net outflow that countries would have to finance.

which capital flows are more procyclical would tend to exhibit both a lower numerator and a lower denominator in periods of low inflows in the net flows/GDP ratio, and *vice versa*. As a result, the inclusion of capital flows volatility measured as a share of GDP in the IMF quota formula would be an improvement over the IMF staff methodology, but may still underestimate its macroeconomic impact.

The Data

Volatility is estimated with data on net capital flows and exports (current receipts or export in goods, service and income) from IMF, International Financial Statistics (IFS) as in the database used in IMF quota reviews¹⁵, and GDP at market prices in dollars from World Bank, World Development Indicators (WDI) for the period 1990-2003. We consider all of the 184 country members of the IMF, with only a few exclusions for extreme cases where data appears to be questionable¹⁶.

Replicating the methodology used in Table 4 of the previous section, we calculate volatility in dollar terms and compare the results with the volatility as a proportion of GDP. In Table 5, we compare the volatility of capital flows in dollar terms and as a proportion of GDP to reflect countries' vulnerabilities to capital account shocks. In Table 6, we compare the volatility of current receipts (exports in good, service and income) and net capital flows altogether in dollar terms and as a percentage of GDP, to reflect countries' vulnerabilities to capital account and current account shocks.

As shown in Table 5, when capital flows volatility is measured in absolute dollars terms, as presented in recent IMF staff papers (first column)¹⁷, industrial countries' share of total volatility represents 60 per cent and that of developing countries, 30 per cent. This result only shows that industrial countries attracted larger amounts of capital flows during the period 1990-2002 and that relative to the trend, changes in flows have been larger in absolute values than flows to developing countries. However, this does not measure the vulnerability

¹⁵ This data excludes Fund credit and loans, and exceptional financing, and also errors and omissions.

¹⁶ Appendix II presents the same results for all 184 countries where data was available.

¹⁷ See Footnote 11.

of industrial countries to financial crises. In fact, over the period 1990-2002 industrial countries have been subject to fewer balance of payment crisis than developing countries. Indeed, Industrial countries only had a major currency crisis at the beginning of the 1990s during the EMS devaluations.

In contrast, when capital flows volatility is measured as a proportion of GDP (second column), industrial countries' share of total volatility represents only 8 per cent, while developing countries account for 73 per cent and transition economies about 19 per cent of total volatility.

**Table 5. Variability of Net Capital Flows¹ (1990-2002)
(Shares)**

	Variability	
	Net Capital Flows (US\$ billions, share of total)	Net Capital Flows / GDP (percent, share of total)
Advanced Economies	60.9	8.2
Major Industrial	43.2	1.0
<i>Of Which U.S.</i>	19.4	0.1
Other Industrial	17.7	7.2
Developing	31.3	73.2
Africa	2.6	26.0
Asia	12.2	13.7
Middle East	8.3	13.9
Western Hemisphere	8.3	19.7
Transition economies	7.8	18.6
	100.0	100.0

Source: IMF, *International Financial Statistics*.

Note: Country outliers excluded are Angola, Congo, Dem. Rep of., Congo Rep., Equatorial Guinea, Mozambique and Kuwait. Appendix II includes all the countries where data is available.

¹ Standard Deviation from centered 3-year trend. Shares represent the regional distribution of the volatility in dollar terms and as percentage of GDP.

Table 6 computes the combined volatility of exports and capital flows, and compares these results with that obtained as percentage of GDP. In the first column, industrial countries represent 62 per cent of the total volatility measured in absolute terms for the period 1990-2002, developing countries account for 30 per cent, and transition economies for 8 per cent of total volatility.

In contrast, when capital flows and exports volatility are measured as shares of GDP, volatility in industrial countries falls to 9 per cent, while developing countries' share rise to 67 per cent, and that of transitions economies to 24 per cent of total volatility.

**Table 6. Variability of Net Capital Flows and Current Receipts¹ (1990-2002)
(Shares)**

	Variability	
	Current Receipts + Net Capital Flows (US\$ billions, share of total)	(Current Receipts+ Net Capital Flows) / GDP (in percent, share of total)
Advanced Economies	62.5	9.1
Major Industrial	44.5	0.8
<i>Of Which U.S.</i>	21.4	0.1
Other Industrial	18.0	8.3
Developing	29.6	67.2
Africa	2.9	26.9
Asia	12.9	14.7
Middle East	6.0	10.2
Western Hemisphere	7.7	15.5
Transition economies	7.9	23.7
	100.0	100.0

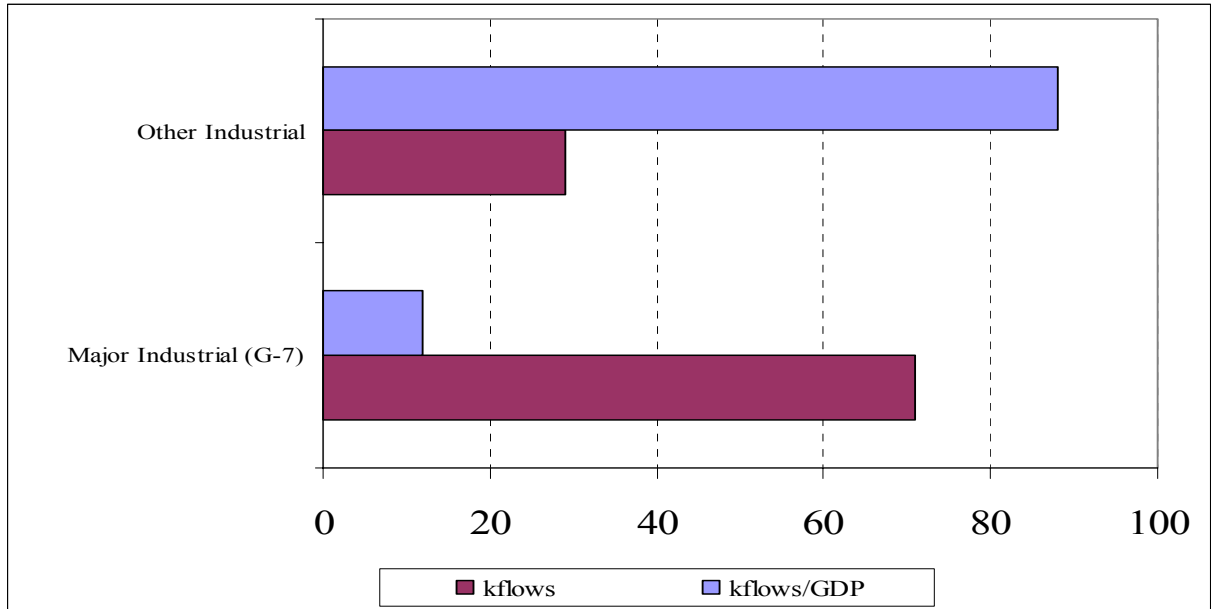
Source: IMF, International Financial Statistics.

Note: Country outliers excluded are Angola, Congo, Dem. Rep of., Congo Rep., Equatorial Guinea, Mozambique and Kuwait. Appendix II includes all the countries where data is available.

¹ Standard Deviation from centered 3-year trend. Shares represent the regional distribution of the volatility in dollar terms and as percentage of GDP.

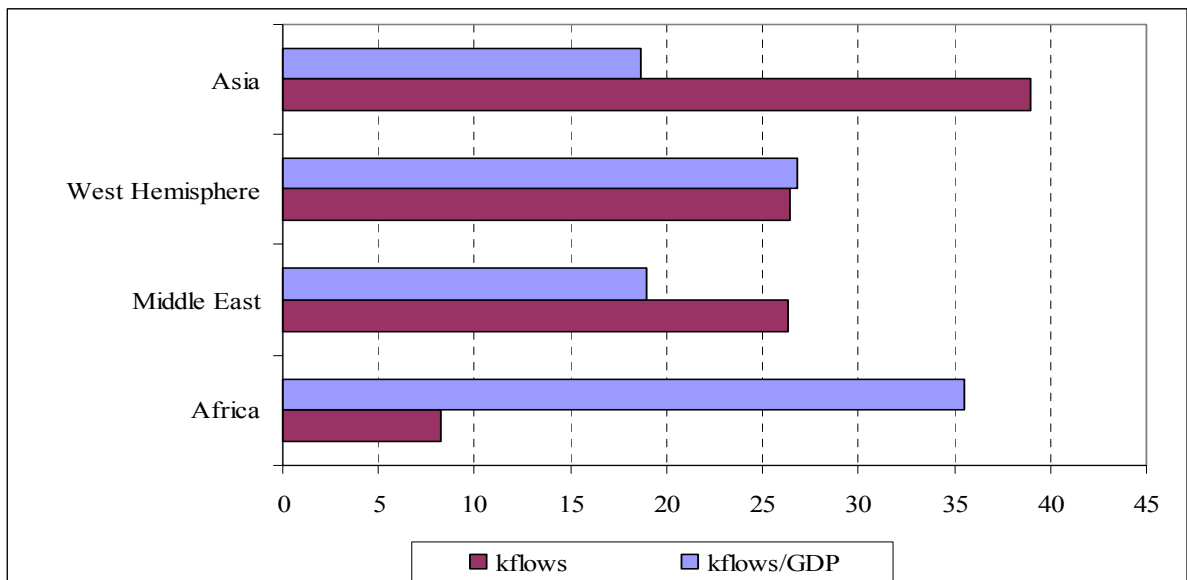
If we analyze the same figures within country groups, the ranking changes radically when comparing volatility in absolute terms with volatility as percentage of GDP. Among industrial countries, volatility in the G-7 countries measured in absolute (dollar) terms accounts for a higher share of the total. This would imply that these countries are the most vulnerable to balance of payment crisis, more than other industrial economies. In contrast, the opposite result is obtained when volatility is measured in relation to GDP. That is, smaller industrial countries would appear to be significantly more vulnerable to crises. This result also holds when we measure volatility for both exports and capital flows (Figure 4).

**Figure 4. Volatility of Net Capital Flows (1990-2003)
(Industrial Countries, in shares)**



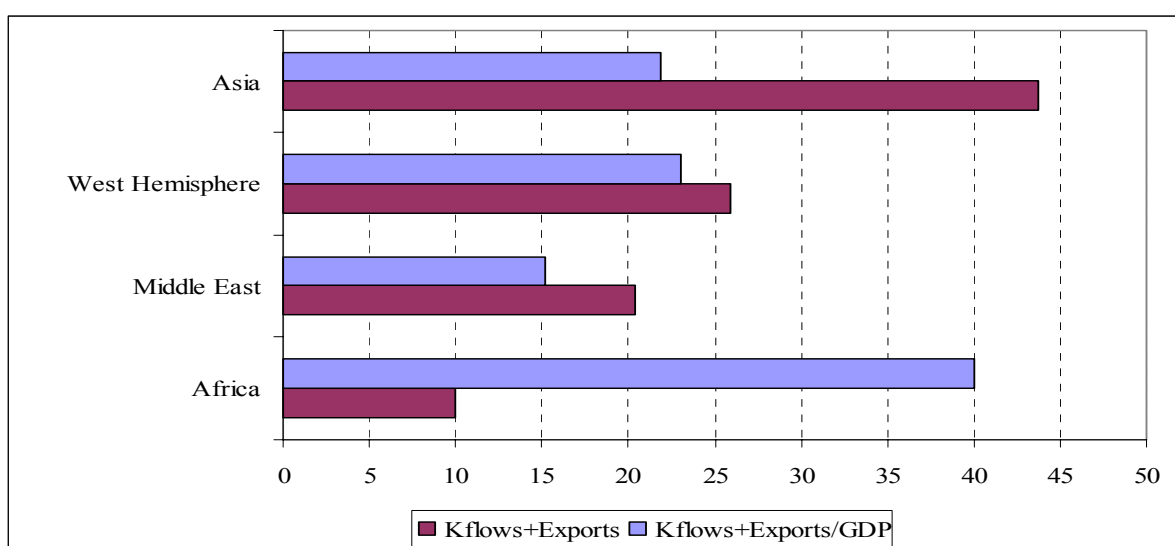
Measuring volatility in absolute terms and comparing the ranking within developing economies results in Asian countries being the most vulnerable, followed by Middle East, the Western Hemisphere and Africa. In contrast, when volatility is measured as a share of GDP, Africa appears as the most vulnerable region, followed by the Western Hemisphere, Middle East and Asia (Figure 5).

**Figure 5. Volatility of Net Capital Flows (1990-2003)
(Developing Countries, in shares)**



The same result holds when computing volatility of both exports and capital flows altogether, as a proportion of GDP. In particular, when exports are included in the measurement of volatility, total volatility for Africa and the Western Hemisphere increases considerably, reflecting the fact that these economies are the most affected by volatility of commodity exports (Figure 6).

**Figure 6. Volatility of Net Capital Flows and Exports (1990-2003)
(Developing Countries, in shares)**



Conclusions

The introduction of volatility of capital flows as a new variable in the quota formula, in addition to export volatility, is necessary in order to take into account countries' vulnerabilities to financial crises and capital account shocks. The proposal to include this variable has gain a broad support among IMF Board members in recent quota reviews as well as among G-24 Ministers.

In response, recent IMF staff publications have included capital flows volatility as a new variable by computing volatility in dollar denominated flows as a deviation from countries' 3-year moving average trend. This measure does not fully capture the

vulnerabilities explained above, as it does not take into account the differential macroeconomic impact of volatility among developing and industrial countries. In particular, fluctuations in capital flows of a given dollar amount implies a greater real adjustment for developing countries since capital flows to these countries represent a larger share of their economies. In addition, capital flows to those countries tend to be more volatile. For example, sudden stops and financial crises are more frequent among developing countries, and also have a more severe negative macroeconomic impact.

The differential macroeconomic effects of volatility in capital flows among developed and developing countries can be better addressed through a variable that relates volatility to the relative size of the economy. This would better capture the potential changes in the countries' financing needs resulting from variations in capital flows.

This paper proposes to measure total volatility in exports and capital flows as a proportion of GDP. Such measures would capture better the economic burden arising from fluctuation in capital flows and commodity prices. For example, when the impact of capital flows' volatility is computed as a percentage of GDP, the volatility experienced by developing countries is much higher. Within country groups, volatility measured as a proportion of GDP, is higher for small industrial countries than for G-7 countries. Among developing countries, African countries appear as the most vulnerable group, followed by the Western Hemisphere, Middle East and Asian countries. In addition, if we measure total volatility in exports and capital flows, the same result holds for industrial and developing countries. Among developing countries, African countries and Latin America are the most vulnerable, with total volatility being higher than that of the rest of the countries.

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APPENDIX I

THE FIVE EXISTING QUOTA FORMULAS¹⁸

Computation of calculated quota shares under the status quo is a complex process that reflects the evolution of quota formulas. The current five formulas, used from the Eighth to the Eleventh Reviews, are:

$$\begin{aligned} \text{Bretton Woods:} & \quad Q_1 = (0.01Y + 0.025R + 0.05P + 0.2276VC) (1 + C/Y); \\ \text{Scheme III:} & \quad Q_2 = (0.0065Y + 0.0205125R + 0.078P + 0.4052VC) (1 + C/Y); \\ \text{Scheme IV:} & \quad Q_3 = (0.0045Y + 0.03896768R + 0.07P + 0.76976VC) (1 + C/Y); \\ \text{Scheme M4:} & \quad Q_4 = 0.005Y + 0.042280464R + 0.044 (P + C) + 0.8352VC; \\ \text{Scheme M7:} & \quad Q_5 = 0.0045Y + 0.05281008R + 0.039 (P + C) + 1.0432VC; \end{aligned}$$

where:

Q_1, Q_2, Q_3, Q_4 and Q_5 = calculated quotas for each formula;

Y = GDP at current market prices for a recent year;

R = twelve-month average of gold, foreign exchange reserves, SDR holdings and reserve positions in the IMF, for a recent year;

P = annual average of current payments (goods, services, income, and private transfers) for a recent five-year period;

C = annual average of current receipts (goods, services, income, and private transfers) for a recent five-year period; and

VC = variability of current receipts, defined as one standard deviation from the centered five-year moving average, for a recent 13-year period.

For each of the four non-Bretton Woods formulas, quota calculations are multiplied by an adjustment factor so that the sum of the calculations across members equals that derived from the Bretton Woods formula. The calculated quota of a member is the higher of the Bretton Woods calculation and the average of the lowest two of the remaining four calculations (after adjustment).

¹⁸ This Appendix is from IMF, 2004, pp. 9.

APPENDIX II

**Table A1. Variability of Net Capital Flows¹ (1990-2002)
(Shares)**

	Variability	
	Net Capital Flows (US\$ billions, share of total)	Net Capital Flows / GDP (in per cent, share of total)
Advanced Economies	59.1	6.5
Major Industrial	41.8	0.8
<i>Of Which U.S.</i>	18.8	0.1
Other Industrial	17.2	5.7
Developing	33.4	78.8
Africa	3.1	30.3
Asia	11.8	10.8
Middle East	10.5	22.2
Western Hemisphere	8.0	15.5
Transition economies	7.6	14.7
	100.0	100.0

Source: IMF, International Financial Statistics.

Note: Includes all the countries where data is available.

¹ Standard Deviation from centered 3-year trend. Shares represent the regional distribution of the volatility in dollar terms and as percentage of GDP.

**Table A2. Variability of Net Capital Flows and Current Receipts¹ (1990-2002)
(Shares)**

	Variability	
	Current Receipts + Net Capital Flows (US\$ billions, share of total)	(Current Receipts+ Net Capital Flows) / GDP (in per cent, share of total)
Advanced Economies	61.2	7.7
Major Industrial	43.5	0.7
<i>Of Which U.S.</i>	20.9	0.1
Other Industrial	17.6	7.0
Developing	31.1	72.4
Africa	3.7	32.0
Asia	12.6	12.3
Middle East	7.2	15.0
Western Hemisphere	7.5	13.0
Transition economies	7.8	19.9
	100.0	100.0

Source: IMF, *International Financial Statistics*.

Note: Includes all the countries where data is available.

¹ Standard Deviation from centered 3-year trend. Shares represent the regional distribution of the volatility in dollar terms and as percentage of GDP.