The world distribution
of external imbalances:
revisiting the stylised facts

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The purpose of this paper is to cast a new light on the present state of global current account imbalances.

As a first step, we compute the world distribution of current account balances, in order to highlight its historically-unprecedented pattern, both in terms of the size of imbalances, its persistence, or the number of countries involved.

The 1987 episode of current account imbalances primarily reflected the USA deficit (the distribution of world ex-USA current account balances sample had a normal shape) and its unwinding was somewhat disruptive and occurred over a short period: two years later, the reduction of the USA current account deficit naturally led to the vanishing of global imbalances.

By contrast, the present episode is the result of more widespread national imbalances across the world. Although its deficit ranks first in absolute terms, the USA is only one among many actors of present imbalances, along with oil exporting countries and Asian exports-led economies on the surplus side. As a matter of fact, the world distribution of current account balances has flattened dramatically over the last decade. An interesting aspect of this flattening trend is that it is not only driven by developments in the USA and China. Indeed, the flattening of the distribution shows up even when the USA, or both the USA and China are excluded. It therefore strikes us as a deeper phenomenon reflecting the fact that the range of current account balances (as a share of GDP) is widening. One of the main conclusions of this paper is that whereas a balanced current account used to be the norm, recording current account imbalances have now become the rule rather than the exception.

The two following steps of this paper aim at explaining current account imbalances: first through an investment-saving approach and second through a financial account balance approach.

Current accounts reflect the national accounting imbalances between saving and investment. We investigate whether global imbalances stem from a shift in the world distribution of saving or in the world distribution of investment by computing the said distributions. The purpose of this approach is to help identify the respective contributions of a "saving glut" (Bernanke, 2005) and the "investment restraint" (Rajan, 2006) in the build-up of global imbalances. The world distribution of investment rates does not exhibit any striking change from an historical perspective whereas the world distribution of saving rates has spread out, more specifically over the last decade. Changes in the world distribution of saving rates therefore seem to have contributed more to ongoing global imbalances than shifts in the distribution of investment rates.

We then turn to the balance of payments approach. In most countries, the main counterpart of the current account balance is the financial balance (i.e. the capital account plays a minor role in most countries). We investigate the world distribution of each of the financial balance components (primarily direct investments, portfolio flows and reserve asset flows) in order to determine which ones may account for growing global imbalances. The most striking development is the flattening of the distribution of portfolio flows: we highlight this phenomenon as a key stylised fact of financial globalisation.

The concern expressed by policymakers and part of the academic literature over "global imbalances" has largely focused on the size and persistence of the USA current account deficit, and the resulting large and growing external position of the USA, which is often deemed to be of systemic importance. However, opposing views remain firmly entrenched on several aspects of the issue: the "stylised facts"; the true causes of this state of the world economy; its sustainability.

Backus *et al.* (2006) questioned the claim that the USA external deficit was "unprecedented" from a historical and cross-country perspective. We take a broader view of global imbalances by examining the world distribution of current account balances. In order to document the magnitude of imbalances, we look at changes in that distribution, weighting each country by its share of the world GDP. We use non-parametric estimates for the sample of countries in the IMF database. It appears that the 2006 situation is indeed unprecedented in the last quarter of century, not only in terms of the USA deficit, but also in terms of the global distribution of imbalances. The world distribution of current account balances has been steadily drifting away from "normality" since 1997. Namely, it has become bimodal, and it has flattened dramatically. Such a flat distribution is especially striking compared to the previous episode of large USA current account deficit (that episode reached its peak in 1987 before a disorderly unwinding).

The literature explaining global imbalances is abundant and meticulous observers count no less than eleven alternative explanations (Roubini, 2007). However, as highlighted by the ECB (2007), the debate largely revolves around the respective roles of cyclical *versus* structural factors. More specifically: one view argues that cyclical policies may have played a role in bringing about a saving shortage in the US; another view emphasizes the role of asymmetric growth potentials and/or market structures in generating current account imbalances as an equilibrium outcome, which could therefore be considered efficient in some sense. A consensus view acknowledges that a combination of factors is required to understand the full picture. As summarised by Blanchard (2007) the consensus is that global imbalances result from a combination of low savings in the USA, high saving in Asia and investors' preference for USA financial assets.

We therefore investigate first the world distribution of saving rates and investment rates. Examining the time-path of these distributions enables us to take a stand in the debate regarding the respective role of the "saving glut" (Bernanke, 2005), and that of the "investment restraint" (Rajan, 2006).

Because current account balances by definition reflect financial flows, one cannot help noticing that the spreading out of current account imbalances has taken place over a period of fast global financial integration and innovation, even though financial market deepness has remained extremely uneven between mature economies and emerging markets. The USA is of course the largest market (with USD 50 trillion in financial assets).

An important body of the international macroeconomics literature has focused on the financial account as the driving force of balance of payments dynamics. The main common feature of this literature is that it emphasizes the macroeconomic consequences of microeconomic market imperfections that are frequently related to liquidity issues, primarily: the ability of various economies to supply liquid assets, and the role played by liquidity/borrowing constraints. In a previous paper (Baclet and Vidon, 2008), we provided an overview of such liquidity related explanations of global imbalances.

As a matter of fact, the importance of net portfolio inflows has grown over time as a funding channel for the USA current account deficit, in line with the increase of that deficit. In this paper we therefore investigate the world distribution of net portfolio inflows as a percentage of GDP, which can be seen as one of the major counterparts to the current account imbalances. The increase in the size of net portfolio flows as a share of GDP is especially striking in the USA.

More generally, inspecting the evolution over time of the global distribution of portfolio flows enables us to draw some conclusions regarding the nature of the most recent stage of financial globalisation.

The remainder of the paper is organised as follows: the first part documents the patterns of current account balance distributions. The second and third parts concentrate respectively on the investment-saving approach and the financial balance approach of global imbalances.

1| Some stylised facts of global imbalances

1|1 1980-2007: The world distribution of current account imbalances in perspective

To what extent is the present episode of current account imbalances unprecedented?

We characterise the present state of global imbalances by documenting the world distribution of current account balances and its evolution over time. We use non-parametric estimation methods for the sample of countries in the IMF database (see Annex for more details on the method and on the robustness of the density estimates). We assess the magnitude of today's imbalances by looking at changes in the distribution between 1980 and 2007.

One could go about plotting the distribution of external imbalances as a percentage of GDP by giving equal weight to each country. This method is used in Chart 1 —A. While this approach reveals interesting changes over time in the dispersion of current account deficits and surpluses, its obvious drawback is to provide us with a picture of global imbalances that gives equal weights to countries of very different sizes. Yet the US current account deficit matters for the world distribution of imbalances because the USA accounted for more than 25% of world GDP at current exchange rates.

Alternatively, one can compute the distribution of current account imbalances as a percentage of world GDP. This method is used in Chart 1 —B. While this approach takes into account the various size of surplus/deficit economies with respect to the global economy, it is not the most relevant in terms of sustainability. The question of the sustainability of the USA current account deficits stems from the fact that it amounted to 6.2% of USA GDP in 2006, not from the fact that it represented 1.7% of world GDP.

Chart 1: Unweighted distributions of current account balances

A: as a share of national GDP

B: as a share of world GDP

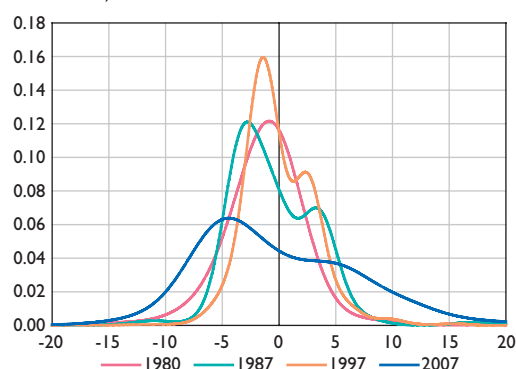Legend: — 1980 — 1987 — 1997 — 2007
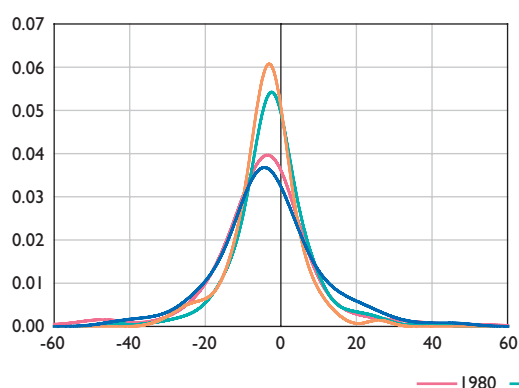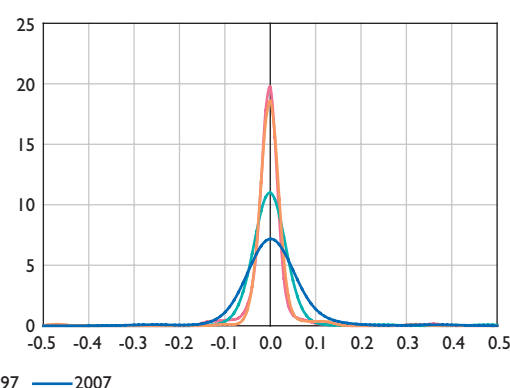
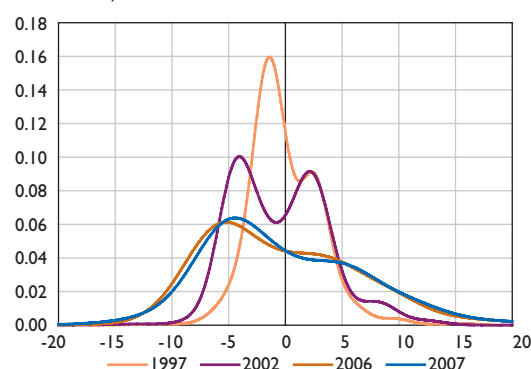*Sources: WEO, authors' calculations.*
Note: Parameters: the optimal bandwidth is computed with the Simple Normal Reference (SNR) method, bandwidth multiplier = 1, range: -100;100 with 2001 points for Chart 1 —A— and -20;20 with 401 points for Chart 1 —B— (see Annex).

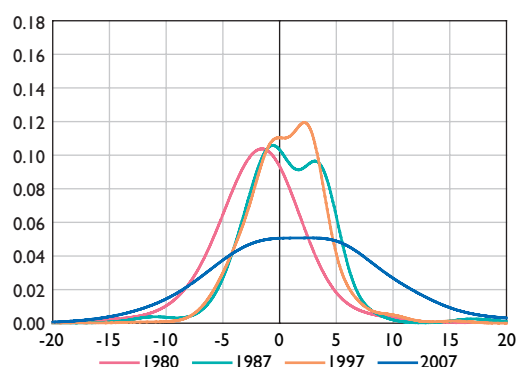**Chart 2: Weighted distributions of current account balances**
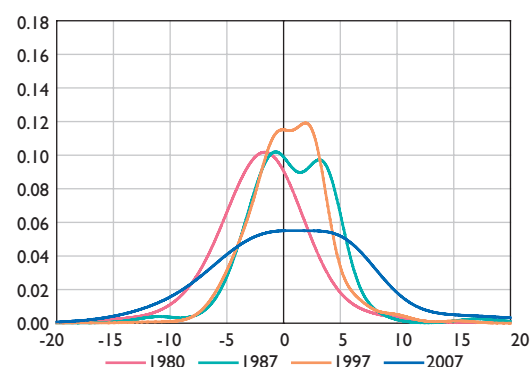
A: 1980-2007, all countries

Legend: 1980 1987 1997 2007

B: 1997-2007, all countries

Legend: 1997 2002 2006 2007

C: without the USA

Legend: 1980 1987 1997 2007

D: without the USA and China

Legend: 1980 1987 1997 2007

Sources: WEO, authors' calculations.
Notes:
• Current accounts are measured as a percentage of national GDP and each country is weighted by its share in the world GDP. Parameters: the optimal bandwidth is computed with the Simple Normal Reference (SNR) method, bandwidth multiplier = 1, range -20-20, 401 points (see Annex).
• In Chart 2 —B and C, countries are weighted by their share in the world economy (e.g. including the USA and China).

We argue that a more accurate picture of global imbalances is provided by estimating the world distribution of current account measured as a share of national GDP, weighing each country by its share of the world GDP. This method is used in Chart 2. This weighted distribution approach reveals striking changes in the nature of international current account imbalances over time.

It thus appears that the situation reached in 2006-07 is indeed unprecedented over the last quarter of century, not only in terms of the USA deficit, but also in terms of the global distribution of imbalances. The world distribution of current account balances has been steadily drifting away from "normality" since 1997.[1] Namely, it has become bimodal, and it has flattened dramatically. Such a flat distribution is especially striking compared to the previous episode of large USA current account deficit (that episode reached its peak in 1987 before a disorderly unwinding that eventually led back to normality). The flattening of the distribution suggests that the range for current accounts as a percentage of GDP has widened over the last years and that the world is now able to face persistent, widespread imbalances that are not specific to some countries. A 3-dimensional view focusing on the last decade emphasizes this last pattern (see Chart 3).

[1] In principle, the surface below the distribution of current account balances in a given year should sum to zero. In practice, it is not exactly the case in the data, because of statistical discrepancies.

Chart 3: Change in the distribution of current account imbalances

*(Density weighted by country share of world GDP)*
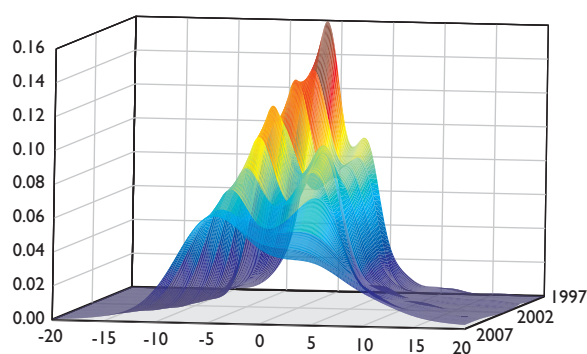
Sources: WEO, author's calculations.

Does the flattening of the distribution reflect a rise in variance or have the tails of the distribution become fatter? Has the distribution become more asymmetric? In order to quantify the drivers of changes in the shape of the distribution we compute the time-profile of the variance, the skewness and the kurtosis of the distributions. While we computed these moments for both for the sample distribution and the estimated distribution, we prefer to present sample moment, excluding only extreme values that correspond to statistical aberrations rather than macroeconomic realities.

The results are presented in Chart 4. The main feature regarding the evolution of the current account distribution over the last decade is an increase in variance. The skewness of the distribution has been relatively stable over the period (or at least does not exhibit any remarkable trend). The kurtosis exhibits a spike in the early 2000s.

Chart 4: Summary statistics for current account distributions
All countries, excluding the USA, excluding the USA and China

A: mean
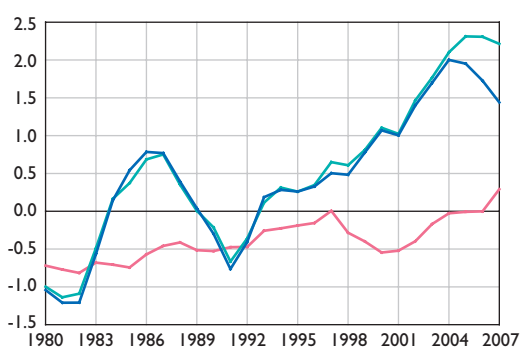
B: variance
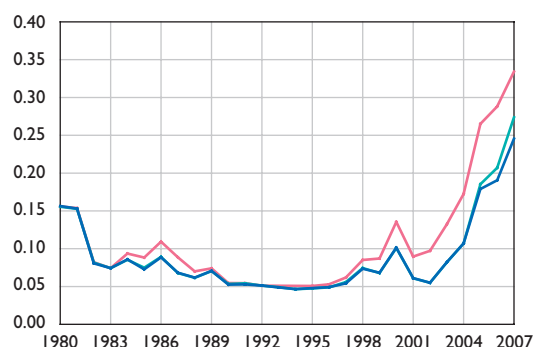
C: skewness
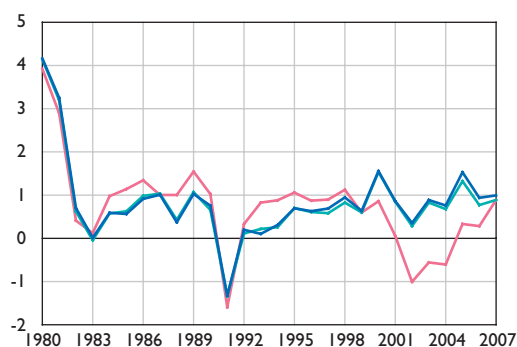
D: kurtosis
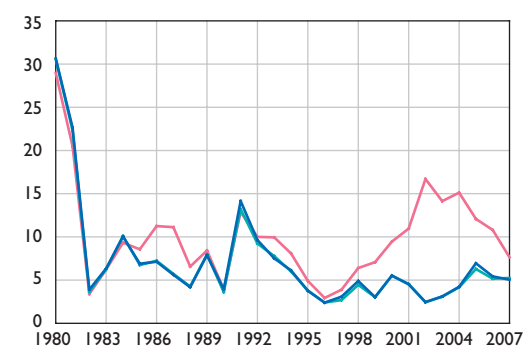
Sources: WEO, authors' calculations.
Notes:
• *Each variable is measured as a percentage of national GDP and each country is weighted by its share in the world GDP.*
• *We exclude extreme values (for instance Kuwait current account deficit reached 250% of GDP in 1991) which may affect statistics values.*

1|2 Are global imbalances really global?

Excluding the United States from the sample provides a benchmark in order to compare the 1987 episode with the current situation. Comparing Chart 2 —A and C— shows that the United States were largely responsible for the lopsided distribution of current accounts in 1987. This in turn explains why the United States experienced a disruptive adjustment. Indeed, the shape of the distributions computed without the United States did not evolve much between 1980 and 1997, with balances being closely distributed around zero. However, the flattening of the distribution since 1997 is robust to the exclusion of the United States, suggesting that the worsening of the USA current account deficit is not sufficient to fully account for the flattening of the distribution.

Removing China from the sample (in addition to the US) does not change much the shape of the distribution especially during the 1980's and the 1990's when China did not weigh much in the world GDP. The increasing Chinese current account since 2000 emphasises the impact of excluding China from the sample in particular by eroding the right hand side distribution for 2007 (see Chart 2 —D).

Again, while the 1980, 1987 and 1997 densities are relatively similar and closely distributed around a balanced current account, the 2007 distribution ex USA and China is flatter. The flattening of the distribution over the last decade does not reflect the impact of one or two countries but rather the widening of the range of most plausible current account balances as a percentage of GDP.

Summary statistics unveil some very interesting features. First, excluding the USA from the sample of course impacts the mean of the current account distribution. Beyond that, excluding the USA and China from the sample reduces the variance and the kurtosis, especially since 2000.

2| "Saving glut" or "investment restraint"?

On a national accounting basis, the current account measures the difference between the saving rate and the investment rate and the following relation holds:

$$CA = S - I$$

either as nominal values or as percentage of GDP. Global imbalances reflect the fact that countries with excess saving over investment (*i.e.* with current account surpluses) export capital towards countries with a deficit of saving over investment (*i.e.* with current account deficits).

The flattening of the world distribution of current accounts implies that a growing set of countries have experienced current account deficits thus allowing a growing number of countries to run current account surpluses (and conversely). Does this phenomenon stem from a shift in the distribution of saving rates (the saving glut hypothesis) or from a shift in the distribution of investment rates (the investment restraint hypothesis)?

## 2|1 Global distributions of saving and investment rates

The 2007 saving rates distribution displays an atypical shape compared with past distributions (see Chart 5). More precisely, the saving rates distribution remained very similar between 1980 and 1997, yet by 2006 the distribution had become strikingly different as a result of its flattening. The rightmost bump in the 1980s corresponds to Japan, whereas the recent fat tail to the right is the result of the extremely high Chinese saving rate.

Chart 5: World distribution of saving and investment rates

A: saving rates
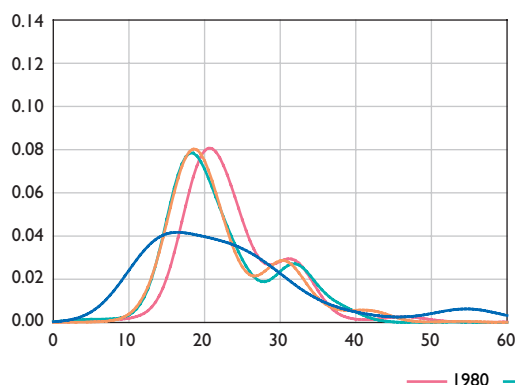
B: investment rates
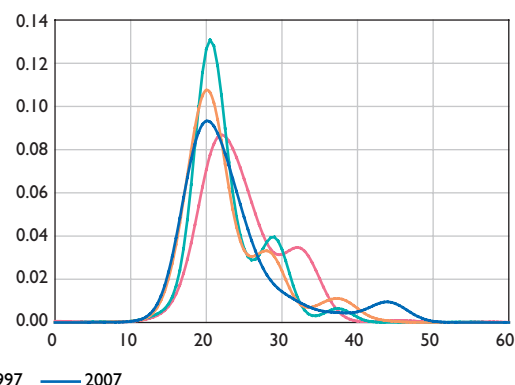
Sources: WEO, authors' calculations.
Notes: Saving and investments rates are measured as a percentage of national GDP and each country is weighted by its share in the world GDP.
Parameters: the optimal bandwidth is computed with the Simple Normal Reference (SNR) method, bandwidth multiplier = 1, range [0;100],
201 points (see Annex).

By contrast, the investment rates distribution does not exhibit the same degree of flattening over time (see Chart 5). Like for saving rates, the rightmost bump in the 1980s corresponds to Japan, whereas the fat tail to the right over the last decade corresponds to high investment rates in China.

The spreading out of the current account balance distribution therefore appears to stem primarily from a shift in the world distribution of saving rates rather than from a shift in the distribution of investment rates. In other words, the analysis of these distributions supports the saving glut hypothesis.

Summary statistics provide a more detailed portrait of these trends. The evolution over time of the saving rate distribution is characterised by a rise in its variance and a decrease in its kurtosis. The range of saving rates has widened over time, rendering extreme values less atypical (decrease in the kurtosis). Meanwhile, the evolution of the investment rate distribution is characterised by a rise in the skewness and in the kurtosis. The investment distribution is more and more asymmetric with more and more extreme values.

The last decade is therefore primarily characterised by a change in the saving rate distribution, reflecting an increase in its variance. By contrast, while the variance of the investment rate distribution has increased over the same period, it has remained in line with historical precedents. The evolution in the variance of saving and investment rates distributions therefore suggests that changes in saving patterns over the last decade are responsible for the increased variance of the current account distribution.

2|2 Conditional distributions

We now proceed with an analysis of investment and saving rates distributions for countries recording current account surpluses and countries recording current account deficits.

The 1980s current account imbalances were essentially North-North imbalances and were the consequences of divergent macroeconomic policies implemented in the major industrialized countries. In the first half of the 1980s, both the saving and investment rates of countries running a current account deficit decreased. The distribution of saving rates was relatively stable between 1987 and 1997 and then resumed its shift towards lower rates, driven especially by the decrease in the USA saving rate.

**Chart 6: World distribution of saving and investment rates
for countries running a current account deficit**

A: saving rates
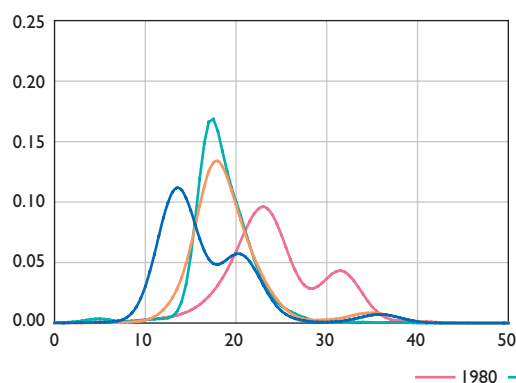
B: investment rates
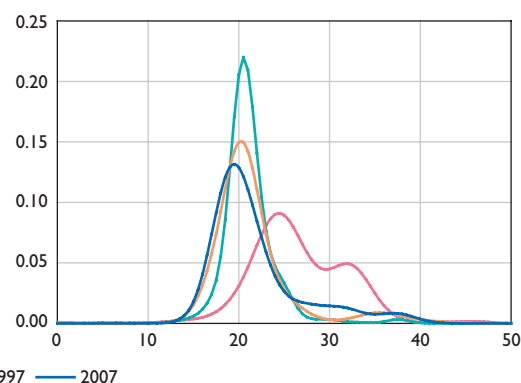
1980 — 1987 — 1997 — 2007
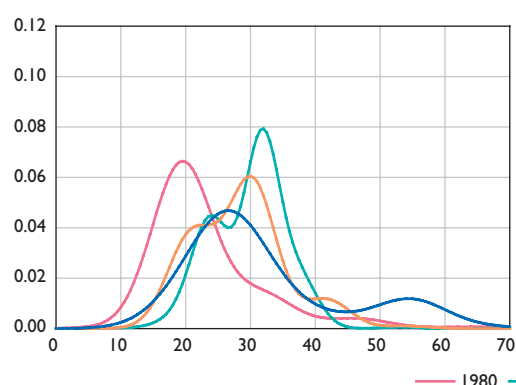
Sources: WEO, authors' calculations.
Note: Saving and investments rates are measured as a percentage of national GDP and each country is weighted by its share in the world GDP.
Parameters: the optimal bandwidth is computed with the Simple Normal Reference (SNR) method, bandwidth multiplier = 1, range [0;100],
201 points (see Annex).

By contrast, the distribution of investment rates is strikingly stable since 1987, except for its emerging right-tail. Therefore, over the last decade, changes in the distribution of current account deficit countries essentially stemmed from a change in the distribution of their saving rates. Yet these countries have also been characterised by a rise in the kurtosis of both saving and investment rates distributions.

Shifts in investment and saving rates distribution for countries with current account surpluses are more difficult to interpret (see Chart 7). In the early 1980s, surpluses were mainly located in countries with relatively low investment and saving rates, such as Japan. By 1987, and until 1997, surpluses had shifted to a large extent to countries with higher saving and investment.

**Chart 7: World distribution of saving and investment rates
for countries running a current account surplus**

A: saving rates

B: investment rates
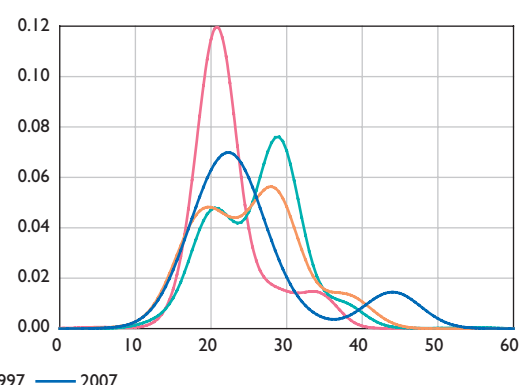
1980 — 1987 — 1997 — 2007

Sources: WEO, authors' calculations.
Note: Saving and investments rates are measured as a percentage of national GDP and each country is weighted by its share in the world GDP.
Parameters: the optimal bandwidth is computed with the Simple Normal Reference (SNR) method, bandwidth multiplier = 1, range [0;100],
201 points (see Annex).

In 2007, saving and investment rates are more evenly distributed among surplus countries, with the exception of China which is responsible for the bumps on the right hand side of the distributions, slightly above 50% for the saving rate and above 40% for the investment rate.

The variance and skewness of both investment and saving rate distributions have increased, especially over the last decade. Therefore, the time path of investment and saving distributions for current account surpluses countries is mainly characterised by an increase in variance.

3| Portfolio flows, direct investment and global imbalances

3|1 The financial balance and its components

In terms of balance of payment accounting, the financial balance is the main counterpart to the current account. The difference between the two is the capital account (which most of the time is very small) and statistical discrepancies. Therefore a current account deficit must be offset by capital inflows, *i.e.* a positive financial balance.

In IMF data, the financial balance is split between four different kinds of capital flows:
• direct investment flows, net;
• portfolio flows, net. These are to a large extent private flows. However, for countries with reserve currency status, inflows also include net foreign official assets held by other countries (*e.g.* government securities); portfolio outflows also include government assets other than official reserve assets;
• other capital flows, net;[2]
• reserve assets.

For the first three items, the distinction between capital inflows and capital outflows is available. A net flow is the difference between capital inflows and capital outflows. For example, net portfolio flows are the net of portfolio inflows (increased liabilities *vis-à-vis* rest of the world) and portfolio outflows (increased assets *vis-à-vis* rest of the world). A negative value of net portfolio flows means that portfolio investments flowing out of the country outpace portfolio investments into the country, resulting in an increase of net liabilities. Reserve asset flows are directly reported as net flows.

The following relation holds:

$$Financial\ Balance\ =\ Net\ Direct\ Investments\ +\ Net\ Portfolio\ Flows$$
$$+\ Net\ Other\ Investments\ +\ Net\ Reserve\ Asset\ Flows.$$

The total financial balance distributions are symmetric to the current account balance distributions (see Chart 8 —A and B) confirming that the financial balance is the main counterpart of the current account. In order to gain some further insight on the dynamics of the current account distributions, we investigate how the distributions of the financial balance components evolve over time.

In general, the shapes of every financial balance component's distribution have flattened over time, especially over the last decade. Among them (see Chart 8 —C, D, E and F), the shape of the portfolio investment flows densities shows the most striking evolution. The dramatic flattening of the portfolio investment flows reflects a widening of the support of net portfolio flows (as a percentage of GDP) in the world, which has occurred in two stages, first in the 1980s, until 1987. The trend was partly reversed in the following years, but resumed

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2   *Other capital inflows (respectively outflows) include liabilities to (resp. claims on) unaffiliated foreigners reported by country non-banking concerns and country liabilities (respectively claims) reported by banks, not included elsewhere.*
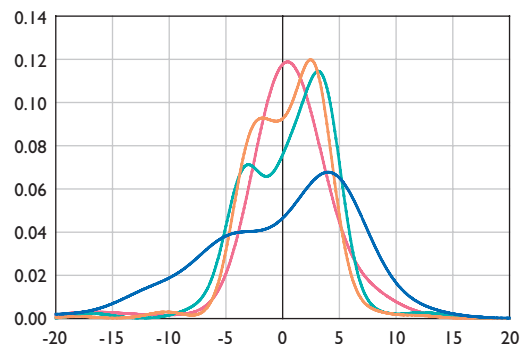
Chart 8: World distributions of financial balances and components
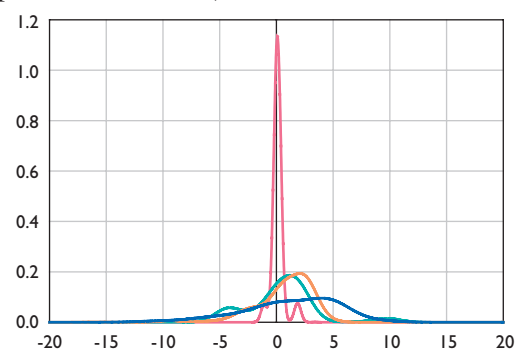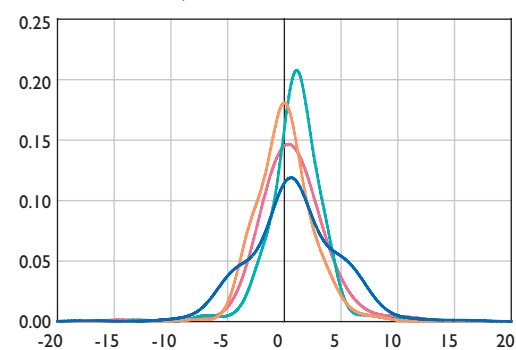1980-2007

(BWM = 1)

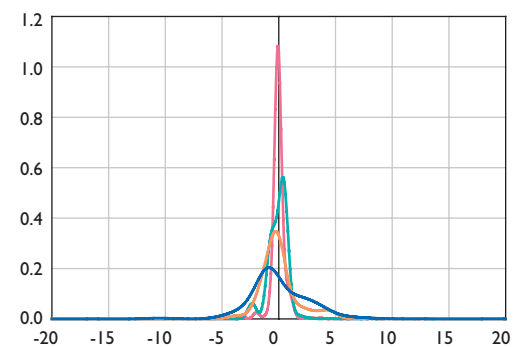**A: current account**
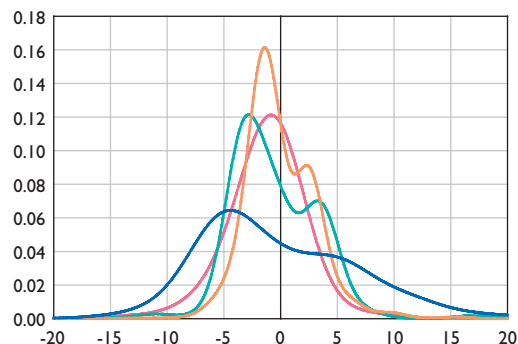
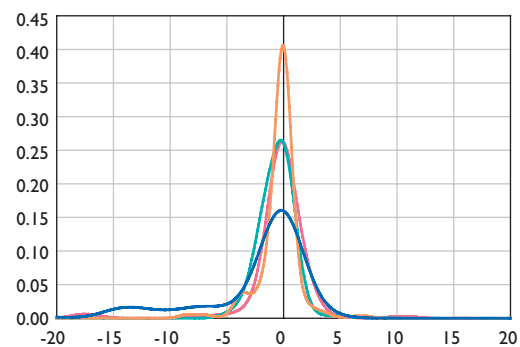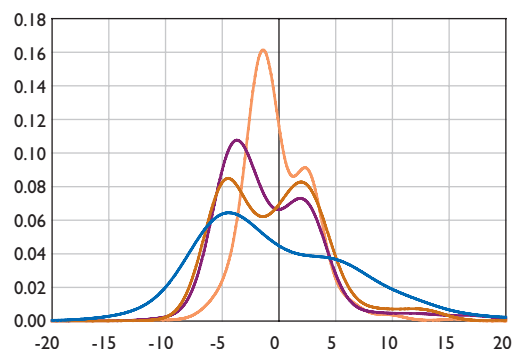**B: financial balance**

C: portfolio investment, net

D: other investment, net

E: direct investment, net

F: reserve assets

— 1980 — 1987 — 1997 — 2007

Sources: WEO, authors' calculations
Note: Each variable is measured as a percentage of national GDP and each country is weighted by its share in the world GDP. Parameter: the optimal bandwidth is computed with the Simple Normal Reference (SNR) method, bandwidth multiplier = 1, range -100;100, 2001 points (see Annex).

after 1990. This spreading out of portfolio investment flows as a share of GDP is the main reason for changes in the shape of the financial balance distribution.

By contrast, the changes in the direct investment distributions occurred (see Chart 8 —E— and 9 —E) to a large extent in the 1980s.
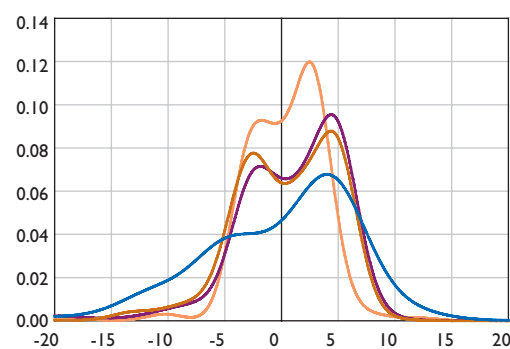
Chart 9: World distributions of financial balances and components
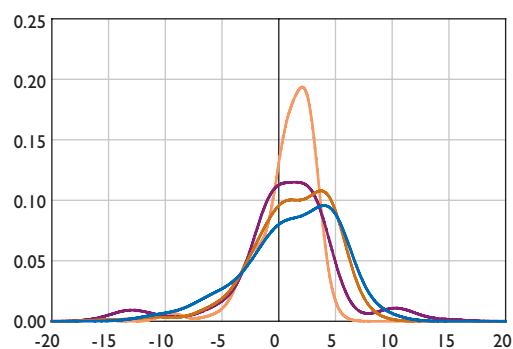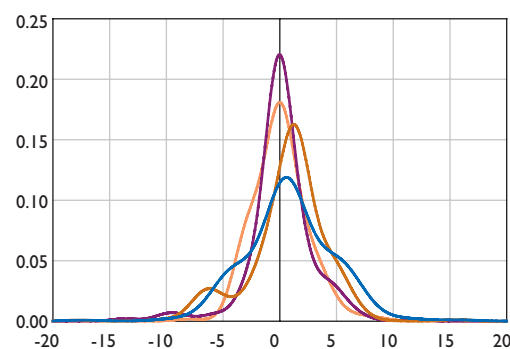1997-2007

(BWM = 1)

A: current account

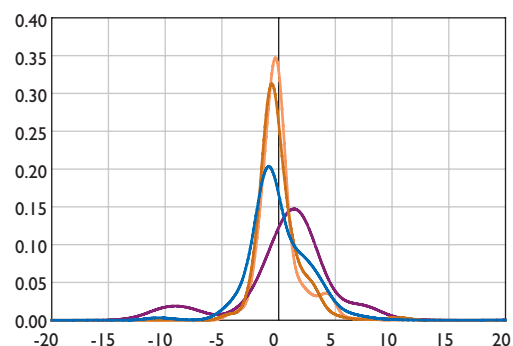**B: financial balance**

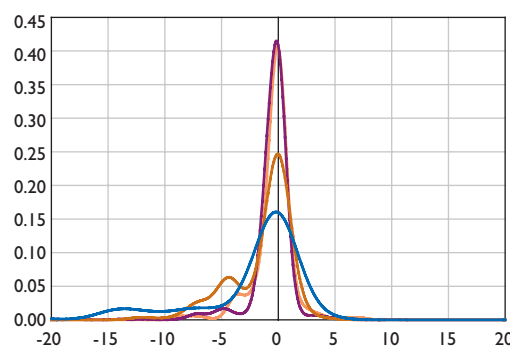**C: portfolio investment, net**

D: other investment, net

E: direct investment, net

F: reserve assets

— 1997 — 2000 — 2003 — 2007

Sources: WEO, authors' calculations.
Note: Each variable is measured as a percentage of national GDP and each country is weighted by its share in the world GDP. Parameters: the optimal bandwidth is computed with the Simple Normal Reference (SNR) method, bandwidth multiplier = 1, range -100;100, 2001 points (see Annex).

Finally, the reserve asset flow distribution (a negative value meaning that the country is hoarding reserves) is less concentrated and more asymmetric than it used to be. In particular it has exhibited more extreme values over the last few years, reflecting the acceleration in reserve hoarding in oil exporting countries and emerging Asian economies.

3|2 Summary statistics

The moments of the distributions provide us with a more precise depiction of those evolutions. Regarding the financial balance, the time-path of even moments is similar to that of the current account balance, and opposite in sign for odd moments (thus confirming that the financial balance is the main counterpart of the current account). Summary statistics regarding individual components of the financial balance are interesting in order to account for the spreading out of this distribution (see Chart 10).

Portfolio flows are on average inflows (except for the massive portfolio withdrawals in the aftermath of the 1997 financial crisis) whereas reserve assets accumulation increasingly accounts for outflows. Therefore, over the last decade, recorded portfolio inflows, especially in developed economies, are offset by steady official reserve hoarding in emerging economies.

Regarding the second moment, the variance of every component of the financial balance has increased. The variance of the portfolio investment flows distribution has steadily increased, especially over the last decade, while the variance of the reserve assets distribution has increased since 2001, reflecting the increasing pressure on emerging countries exchange rates and the ever increasing reserve accumulation.
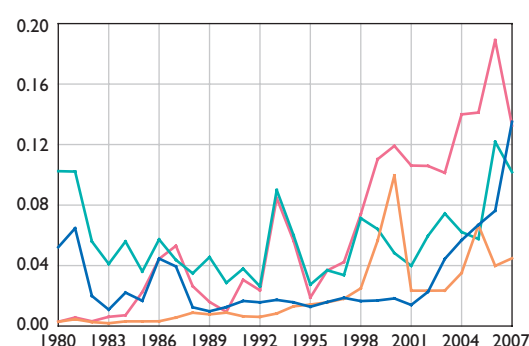
With respect to higher moments, we focus on changes in the distribution of portfolio flows and reserve assets. The reserve assets distribution shows increasingly negative skewness since the Asian crisis, which is consistent

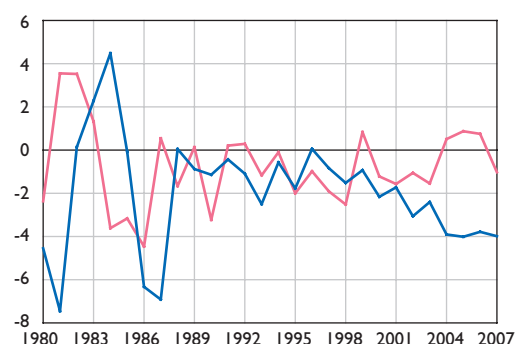**Chart 10: Summary statistics for the components of the financial balance**

A: mean
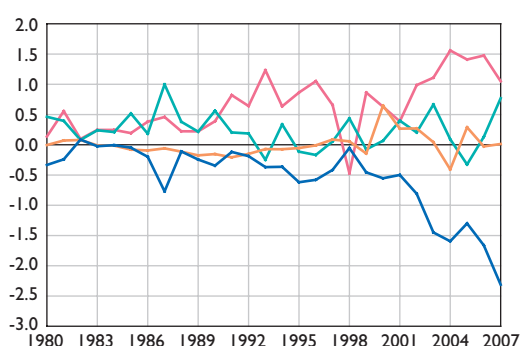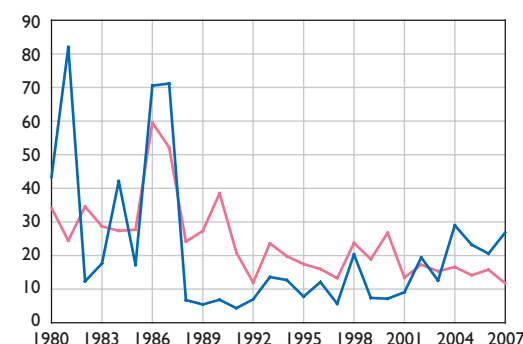
B: variance

C: skewness (PI et RA only)

D: kurtosis (PI et RA only)

PI: portfolio investment flows
DI: direct investment flows
OI: other investment flows
RA: reserve assets flows

Sources: WEO, authors' calculations.
Note: Each variable is measured as a percentage of national GDP and each country is weighted by its share in the world GDP.

with reserve accumulation behavior in many emerging economies. By contrast, the kurtosis of the portfolio inflows distribution has significantly declined since the 1980s.

In other words, whereas this distribution used to exhibit extreme values, it has gradually shifted into a high variance distribution, *i.e.* it now has a wider support (as a share of GDP) reflecting the increasing financial globalisation.
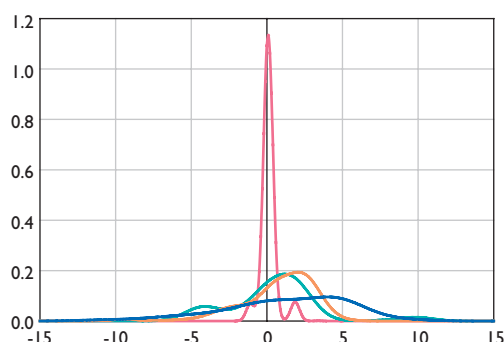
3|3 Focus on portfolio investment asset and liability flows

The main changes in distributions were recorded for portfolio investment flows and reserve asset flows. We therefore proceed with a more detailed analysis of gross portfolio investment flows, namely flows regarding portfolio investment liabilities and portfolio investment assets. This distinction does not exist for reserve assets: in that case a negative value corresponds to an increase in reserve assets, while a positive number represents a diminution of reserve assets.
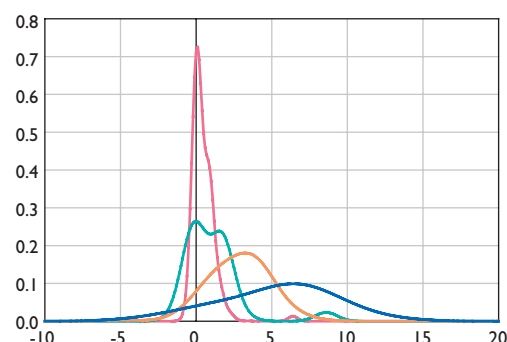
The breakdown between portfolio investments assets and liabilities flows strikes us as very informative given the increasing size of gross international flows.

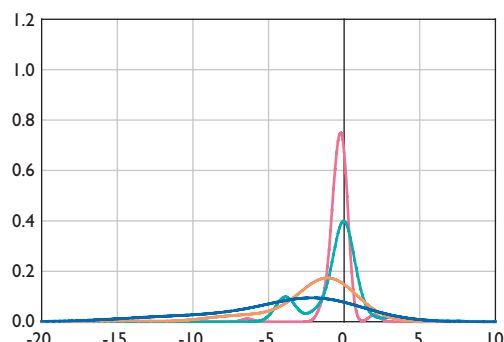**Chart 11: Distributions of gross portfolio investment flows**
1980-2007

Sources: WEO, authors' calculations.
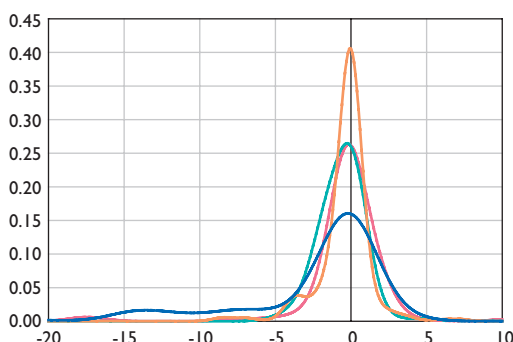Notes:
• Each variable is measured as a percentage of national GDP and each country is weighted by its share in the world GDP. Parameter: the optimal bandwidth is computed with the Simple Normal Reference (SNR) method, Bandwidth multiplier = 1, range -100;100, 2001 points (see Annex).
• Summary statistics are computed with the estimated densities of capital flows. Portfolio investment asset flows measure outflows, liability flows measure inflows while the net flows measure the difference between the two. A positive (respectively negative) net flow is an inflow (respectively outflow) of capital.

First, gross portfolio investment flow distributions have experienced since 1980 the same dramatic flattening as the distribution of net flows (see Chart 11 —A, B and C). A reversal similar to the one observed for net flows occurred after 1987, but the trend resumed thereafter. This evolution reflects a structural change in financial globalisation. The trend is all the more interesting as the reserve asset flows distribution does not exhibit such an evolution, even though the distribution is less concentrated than it used to be (see Chart 11 —D).

Another striking feature of these distributions has to do with the period between 1987 and 1997. The 1987 and 1997 net distributions look pretty much alike. However, the gross distributions reveal a different pattern. Whereas the 1987 asset and liability distributions show clear asymmetries (each distribution exhibits a bump, on the left (respectively right) hand side of the distributions for the asset (respectively liability) flows distribution), the 1997 distributions are more balanced. However, since 1997, the distributions have dramatically flattened (see Chart 12 —A, B and C). The decrease in the concentration of reserve asset flows is clear over the 1997 to 2007 period (see Chart 12 —D).

In order to better characterise the changes in the distributions shapes, we computed the moments of the distributions for net portfolio investment flows, for reserve asset flows and for their sum (the sum of portfolio

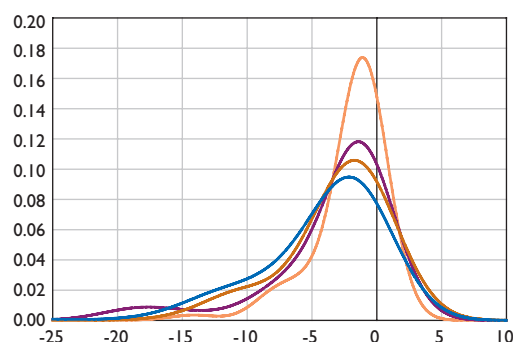**Chart 12: Distributions of gross portfolio investment flows**
1997-2007
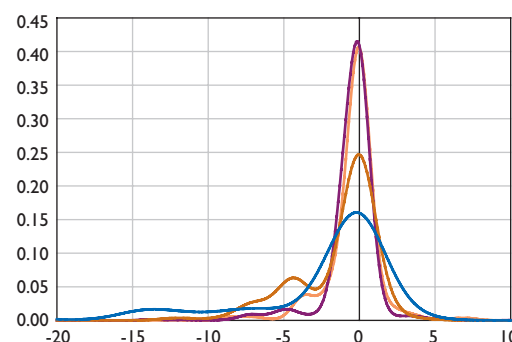
A: net portfolio investment flows
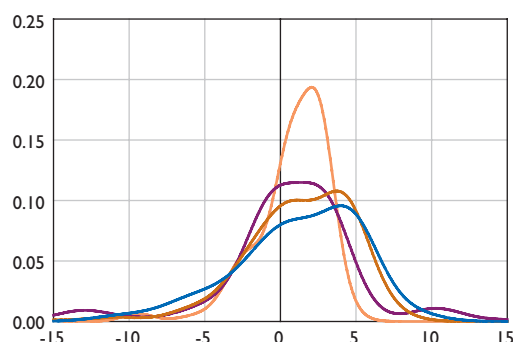
B: portfolio investment liabilities flows
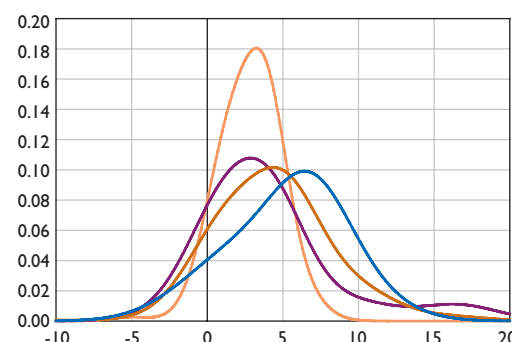
C: portfolio investment assets flows

D: reserve assets flows

—— 1997 —— 2000 —— 2003 —— 2007
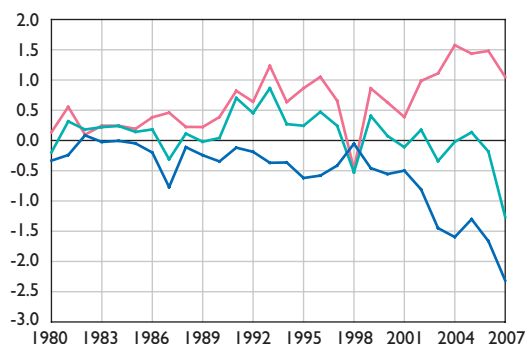
Sources: WEO, authors' calculations.
Notes:
• Each variable is measured as a percentage of national GDP and each country is weighted by its share in the world GDP. Parameter: the optimal bandwidth is computed with the Simple Normal Reference (SNR) method, Bandwidth multiplier = 1, range -100;100, 2001 points (see Annex).
*• Summary statistics are computed with the estimated densities of capital flows. Portfolio investment asset flows measure outflows, liability flows measure inflows while the net flows measure the difference between the two. A positive (respectively negative) net flow is an inflow (respectively outflow) of capital.*

Chart 13: Summary statistics for portfolio flows, reserve assets flows and their sum

A: mean

B: variance
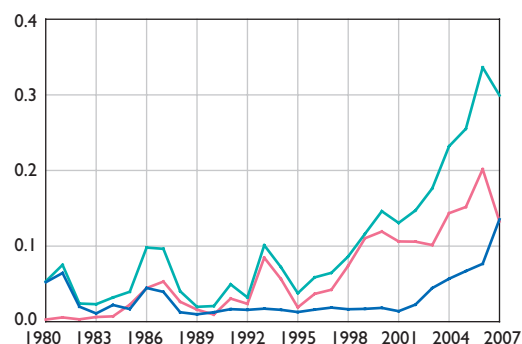
Sources: WEO, authors' calculations.
Note: Portfolio stands for portfolio investment flows, reserves for reserve assets flows and total for their sum.

investment flows and reserve asset flows is a good proxy for the global net portfolio flows since reserve assets consist most of the time in portfolio assets such as developed economies securities).

The mean of global flows is generally close to zero confirming that the sum of portfolio flows and reserve assets flows is globally balanced (see Chart 13 — A), although in 2007, reserve accumulation seems to have exceeded portfolio flows. The variance of the distribution has increased especially over the last decade, which has offset the decrease of the kurtosis. Again, this suggests that the world has switched from a state with extreme values to a state where the range of observed values has significantly widened.

Regarding the distributions of gross portfolio flows, gross portfolio capital flows have been growing in size since 1980 with acceleration since the first half of the 1990s. The variance of these flow distributions exhibits the same pattern (see Chart 14 — B), stable and a low level during the 1980s; it is characterised by an increasing trend since the beginning of the 1990s. However, the year 2007 appears as peculiar in that respect, showing a sharp decline in the variance of these flows, presumably as a result of the financial turbulences that started in the summer of that year, and the accompanying adjustment of the USA current account deficit financing.

Chart 14: Summary statistics for gross portfolio investment flows

A: mean
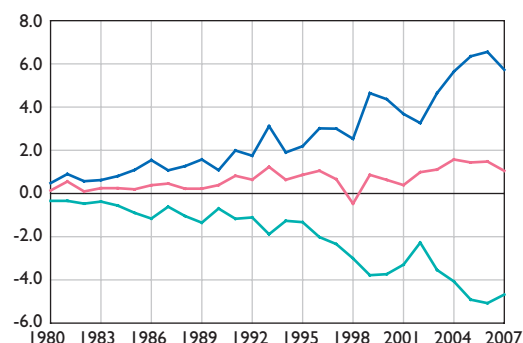
B: variance
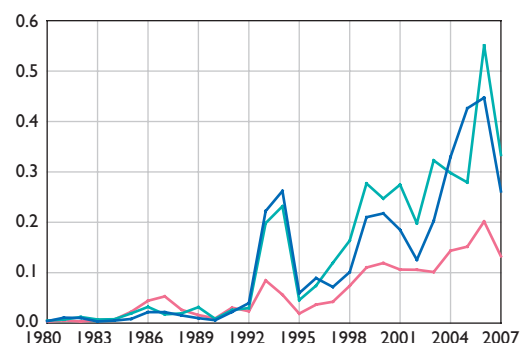
Sources: WEO, authors' calculations.
Note: Portfolio investment asset flows measure outflows, liability flows measure inflows while the net flows measure the difference between the two. A positive (respectively negative) net flow is an inflow (respectively outflow) of capital.

4| Conclusion

The main conclusions of this descriptive, empirical investigation of global imbalances are the following:

• the main feature regarding the evolution of the current account distribution over the last decade is an increase in variance: whereas a balanced current account used to be the norm, recording current account imbalances have now become the rule rather than the exception;

• the last decade is also characterised by a change in the world distribution of saving rates, primarily reflecting an increase in its variance. By contrast, while the variance of the investment rate distribution has increased over the same period, it has remained in line with historical precedents. This suggests that changes in saving patterns over the last decade are primarily responsible for the increased variance of the current account distribution;

• regarding financial balance components, the world distribution of portfolio investment flows shows the most striking evolution. Its dramatic flattening reflects a widening of the range of net portfolio flows (as a percentage of GDP), which has occurred in two stages: first in the 1980s, then over the last decade. This spreading out of international portfolio investment flows as a share of GDP is the main reason for changes in the shape of the financial balance distribution.

The latest IMF projections (IMF, 2008) forecast a small and gradual reduction in the USA current account deficit as a share of GDP and in dollars. Noticeably, surpluses recorded in emerging Asia, in particular in China, as in oil-exporting economies, are expected to be sustained at a foreseeable horizon. As a result, the world distribution of current account imbalance would evolve very slowly: the reversal in the recent flattening trend would be very limited, and the distribution would remain very asymmetric, with a fat tail on the surplus side. Such an evolution would be in contrast with the rapid unwinding of the 1987 episode. Yet it may be consistent with the more intricate and widespread character of present imbalances.

A deeper understanding of the world distribution of current account imbalances would require a modeling strategy such as a heterogeneous country framework. This is left to further work.

Bibliography:

Backus (D.), Henriksen (E.), Lambert (F.) and Telmer (C.) (2006)
"Current account fact and fiction", *mimeo*, New York University.

Baclet (A.) and Vidon (E.) (2008)
"Liquid assets, liquidity constraints and global imbalances", *Financial Stability Review*, Banque de France, February (downloadable on the website of the Banque de France:
English version: *http://www.banque-france.fr/gb/publications/telechar/rsf/2008/etud12_0208.pdf*
French version: *http://www.banque-france.fr/fr/publications/telechar/rsf/2008/etud12_0208.pdf*).

Bernanke, B. (2005)
"The global saving glut and the US current account deficit", Remarks at the Sandridge Lecture organised by the Virginia Association of Economics, 10 March.

Blanchard (O.) (2007)
"Current account deficits in rich countries", *NBER Working Paper*, No.12925.

ECB (2007)
"Adjustment of global imbalances in a financially integrated world", *Monthly Bulletin*, August.

International Monetary Fund (2008)
"World Economic Outlook", April.

Rajan (R.) (2006)
"Is there a global shortage of fixed assets?", Speech at the G30 meetings in New York, International Monetary Fund.

Roubini (N.) (2007)
"The instability of the Bretton Woods 2 regime", *www.rgemonitor.com*, July.

Annex

Density estimation methodology

Gaussian kernel

The SAS kde procedure performs univariate kernel density estimates. Current account distributions can not be properly described by a parametric density such as a normal distribution. Approximating a hypothesised density function thus requires to use a kernel density method, a non-parametric technique in which a known density function (the kernel) is averaged across the observed data points to create a smooth approximation. The SAS kde procedure uses a Gaussian density kernel and its assumed variance determines the smoothness of the resulting estimates. More precisely, the weighted kernel density estimate of the theoretical density $f(x)$ of a variable X weighted by a variable W, the $(X_i, W_i)_{i=1,...,n}$ vector of observed variables, is defined as:

$$\hat{f}(x) = \frac{1}{\sum_{i=1}^{n} W_i} \sum_{i=1}^{n} W_i \varphi_h (x - X_i)$$

where h is the bandwidth and

$$\varphi_h(x) = \frac{1}{\sqrt{2\pi}} \frac{1}{h} \exp\left(-\frac{x^2}{2h^2}\right)$$

Alternatives to the Gaussian kernel include the Epanechnikov kernel or the triangular kernel. A different choice of the kernel changes the shape of the estimated densities but the evolution over time of the distributions is robust to this choice. Moreover, it is theoretically possible to compute the optimal bandwidth h but it requires knowing the theoretical density function f. Since the optimal value is unknown, we need an approximation method to approximate it. We assess in the next section the robustness of our results to the choice of the optimal bandwidth approximation method.

The bandwidth estimation method

The available methods to compute the optimal bandwidth are the Sheater-Jones Plug In (SJPI) method, the Simple Normal Reference (SNR) method, the Silverman's Rule Of Thumb (SROT) method and the OverSmoothed (OS) method. We will first of all assess the robustness of the result to the choice of the bandwidth approximation method. The shapes of the densities are highly sensitive to the method, yet the stylised fact of a flattening of the current account distributions over the last ten years seems robust. If global imbalances clearly appear with the SNR or SROT methods, they do not with the SJPI or the OS methods, which suggest that the latter are less appropriate for our estimates (especially the SJPI method which barely reveals the asymmetries in the global distribution of current accounts). The bad performance of the SJPI and OS methods leads us to reject them and we will therefore further investigate the SNR or SROT methodology, especially regarding the choice of the bandwidth multiplier.

Chart: Current account distributions according to the optimal bandwidth estimation method
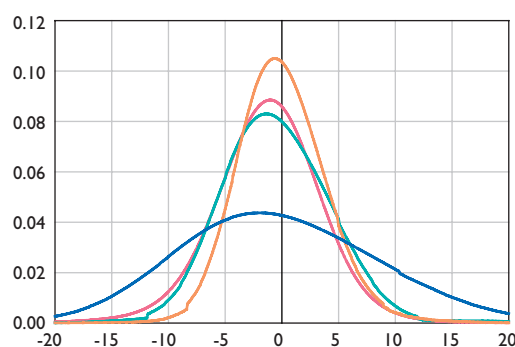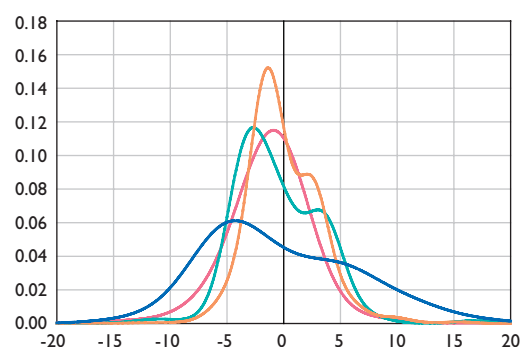
A: Simple Normal Reference (SNR)
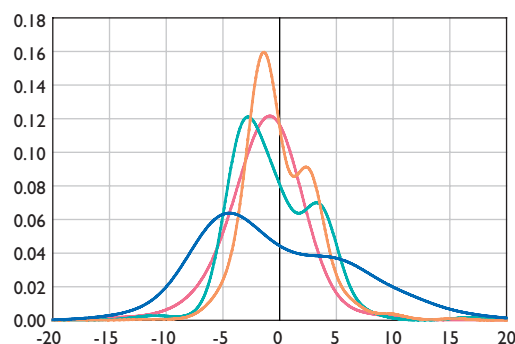
B: Silverman's Rule Of Thumb (SROT)
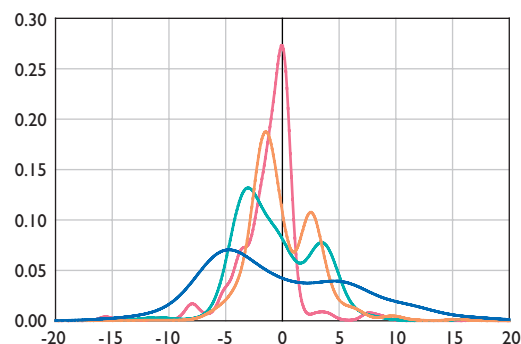
C: Sheater-Jones Plug-In (SJPI)

D: Oversmoothed (OS)

1980 — 1987 — 1997 — 2007

Sources: WEO, authors' calculation.
Note: All the methods show a flattening of the distributions over time. However the lopsided features of global imbalances do not clearly appear with the SJPI and OS methods.

The bandwidth multiplier

The choice of the bandwidth multiplier determines the smoothness of the density estimates. The greater the value of the bandwidth multiplier, the smoother the shape of the density estimate. We test the performing of the SNR and SROT methods with three different bandwidth multipliers: 0.5, 1 and 1.5. The flattening of the estimated distribution appears to be robust to the choice of the bandwidth multiplier.

The 0.5 multiplier provides the least smooth distribution which reflects closely the actual sample distribution. For instance, the 2006 distribution, regardless of the approximation methods, exhibits four bumps representing respectively from left to right, the United States, a United Kingdom-France-Italy aggregate, Japan and at the far right hand side China with its huge current account surplus. However precise are those distributions, we do not need such a level of accuracy since we are more interested in the global shape of the distribution and its evolution over time.

On the contrary, the smoothest distributions obtained with a bandwidth multiplier of 1.5 do not exhibit clearly the lopsided feature of current account imbalances. In this respect, the densities obtained with a bandwidth multiplier of 1 are the more satisfactory to illustrate global imbalances. They clearly exhibit an imbalanced pattern and a widening over the last decade.

We therefore choose the SNR method with a bandwidth multiplier of 1, which provides the most satisfying compromise between smoothness and precision, especially with respect to asymmetries.