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Reserve accumulation - objective or by-product?

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NO 73 / SEPTEMBER 2007

RESERVE ACCUMULATION OBJECTIVE OR BY-PRODUCT?

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RESERVE ACCUMULATION

OBJECTIVE OR BY-PRODUCT? ¹

by J. Onno de Beaufort Wijnholds²
and Lars Søndergaard³

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ABSTRACT

This paper examines whether the level of reserves in emerging market countries has become excessive. It presents a discussion of “adequacy” versus “excessive” levels of reserves, and presents calculations of reserve adequacy for a large number of emerging market countries. Two categories of countries can be distinguished: i) those whose reserves have grown on account of a need for self-insurance against financial crises, and which tend to be reasonably in line with adequacy measures (mainly Latin American countries and countries in central and eastern Europe), and ii) those whose reserve accumulation is nowadays primarily the result of rapid export-led growth supported by a lack of exchange rate flexibility. This is especially the case for several emerging Asian countries, whose reserve levels have grown far beyond what can reasonably be considered adequate. Various opinions on Asian exchange rate and reserves policies are examined, and the costs and benefits of currency undervaluation are assessed. Attention is also paid to the composition of the reserves. The paper concludes by bringing together the various strands of the analysis and enumerating the main implications of large-scale reserve accumulation for the international monetary system.

Key words: International reserve accumulation, emerging markets

JEL classification: F31, F41

EXECUTIVE SUMMARY

International reserves have grown dramatically in recent years, with Asian countries accounting for the bulk of this accumulation. This raises the question whether the level of reserves in a number of countries has become excessive. In this paper, reserve adequacy is calculated for a large number of emerging market countries. Two categories of countries emerge from this exercise: i) ones whose reserves have grown on account of their need for self-insurance against financial crises, and which tend to be reasonably in line with adequacy measures (mainly Latin American countries and countries in central and eastern Europe), and ii) those whose reserve accumulation is nowadays primarily the result of rapid export-led growth fostered by a lack of flexibility of the exchange rate. This is especially the case for several emerging Asian countries whose reserves have grown far beyond what can reasonably be considered adequate to reach levels that this paper labels “excessive”.¹

Various opinions on Asian exchange rate and reserves policies are examined, and the costs and benefits of currency undervaluation examined. The paper concludes that the cost of massive reserve accumulation associated with an artificially weak currency can be considerable, either in macroeconomic terms (via overheating, inflation and protectionist measures) or in financial terms (through net borrowing costs, net opportunity costs, the costs of sterilisation and capital loss on account of appreciation against the dollar). Over time, these costs can clearly outweigh the benefits for the

country concerned; however, in some countries the authorities may well be giving more weight to non economic domestic considerations than to purely economic or financial considerations in allowing massive reserve accumulation. In this sense, the increase in reserves is more a by-product of a growth strategy than an objective in itself. From a global perspective, a strategy aimed at keeping domestic exchange rates artificially low contributes to sustaining large global current account imbalances.

The paper also examines the diversification in reserves which is gradually taking place, although analysis is somewhat hampered by a lack of reliable data. While diversification is likely to take place only at the margin, it would be desirable to monitor the process closely.

The final concluding section brings together the various strands of the analysis and enumerates the main implications for the international monetary system of large-scale reserve accumulation.

¹ The paper does not pretend to know the objective function of certain central banks. Therefore, the notions of “adequacy” versus “excessive” presented in this paper are purely assessments of whether or not reserve accumulation exceeds the conservative estimates of reserves needed for self-insurance purposes.

I INTRODUCTION

In recent years the rate of growth and the distribution of global international reserves has changed dramatically. Between 2000 and 2005 international reserves increased by 91% in Special Drawing Right (SDR) terms, and 110% in dollar terms.² This surge in holdings of official foreign exchange³ has been concentrated in Japan and in Asian emerging market countries (EMCs). With the exception of Japan, most industrial countries have either added modest amounts to their reserves or even experienced a reduction in them, especially in the euro area. Other European countries, however, doubled their reserves during this period, which mainly reflects Russia's rapid recent build-up of foreign exchange holdings.

These striking developments do however raise three main policy issues that could help in assessing the ramifications of the rapid accumulation of reserves for individual countries, as well as for the functioning of the international monetary system.⁴ First, are global international reserves merely adequate, or has a surfeit developed? Second, how adequate are reserve levels of individual countries and,

more specifically, have official holdings in some Asian countries reached excessive levels? And third, to what extent are changes in the currency composition of reserves taking place? As Asian countries' reserve management and exchange rate policies have become a central issue in the debate on the international adjustment process, this paper accordingly focuses largely on them. With regard to the adequacy of global reserves, which is closely linked to the process of SDR allocation, this ceased to be an issue some time ago and is therefore discussed only briefly. With regard to the currency composition of reserves, there is at present still insufficient information for arriving at a comprehensive picture. Nevertheless, the process of reserve diversification requires monitoring in view of its possible consequences for the international monetary system.

2 The difference reflects the depreciation of the dollar against the SDR (a basket comprised of the US dollar, the euro, the yen and pound sterling).

3 Gold holdings, which have actually decreased, are not included here. See Box 1.

4 For an extensive discussion of the process of reserve accumulation, see ECB (2006).

2 GLOBAL INTERNATIONAL RESERVES

Chart 1 shows the acceleration in the growth of international reserves since 1995, which has

been more marked in EMCs than in industrial countries. Overall, the ratio of world reserves to imports, which increased only gradually between 1980 and 1995, has surged since then.

Box 1

MONETARY GOLD

The role of gold in the international monetary system has substantially declined over time. After the collapse of the Bretton Woods par value system, following the termination of the conversion of officially held dollars into gold by the US, the metal has hardly figured in discussions on the international monetary system. While the 1970 Annual Report of the International Monetary Fund (IMF) devoted 11 pages to gold, for example, references to monetary gold in recent years have been limited to amounts mentioned in tables. Yet despite the process of the demonetisation of gold, central banks continue to hold gold as part of their external reserves, especially in industrial countries. Gold holdings may constitute a significant share of a country's national wealth and can be seen as a strategic reserve that may also be used in extreme circumstances.

However, the use of gold to settle balance of payments deficits ceased many years ago.

The IMF also has a substantial amount of gold on its books, representing a market value of USD 53 billion at the end of 2005. Under the IMF's original rules, which were amended in the 1970s, member states had to pay 25% of their subscription in gold, which is still valued at SDR 35 per ounce, whereas the market price is a multiple of that.

After the official price of gold of USD 35 dollar per ounce was abandoned, the market price – while showing considerable volatility – rose over time to reach USD 513 at the end of 2005, with further increases taking place in the course of 2006.

Sales of gold by central banks have become a regular feature in the market. While the physical stock of gold held by central banks remained virtually unchanged during the 1970s and 1980s, between 1990 and the end of 2005 it declined by 23%.

While gold continues to constitute a significant part of the international reserves of a number of countries, the preferred method of calculating global reserve holdings is to include only official foreign exchange holdings, SDRs and reserve positions in the IMF.

World Monetary Gold

Industrial countries	371	Developing countries	81
Euro area (incl. ECB)	192	China	10
United States	134	Russia	7
Switzerland	21	Indonesia	6
Japan	13	Venezuela	6
United Kingdom	5		

* At market rates in US dollars, end-2005.

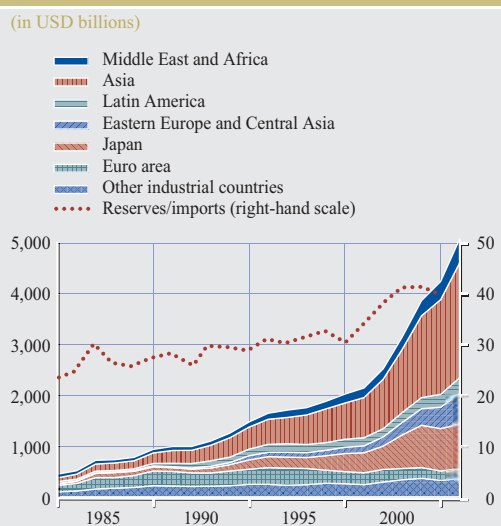
With such a huge increase in international reserves, also in relative terms, the concerns expressed in earlier decades about the adequacy of global reserves, which led to the introduction of SDRs in the late 1960s, have entirely disappeared. Indeed, it has generally been acknowledged for quite some time that the supply of international reserves has become largely demand-determined – many countries are able to access international financial markets to augment their reserves if they so desire – and that the case for SDR allocations no longer exists.⁵ Nowadays, only countries with no or limited access to international financial markets may need to run current account surpluses to increase their reserves, assuming insufficient foreign direct investment (FDI) and official aid flows for that purpose.⁶ These countries tend to be in the low-income category, where the need for holding reserves is relatively small and the overriding concern is the availability of long-term concessional or grant resources to finance the development process. Most other countries can borrow on the international financial markets at a relatively modest cost to supplement their reserves if and when needed. This cost consists of the difference between the interest rate at which they are able to borrow and the

yield to be earned on their reserve holdings. For industrialised countries, whose currencies tend to float more or less freely, and which are much less prone to financial crises than EMCs, the level of reserves tends to be a matter of little concern. It is striking to see that these countries feel able to cope with relatively modest official reserve holdings. In the case of Canada, for instance, the ratio of reserves to imports stood at a mere 10% at the end of 2005, compared with over 40% globally (see Chart 1).

While it can be concluded therefore that there is not – and has not been for a long time – a global shortage of international reserves, developments in recent years have raised the question of whether there might be an excess of reserves.⁷ Looking at such indicators as the ratio of reserves to imports, a case can indeed be made for considering the present global level of reserves to be (significantly) more than adequate. A subsequent question is whether this overabundance poses any danger for the world economy.

There are different views on the extent to which the surfeit of reserves can have negative consequences. One concern is that the excess amount of reserves represents excess global liquidity which may result in an increase in global inflation. The mechanism which would bring about global inflationary pressures is the creation of domestic (base) money as a result of official purchases of foreign exchange from the market. Since much of the reserve accumulation is concentrated in a limited number of countries, and since the central banks concerned tend to

Chart 1 Global foreign exchange reserves



Source: IMF, International Financial Statistics.

- Under the fourth amendment of the IMF's Articles of Agreement, a special one-time "equity" allocation of SDRs to the amount of SDR 21.4 billion is to take place. However, this amendment has not been ratified by enough member countries (the US being the most important holdout), and is unlikely ever to become effective.
- The only remaining argument for an SDR allocation seems to be that it would allow low-income countries to acquire reserves in a cost-free fashion; see Clark and Polak (2004).
- The IMF's Articles of Agreement foresee the possibility of cancelling SDRs in the event of an excess of reserves. Given the tiny fraction (less than 1%) that SDRs constitute in total reserves, cancellation would make practically no difference at the global level, but would certainly harm those countries that have used part of their allocations, since they would have to pay back this share.

sterilise (part) of the base money increase, the likelihood of a significant inflationary impact on a global scale seems limited. At the individual country level, however, this may not be the case. This matter will be further explored in Sections 5 and 6.

Although the recent extraordinary accumulation of reserves may not directly pose any policy challenges for the world economy, some observers are concerned that the build-up could reflect the fact that an important and necessary adjustment process is being frustrated. Indeed, a major factor behind the growth in global reserves is Asian central banks' interventions with the aim of preventing their currencies from appreciating (strongly) against the US dollar, which would otherwise have constrained the

US's ability to attract foreign official financing of its large fiscal and growing current account deficit. By impeding the appreciation of their currencies vis-à-vis the dollar – sometimes leading to a depreciation of their currencies in effective terms – emerging Asian countries have fostered export-led growth. At the same time, such interventions prevent the exchange rates in several of these countries from serving as an adjustment tool that could help to alleviate overheating and slow down burgeoning capital inflows in their economies. In view of the ongoing heavy accumulation of reserves and the prospect of strong further growth in them, Asian monetary authorities may sooner or later judge that the benefits of maintaining undervalued exchange rates are surpassed by the mounting costs of holding reserves.

Box 2

METHODS OF ASSESSING RESERVE ADEQUACY

The method for assessing the adequacy of official foreign exchange reserves applied here is the one developed by De Beaufort Wijnholds and Kapteyn (2001).

Recognising the gap between the theoretical contributions in the field of assessing reserve adequacy and the operational need of policymakers to have some benchmark against which to assess their level of reserves, De Beaufort Wijnholds and Kapteyn combine a number of commonly used vulnerability indicators to formulate the following rule of thumb: a country's level of reserves should at least cover its short-term external debt, and a fraction of broad money, determined by the exchange rate regime and perceived country risk.

Specifically, they argue that, in addition to covering short-term external debt – the external drain – countries with “intermediate” exchange rate regimes, such as managed floats, should also maintain reserves to cover 10-20% of broad money as a buffer against a possible internal drain of capital. For countries with floating exchange rate regimes, the fraction of broad money to be covered by reserves is half of that. These ratios are broadly based on calculations involving errors and omissions in balance of payments statistics as a proxy for capital flight. In recognition of the fact that not all countries are equally susceptible to the risk of capital flight, the 5-10 and 10-20% ranges are adjusted by a country risk index, which takes into account 77 different indicators ranging from monetary and fiscal policy to political stability. A high-risk country's adequate level of reserves is therefore higher than that of a low-risk country, all other things being equal.

The formula can be written as: $R^* = E + a M.C$,

with R^* denoting adequate reserves, E external short-term debt by residual maturity, a constitutes a fraction depending on the exchange rate regime (0.05 to 0.1 for floating regimes and 0.1 to 0.2 for intermediate regimes), M stands for broad money, and C denotes a country risk index.

This method has been regularly referred to in the literature and is used extensively in Bird and Rajan (2003). It has also been applied by IMF staff in the section on Reserve Adequacy in Mexico in its Article IV Consultation Report on Mexico for 2003, and by the IMF's Independent Evaluation Office in its evaluation of IMF support to Jordan (2006a). The method also figures in the Central Bank of Venezuela's report (2003) on reserve adequacy.

Other more sophisticated approaches for assessing reserve adequacy or optimal reserves, i.e. taking into account the costs of holding reserves, have also been developed. For instance, the Central Bank of Colombia (2003) has used the following formula:

$$C = p C_o + (1 - p) R.r,$$

where C_o denotes the cost of an external crisis caused by a lack of international reserves as a percentage of GDP, p is the probability of an external crisis, R stands for the level of reserves, and r denotes the opportunity cost of maintaining a dollar of reserves. A major drawback of this approach, however, is the difficulty of estimating the probability of a crisis. The range of plausible probabilities could be so large as to render the outcome of little more than theoretical value.

Jeanne and Ranciere (2006) from the IMF have presented a sophisticated model of the optimal level of reserves for emerging market countries but, as the authors themselves acknowledge, there are still a number of problems that need to be solved before their approach can be fully operational. They too emphasise that it is extremely difficult to estimate the causality from the level of reserves to the probability of a crisis.

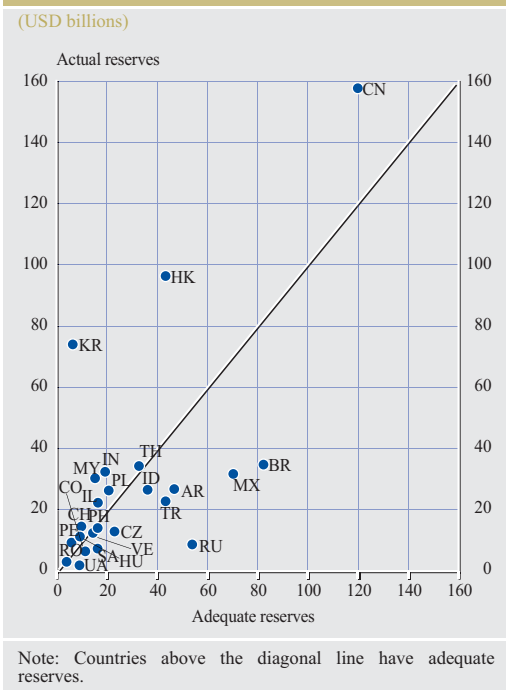
This paper labels reserve levels accumulated beyond the estimated adequacy levels as being "excessive". Naturally, central bankers might have objective functions which would lead them to disagree with being labelled as "excessive accumulators". For instance, a particular central bank may have an objective function which exhibits extreme risk aversion, leading it to accumulate reserves well beyond another less risk-averse central bank. However, central bankers' specific objective functions are unobservable, and the emphasis of the approach used in this paper is that it is operational. Thus, the "adequacy" criteria listed above can be thought as resulting in levels of reserves consistent with a "typical" central banker's appetite for risk.

3 RESERVE ADEQUACY IN EMERGING MARKET COUNTRIES

At the present juncture, therefore, it may well be more meaningful to look at the reserve adequacy of individual countries and to do so in conjunction with their exchange rate policies. Since, as already noted, industrial countries generally do not face concerns about inadequate reserves⁸, whereas low-income countries mainly have a need for grants or highly concessional financial resources for investment purposes rather than for holding reserves⁹, this section rather focuses on EMCs for which the question of reserve adequacy remains highly relevant.¹⁰

Since the Asian and Russian financial crises of 1997/1998, there has been an upsurge of interest in assessing what constitutes an adequate reserve levels for EMCs. Among various contributions to the literature, De Beaufort Wijnholds and Kapteyn (2001) developed a rule of thumb for assessing the adequacy of reserves in EMCs (see Box 2). This measure shows that for several EMCs, reserves were inadequate at the end of 1999 (see Chart 2). In retrospect, it can be concluded that the low level of reserves in Argentina and Turkey contributed importantly to the financial crises they experienced in 2001/2002. Earlier Brazil, which lost a large part of its reserves in 1998, and Russia, which held quite modest reserves, were unable to maintain their exchange rate pegs. Russia defaulted on part of its debt in 1998, triggering severe tensions in international financial markets. In similar fashion Romania and Ukraine, which held very modest reserves in the late 1990s, underwent great financial difficulties, with Ukraine having to restructure its external debt, and Romania narrowly escaping having to do so. At the same time, South Africa, which had much smaller reserves than indicated by the benchmark used in Chart 2, but which was operating a floating exchange rate, was able to avoid major financial upheaval. In recent years, however, the South African Reserve Bank, which at one point had negative net reserves of around USD 25 billion

Chart 2 estimated adequate and actual reserves end of 1999



on account of a large open forward position, began to accumulate (gross) reserves beyond the end-1999 level, after having eliminated its open forward book.

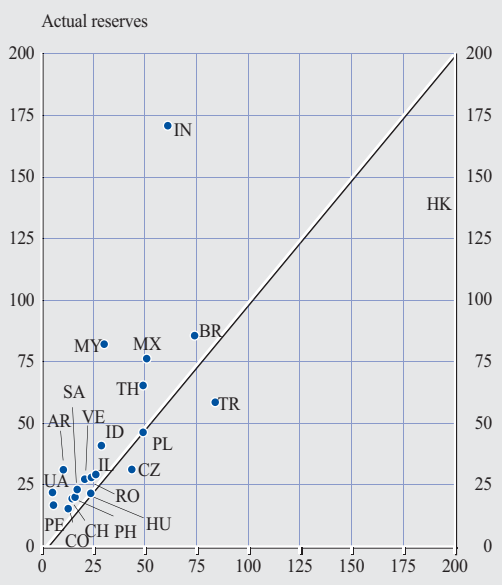
Reserve holdings at the end of 2006 offer a striking contrast with those of seven years earlier for most EMCs, as Chart 3 illustrates. Indeed, this development has prompted the question whether there has not been excessive reserve accumulation in a number of countries, and whether accumulation beyond a certain point would not be unwise (see Bird and Rajan, 2003).

In several (mostly Asian) countries, reserves are now a multiple of what they were in 1999.

8 They tend to intervene little or not at all in the foreign exchange market and can mobilise private financing at short notice in case of a sudden crisis.
 9 Put differently, the opportunity costs of holding reserves in low-income countries are relatively high.
 10 Japan has accumulated huge reserves (around USD 840 billion at the end of 2005 or 217% of imports), and its policies appear to be rather similar to those of some emerging Asian countries, although it has in recent years foregone foreign exchange market intervention.

Chart 3 Estimated adequate and actual reserves

(USD billions; end-2006)



Note: Countries above the diagonal line have adequate reserves. Not shown on the graph for reasons of dimensionality are China, Hong Kong S.A.R., South Korea and Russia (see data in Annex 1).

China's foreign exchange holdings have surged to over USD 1 trillion, a multiple of its estimated adequate reserve level (not shown in the charts as its position is "off the charts"; however, see Annex 1 for full statistics). South Korea, which at the time of the Asian financial crisis held a "mere" USD 30 billion (a portion of which was not freely usable, moreover), had amassed a multiple of that in the following years¹¹, while India quintupled its reserves in seven years, and Malaysia by the end of 2006 had more than doubled its reserves from an already ample level in 1999. Reserve accumulation in other emerging Asian countries was considerably smaller, however, whereas the reserves of the Philippines were on balance unchanged over the seven-year period examined here. Elsewhere, the most notable change took place in Russia, where the clearly inadequate level of gross reserves in 1999 of USD 8.5 billion, underscored by the fact that net reserves were negative, had reached USD 300 billion at the end of 2006 (see Table 3).

Reserves have also grown apace in the new and candidate EU Member States.

The difference between gross and net international reserves is significant for a number of countries. Taking into account a country's official monetary liabilities can significantly change the assessment of its reserve position, as Table 1 illustrates. This is, for instance, very clear in the case of Turkey. While its gross reserves have increased and are now not very far from the adequacy measure, its reserves at the end of 2004¹² were negative on a net basis. In addition to a very large amount of credit outstanding to the IMF (USD 22 billion at the end of 2004), the Turkish Central Bank had accumulated foreign liabilities of USD 18 billion on account of so-called Dresdner deposits (special foreign currency accounts of Turkish nationals living abroad that are held with the Turkish Central Bank).¹³ It can be questioned whether these deposits held by private individuals, which can be withdrawn at short notice, should be included at all in Turkey's reserve statistics, since they are not fully unencumbered.

In Latin America a mixed picture emerges. Whereas a number of countries, especially the two oil exporters, Mexico and Venezuela, added

¹¹ Aizenman et al. (2004) find that the Asian financial crisis of 1997/1998 led to a structural change in the accumulation of reserves in South Korea with the authorities paying much greater attention to short-term capital flows.

¹² Net reserves are defined as gross reserves minus short-term foreign liabilities. Since May 2000, countries that subscribe to the IMF's Special Data Dissemination Standard (SDDS) have been requested to provide detailed information on their international reserves and foreign liquidity positions, which makes it easier to assess the adequacy of reserves and the short-term drains the country is facing. This reflects the increased awareness that markets (should) care about net, rather than gross, reserves. The new SDDS template asks for information on gross international reserves as well as SDRs, plus IMF positions, other foreign currency assets, predetermined short-term drains on foreign currency assets, and contingent short-term drains on foreign currency assets. However, even without such detailed information, it is possible to calculate a rough measure of net international reserves using data which are readily available in the IFS.

¹³ These deposits used to be collected mainly via the Dresdner Bank, hence the designation "Dresdner deposits".

¹⁴ As IMF staff noted in the Fund's World Economic Outlook of April 2005, both Brazil and Argentina needed to strengthen their reserves.

Table 1 Gross and net international reserves of emerging market countries

(USD Billions)

	1999		2004		2006	
	Gross	Net ¹	Gross	Net ¹	Gross	Net ¹
Argentina	26.3	21.8	18.9	4.7	27.0	27.0
Brazil	34.8	20.7	52.7	23.4	73.1	69.8
Chile	14.6	14.1	16.0	15.7	17.5	17.2
China	157.7	152.9	614.5	607.7	990.5	978.6
Colombia	8.0	7.8	13.4	13.3	14.9	14.8
Czech Republic	12.8	12.0	28.3	27.2	30.5	26.6
Hong Kong S.A.R.	96.2	96.2	123.5	123.5	130.2	130.2
Hungary	11.0	10.4	15.9	15.6	20.9	20.5
India	32.7	32.6	126.6	126.6	159.1	159.1
Indonesia	26.4	12.6	35.0	23.3	40.7	39.9
Israel	22.6	22.6	27.1	27.1	27.8	27.8
Korea, South	74.0	67.6	199.0	179.1	225.6 ⁴	208.2 ⁴
Malaysia	30.6	30.6	65.9	62.9	79.2	74.9
Mexico	31.8	26.9	64.1	64.0	83.4	83.2
Peru	8.7	7.3	12.2	11.1	14.6	13.6
Philippines	13.3	13.3	13.1	13.1	18.8	18.8
Poland	26.4	24.4	35.3	35.2	46.7	n.a.
Romania	1.5	0.7	14.6	13.7	13.7	23.1
Russia	8.5	-7.3	120.8	113.1	258.7	255.7
South Africa ²	6.4	3.1	13.1	9.3	22.2	19.1
Thailand	34.1	21.2	48.7	47.6	60.0	53.5
Turkey	23.3	11.2	35.7	-11.5 ³	58.6 ⁵	29.6 ⁵
Ukraine	1.0	-1.9	9.3	7.4	18.8	17.8
Venezuela	12.3	11.3	18.4	18.0	27.2 ⁵	27.0 ⁵

Source: IMF, International Financial Statistics.

1) Gross reserves minus monetary liabilities consisting mainly of IMF credits, except for Turkey (see text).

2) Does not include large outstanding forward sales of foreign exchange, which reached a maximum of USD 25 billion USD according to press reports, but had been extinguished by 2004.

3) Latest monetary liability figure from 2005;

4) June 2006;

5) September 2006.

to their reserves and attained comfortable levels, others were still facing a tight foreign exchange buffer at the end of 2004, particularly on a net basis (see Table 1).¹⁴ Brazil's net reserves hardly increased between 1999 and 2004 despite a considerable accumulation of gross reserves. In 2005, however, further strong foreign exchange inflows led the authorities to announce that they would repay in full the USD 15.5 billion owed to the IMF. After this repayment, net reserves stood at USD 51.4 billion at the end of 2005 and USD 69.8 billion one year later. As for Argentina, which had already coped with inadequate reserves before the devastating crisis of 2001, the reserve losses suffered in a futile defence of the currency board had left the country with far too low reserves at the end of 2004, certainly on a net basis – as shown in Table 1 – despite having adopted a floating exchange rate. Here

too, reserve accumulation took place during 2005 and 2006, followed by a decision to repay the IMF in full (USD 9.5 billion), and at the end of 2006 net reserves stood at USD 27 billion.

The oil-exporting countries of the Middle East are not shown in Charts 2 and 3, since the accumulation of official reserves in this region has been quite modest compared to that of most non-industrial countries (see Box 3 below for an explanation of this remarkable development).

Box 3

THE OIL-EXPORTING COUNTRIES

As a result of the large increases in energy prices in recent years, the oil-exporting countries have experienced a huge jump in their external position. The main counterpart of the US deficit on the current account of the balance of payments is no longer the surplus of emerging Asian countries, but that of the main oil-exporting countries.

Whereas the current account surpluses of Asian and Latin American countries – sometimes augmented by net capital flows – are mostly reflected in large increases in their official reserves, the situation is rather different for a number of important oil-exporting countries. Their large external surpluses have generally only to a limited extent been reflected in their official foreign exchange holdings. There are two main reasons for this development. First, these oil exporters have channelled a substantial share of their foreign exchange revenue into special state-owned funds.¹⁾ These can take the form of stabilisation, savings or heritage funds. The assets of such funds, which are generally of a less liquid nature and therefore lack the character of international reserves, i.e. they are usable at short notice without significant capital losses. They are not counted as part of international reserves. Second, assets placed in offshore financial centres are often not recognised or reported as belonging to monetary authorities. This leads to an underestimation of reserve holdings of oil-exporting countries in particular.

A good example of the difference between current account surpluses and the increase in official reserves is provided by Saudi Arabia (figures in billions of USD):

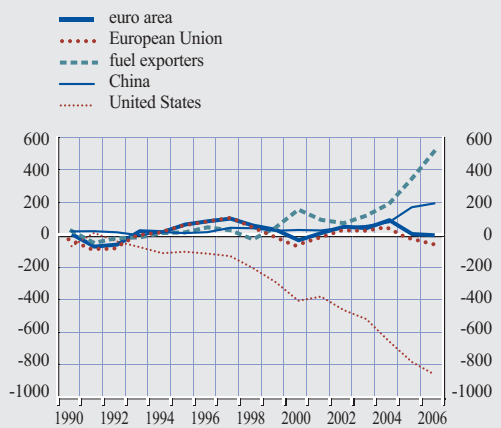
	2003	2004	2005	2006
Current account surplus	28	52	91	120 [°]
Increase in reserves	2.0	4.7	-0.8	1.0

Source: IMF, International Financial Statistics. ° estimated at September 2006 (WEO).

1 See ECB (2006), pp. 27-28.

Current account balances

(USD billions 1990-2006)



Source: IMF, World Economic Outlook (September 2006).

4 RECENT DEVELOPMENTS IN RESERVE MANAGEMENT AND EXCHANGE RATE POLICIES

A key question for policymakers is to understand the reasons behind the massive reserve accumulation in recent years as well as the divergent developments in individual countries in managing their reserves.

In retrospect it is clear that many EMCs, as well as the international financial organisations, paid insufficient attention to the adequacy of reserves before the crisis years of 1995 to 1999. After the severe financial crises that affected Mexico, East Asia, Russia and Brazil during this period, the behaviour of many EMCs changed, often dramatically. Reserves were generally increased, in several cases (especially in Asia) much more rapidly than before. A few EMCs, however, experienced such severe crises in the new century that they lost significant amounts of reserves, Argentina and Turkey being the main examples. Eventually the IMF, along with national monetary authorities, started to pay more attention to the need to have in place adequate reserves.¹⁵

The large reserve accumulation in recent years raises two questions: first, through which channels did countries increase their reserves? That is, did the accumulation occur as a result of current or capital account surpluses, or a combination of both? Second, what was the motivation behind the accumulation? Were countries accumulating for precautionary motives, was it a by-product of their choice of exchange rate regime, or can the recent developments be attributed to other motives? A description of the channels of accumulation is contained in Annex 2. Identifying the motives behind these build-ups is more complicated and involves a judgemental element. For example, ascertaining when a central bank moves from accumulating reserves based on a precautionary considerations to allowing a build-up in reserves as a by-product of maintaining an undervalued exchange rate is seldom clear-cut. Estimating the equilibrium value of an exchange rate and forecasting exchange rates is a complicated exercise,

resulting in considerable uncertainty from the policymaker's perspective. Thus, while the monetary authorities in several Asian countries appear to acknowledge that their currencies are or have been undervalued, it is not clear precisely when they reached this conclusion. Moreover, given the uncertainty surrounding forecasts, they may not wish to exclude the possibility that markets could cease to view their exchange rates as undervalued in the near future.

Notwithstanding the difficulties in identifying the exact motives underlying reserve accumulation (see Box 4 for an overview of the motives for holding reserves), it can be argued that there are essentially two main, and one secondary, explanations for the recent strong rise in reserves among most EMCs: self-insurance against future crises on the one hand, and attempts at influencing the exchange rate (sometimes referred to as manipulation) on the other (see Section 5). While generally probably of secondary importance in explaining the large build-up of reserves in many EMCs, it should not be overlooked that the underdevelopment of domestic financial systems in most of these countries can be a significant contributing factor in the process of reserve accumulation. As many EMCs lack sufficient attractive liquid domestic financial instruments and often still maintain (some) capital controls, they tend to channel surplus funds for investment abroad through the official sector.

As mentioned above, identifying countries that are purposely maintaining undervalued exchange rates is not clear-cut.¹⁶ However, given the rapid increase of dollar-denominated reserves in Asia,

¹⁵ IMF programmes tend to contain as a performance criterion a floor for net international reserves. However, until a number of years ago, in Article IV consultations Fund staff tended to pay scant attention to reserve adequacy. This has since significantly changed, especially for several Latin American countries for which IMF staff have now examined the reserve position in considerable depth.

¹⁶ Frankel (2004) argues that "allegations of 'illegal exchange rate manipulation' are inappropriate" given that any country is free to choose to peg its currency if it wishes. On the other hand, Goldstein (2004) states that China is manipulating its exchange rate in breach of Article IV of the IMF's Articles of Agreement. Bergsten (2005) makes the same point, and advocates sending a special IMF team to such countries and, if necessary, "naming and shaming" them.

especially since 2003, combined with little or no movement in the local currencies' exchange rate vis-à-vis the US dollar, it is clear that the authorities are intervening – often massively – in the market, and that their interventions are one-sided.

Countries seeking self-insurance through reserve accumulation are to be found primarily

in Latin America, as well as to some extent in central and eastern Europe. While Asian countries initially shared this motivation after the 1997/1998 financial crisis in their region, several of them are now clearly engaged in large-scale foreign exchange intervention aimed at keeping their exchange rates at (very) competitive levels.

Box 4

MOTIVES FOR HOLDING RESERVES

International reserves are held for a variety of reasons. Under the fixed exchange rate regimes prevailing during part of the twentieth century, reserves were needed to defend the exchange rate whenever the national currency came under pressure. Apart from this intervention need, countries also sought to keep a buffer of reserve assets to be able to deal with contingencies; this consideration was also known as the “war chest” motive. A distinction was sometimes also made between these explanations and reserves held for confidence reasons.¹

Under the floating exchange rate regimes adopted by most industrialised countries after 1973, there is in principle no need to hold reserves for intervention purposes if the float is fully free. In practice, however, industrial countries have continued to hold reserves and sometimes add to them, both to enable them to intervene in the foreign exchange markets to avoid disorderly exchange rate conditions, or – in some cases – to manage the exchange rate more actively. In EMCs that have moved to a floating regime, the exchange rate has tended to be actively managed. Moreover, as the liberalisation of capital movement proceeded, many countries felt the need to increase their foreign exchange buffer to deal more effectively with “sudden stops” of capital inflows.

The notion of self-insurance against adverse developments in their external position led many countries to strengthen their reserves following the major financial crises that occurred in the late 1990s and early 2000s. Part of the motivation appears to have been a desire to reduce the likelihood of these countries having to apply for credits from the IMF and of being subjected to their policy conditions. This motive is sometimes referred to as a need to gain “financial independence”.

Other motives that have been brought forward are the desire *to reduce country risk* as perceived by financial markets and rating agencies, and as a corollary, *a reduction in borrowing costs*. This latter consideration is basically an element of the desire to gain confidence.

The large reserve accumulation by many EMCs, especially in Asia, is often considered to be mainly the outcome of the domestic policies pursued by these countries. Alternatively, this trend can also be seen as a direct consequence of globalisation (see ECB, 2006, p.7)

¹ This distinction was already made by Keynes in *A Treatise on Money* in 1930.

A good example of self-insurance is provided by Mexico¹⁷, which had suffered a series of financial crises around the time of presidential elections. Based on sound internal analysis, the Banco de Mexico¹⁸ developed a policy of gradual reserve accumulation. This approach was also taken in response to an earlier unsatisfactory experience with contingency credit lines provided by international commercial banks: when Mexico wanted to utilise these in times of difficulty, the banks were less than forthcoming.¹⁹ Subsequently, Mexico contemplated utilising the IMF's Contingent Credit Line facility (CCL), which was created in 1999 following the severe nervousness in international financial markets triggered by the Russian financial crisis. The CCL was never used, however, as no country wished to be the first to apply for it, and as there were serious design problems associated with the facility.²⁰

Self-insurance is also still a consideration for the new EU Member States, especially with an eye to entering ERM II, where exchange rate pressures could occur within the agreed fluctuation band of $\pm 15\%$. The new EU Member States have generally accumulated comfortable levels of reserves. Looking further east, Russia is now in a very different situation than in 1999. It no longer needs to be concerned about self-insurance, having accumulated very large reserves in recent years, aided by sizeable energy-related current account surpluses and a significant reduction in capital flight. Russia's reserves are now much higher than adequacy indicators suggest (see Annex 1), and its main motive for recent accumulations appear to be the by-product of a desire to keep the nominal exchange rate from appreciating too strongly. In this sense, Russia is displaying a policy stance similar to that of emerging Asian countries.

A number of emerging Asian countries have in recent years increased their reserves to levels beyond what can be considered as adequate for self-insurance purposes.²¹ Most of these countries or territories are situated in East Asia, and include China, Hong Kong S.A.R., Taiwan

(Province of China), Singapore and South Korea. In similar fashion, reserves in India, Malaysia and – to a lesser extent – Thailand have now also grown beyond levels that can be considered adequate. Japan, the only fully industrialised country in Asia, has also experienced reserve accruals substantially beyond its likely crisis buffer needs. This is quite different from what can be seen in other industrialised countries, where reserves have remained at relatively modest levels, as mentioned earlier. Japan's reserves, which soared from USD 287 billion in 1999 to around USD 840 billion at the end of 2005, but have shown little change since then, reflect massive interventions aimed at putting the brakes on yen appreciation. The main consideration was to combat deflation and stagnant growth through the channel of strong export growth. Since the Japanese economy started to recover around late 2004, further intervention in the foreign exchange market has been absent.

There has been an interesting public debate in a number of Latin American countries about the adequacy of their reserves, mainly stemming from a concern that these may have become excessive and that such resources could be better utilised for other (domestic) purposes. Recently published studies include those of the central banks of Colombia and Venezuela.²² IMF staff have also increasingly produced analyses of reserve adequacy in their work in the scope of Article IV consultations with EMCs. Fund staff have furthermore produced a study on liquidity management²³, which also included sections on

17 In Argentina, following the severe depletion of its reserves during the crisis of 2001/2002 and its early repayment of outstanding credit to the IMF in 2005, the accumulation of reserves is designated as a state policy; see Redrado (2006).

18 See, for instance, Guzman and Padilla (2004).

19 This and other experiences with private sector contingent credit lines extended to EMCs have led to the virtual disappearance of such lines as a way of reducing external vulnerability for these countries.

20 The lack of an appropriate exit strategy was particularly criticised. The facility lapsed at the end of 2003.

21 For a comprehensive treatment of Asian reserve accumulation, see Genberg et al. (2005).

22 See Banco de la Republica (Colombia, 2003) and Banco Central de Venezuela, (2004). In the latter study, the De Beaufort Wijnholds/Kapteyn approach is one of the methods applied.

23 Liquidity Management, IMF Staff Memorandum, SM/04/149.

how to approach reserve adequacy. The report summarises the shift which has taken place in the literature on reserve adequacy since the Asian crisis. Whereas the traditional focus was on having sufficient reserves to cover part of annual imports (the rule of thumb applied was that reserves should at least cover three months

of imports), reserves now tend to be assessed against a number of different indicators, including short-term external debt, rollover rates of short-term debt, and broad money supply. The report concludes that further work is needed, especially in weighing the benefits and costs of holding reserves (see also Box 2).

5 ASIAN EXCHANGE RATE AND RESERVES POLICIES

Asian countries' exchange rate and reserves policies have become a crucial element in the functioning of the international monetary system. By either pegging their currencies to the US dollar or conducting a heavily managed float, a number of these countries play an important role with respect to existing global external imbalances. They have also become a significant conduit for financing the large US current account deficit. The high level of Asian reserves and questions about the sustainability of this in view of the accompanying risks and costs were flagged as an "imminent issue" by the ECB in its Monthly Bulletin in January 2005.²⁴

Under the Bretton Woods system of fixed but adjustable exchange rates, which lasted from 1945 to the early 1970s, Asian countries maintained a fixed exchange rate with the dollar. After the changeover to floating among industrialised countries, Japan continued to intervene heavily from time to time to influence the value of the yen. Other Asian countries either pegged to the dollar or to a basket of currencies. As international capital markets developed and capital flows became freer, the rigidity imposed by fixed exchange rate arrangements increasingly caused problems in the emerging Asian countries, as well as in other EMCs. In the 1990s the series of severe financial crises in EMCs was closely related to inflexibility in their exchange rates and the ability of their authorities to defend them. In several cases, especially in Latin America and Turkey, as well as in Indonesia and Thailand, overvaluation of the exchange rate was a major cause of the crisis. In others, such as South Korea and Malaysia, other factors were more important.²⁵ During the Asian financial crisis of 1997/1998, several countries were forced to adopt a floating exchange regime. However, they generally chose to manage their float quite actively through interventions in the foreign exchange market. China, on the other hand, was not seriously affected by the Asian financial crisis, and continued to peg the renminbi to the dollar. Several countries actively

resisted what they considered to be excessive appreciation of their currencies; in the case of China, the exchange rate has moved very little in real terms in recent years, leading to what most observers see as a substantial undervaluation of its currency.²⁶ During 2005 China gradually started to introduce some flexibility in its exchange rate regime, but continued to make very substantial additions to its reserves. After lengthy internal discussions on how best to manage the large and still growing stock of international reserves (see Feng, 2007), China has recently decided to establish a state fund for the purpose of investing part of its reserves in less liquid, higher yielding assets. Such special public investment funds, traditionally limited to countries with non-renewable resources (see also Box 3 on the oil-exporting countries), have now been established in quite a few Asian countries besides China, as well as in Russia. The rise of special public investment funds worldwide has been estimated at accounting for between USD 1,500 and 2,500 billion (end-2006).²⁷ If these funds were to grow rapidly in Asian countries, their reserve accumulation could be reduced markedly.

There is no consensus on what these developments mean for the functioning of the international monetary system. One line of thinking is that countries like China are pursuing policies aimed at achieving export-led growth by means of an undervalued exchange rate.²⁸ This results in large-scale reserve accumulation and contributes to global

24 ECB (2005), "Financial Flows to Emerging Market Economies: Changing Patterns and Recent Developments", Monthly Bulletin, January, p. 73.

25 See De Beaufort Wijnholds (2003).

26 Views about the renminbi's appropriate value vary widely (see Dunaway et al., 2006). The extent of this undervaluation is estimated to range from "not significantly undervalued" to 30% or more. As regards some other Asian EMCs, it should be mentioned that their currencies have appreciated significantly in recent years. This is especially the case for South Korea, Thailand and Indonesia, where the current account has deteriorated significantly.

27 See Morgan Stanley Research and PIMCO.

28 This is sometimes referred to as mercantilism; see Aizenman and Lee (2006). See also IMF (2006b), which calls upon China to rebalance its economy in order to reduce its heavy dependence on export-led growth, which has started to attract attention since mid-2004.

imbalances in external current accounts. Specifically, it is argued that the undervalued Asian currencies (*vis-à-vis* the US dollar) are contributing to persistently large US trade deficits, which discourages investment in the US tradable sector, at the expense of a rapidly growing tradable sector in Asia.²⁹ There is considerable concern that this trend, if continued, will lead to protectionist measures being adopted in the US and elsewhere. As the present large external imbalances are not sustainable overtime, according to most observers, and as undervaluation of the exchange rate and large official dollar purchases may well lead to overheating and inflation in countries pursuing such policies, the remedy is to move toward greater flexibility in their exchange rates.³⁰ In other words, it is desirable both from a global point of view and from that of the countries themselves to allow their currencies to appreciate. This view is supported by the (main) industrialised countries as well as the IMF.³¹ While both China and Malaysia have started to allow more exchange rate flexibility³², there is a widespread sentiment that further measures will be needed.

According to another view, the present policy stance of emerging Asian countries can be compared to the functioning of the Bretton Woods system. A parallel is drawn between the behaviour of European countries at the time of the post-war system with present day Asian exchange rate and reserve policies. Dooley et al.³³ argue that European countries were content under the Bretton Woods system to accumulate large amounts of US dollars as a price for maintaining undervalued exchange rates, enabling them to enjoy export-led growth.³⁴ Nowadays, emerging Asian countries are prepared to undergo the disadvantages of a fixed, undervalued exchange rate because they consider the advantages this brings in terms of economic growth and job creation to be greater. Dooley et al. assert that China needs to grow very fast in order to create enough jobs to absorb its 200 million rural unemployed – or underemployed – inhabitants. An undervalued exchange rate will allow sufficient jobs to be

created, thereby avoiding political unrest. At the same time, by investing the accumulated reserves mainly in dollar assets, China contributes to financing the US's external and budget deficits, and mutes American protectionist pressures. According to Dooley et al., the political economic reality is that such a situation could last for many years.

Other observers are more concerned about the risks in the shorter term involved in this configuration. Not only could China (and some other Asian EMCs) experience negative effects on account of an overheated economy, with spillover effects to other countries, but the accumulation of massive claims on the US could at some point lead central banks to cease to add to their dollar holdings.³⁵ Such a development would, other things being equal, cause interest rates to rise and increase the volatility of major exchange rates. Large reserve accumulation can also lead to distorting current decisions about investment and consumption in such a way that they could negatively affect long-run growth prospects in the US.³⁶

29 See, for example, Dunaway et al. (2006) for an assessment of the renminbi exchange rate.

30 Goldstein and Lardy (2004) and Roubini and Setser (2005), among others, provide arguments suggesting that the cost of maintaining a peg, especially for China, will eventually become unacceptably high.

31 See recent communiqués of the Group of Seven and the IMFC.

32 In July 2005 the Chinese authorities announced a 2.1% revaluation of the renminbi, and that its value would henceforth be set with reference to a basket of currencies. The composition of the reference basket has not been published, but appears to be based on the composition of China's foreign trade.

33 See Dooley, Folkerts-Landau and Garber (2003, 2004 and 2005).

34 The argument neglects the fact that a number of European countries, foremost France, formerly continuously converted dollars into gold on the grounds that they wished to provide incentives for the US to curb its balance of payments deficits. When the gold drain became too large, in 1971 the US ceased to provide gold against dollars.

35 Roubini and Setser (2005) discuss why Asian central banks' appetite for US-denominated reserves is likely to dwindle. Roubini and Setser (2005) discuss why Asian central banks' appetite for US-denominated reserves is likely to dwindle.

36 This view is not only held by IMF officials and other observers, but also by some US officials. Geithner, President of the Federal Reserve Bank of New York, has echoed such warnings, and has also pointed out that large increases in officially held dollars "work to mask or dampen the effects on risk premiums that we might otherwise expect to be associated with the expected trajectory of the fiscal external imbalances in the United States"; see Geithner (2002).

In light of the above, the benefits and costs of Asian exchange rate and reserve accumulation policies merit further examination. In general terms, the benefits and costs of substantial undervaluation can be identified as follows:

Dooley et al. posit that the Chinese authorities consider that the benefits, especially with respect to political stability, outweigh the costs of maintaining a too low exchange rate. Although these factors are generally very hard to quantify, it seems possible to approximate at least the financial costs of maintaining an

undervalued exchange rate. By highlighting these costs, policymakers could be made more aware of the significant (potential) effects resulting from their policies, which are in addition to those that can be identified only in a qualitative sense. As for the non-quantifiable costs, the danger of protectionism seems to be the greatest, as this will not only harm growth in emerging Asia, and raise costs in those countries initiating trade restrictions, but could also lead to more widespread protectionist tendencies and the attendant loss of economic welfare.

6 THE COSTS OF HOLDING RESERVES

Measuring the costs of holding reserves is a complicated exercise, and the existing literature provides little guidance towards obtaining operational results. In this section, a framework attempting to bring more clarity to the issue is developed. Measuring the cost of holding reserves depends on the perspective taken: it is useful to distinguish a macroeconomic perspective which does not make a distinction between the private and public sector (broadly defined), and a balance sheet perspective, focusing exclusively on the effects holding reserves has on a central bank's balance sheet. It is argued that, ultimately, it is the former which is of fundamental importance.

6.1 MEASURING THE COSTS OF HOLDING RESERVES FROM A MACRO PERSPECTIVE

From a macroeconomic perspective, the costs of holding reserves are the costs incurred for the whole economy, irrespective of who accumulates the reserves and who holds them. There are two ways of calculating this cost, depending on how the accumulation takes place: either it can be assumed that the country concerned can "borrow" (or has borrowed) reserves, or it can be assumed that the country cannot borrow reserves and has to accumulate them by running a current account surplus (i.e. "earning" reserves). Hence two alternative ways of estimating the cost of holding reserves can be distinguished, depending on whether "borrowing" or "earning" is the predominant process behind the reserve accumulation.

As Figure 1 shows, in order to simplify the discussion, "borrowed" reserves are viewed in very general terms. Specifically, the focus is not only on the central bank or the government issuing sovereign bonds internationally, but rather the extent to which the country as a whole is generating capital and financial accounts surpluses (e.g. by attracting FDI, portfolio or banking inflows). Clearly, for a number of reasons it makes a considerable difference whether these surpluses are created as a result

Table 2 Benefits and costs of exchange rate undervaluation

Benefits	Costs
Macro Strong export and GDP growth Large job creation	Macro Overheating and inflation Protectionist measures
Strategic Maintenance of political stability	Financial Costs of holding reserves (from a macro perspective) Costs of sterilisation (the balance sheet approach)

of "official" borrowing or as a result of the private sector having attracted large sums of FDI.³⁷ However, as the objective is to derive a rough measure of the cost of holding reserves, a distinction between the different sources of borrowing will not be pursued here.

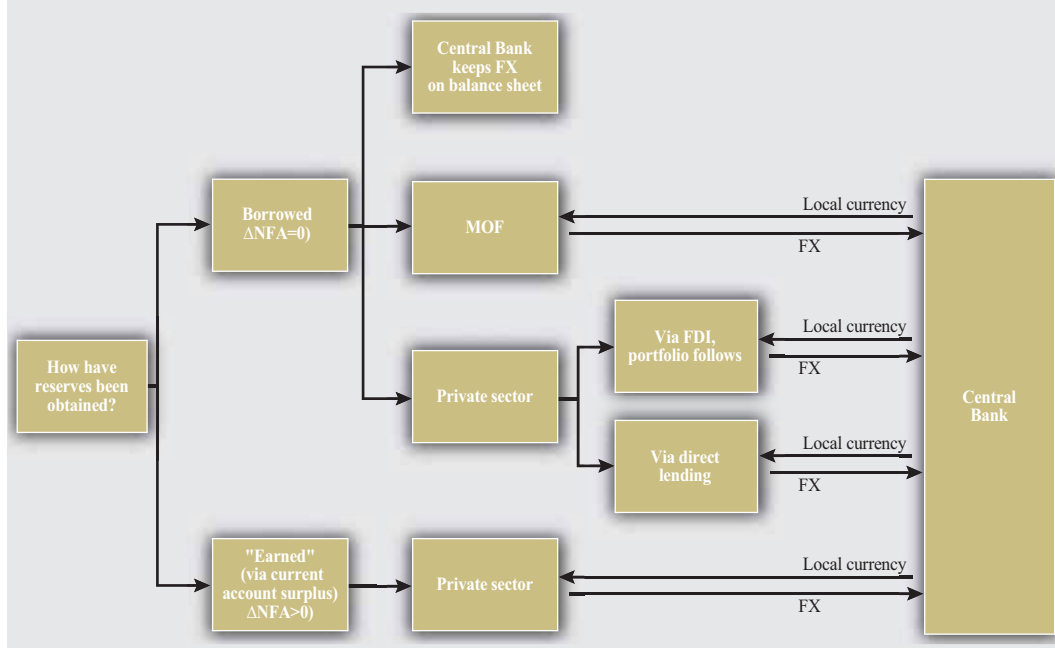
The underlying assumption in Table 2 is that countries "borrow" to build up reserves, as, indeed, a large number of countries have done in recent years (see Annex 2). The calculations are based on the difference between the costs for the various national governments of borrowing (in dollars) on international capital markets and the return on investment of their official reserves.³⁸ The percentage cost in terms of GDP ranges from only 0.03% in Poland to 0.48% in Venezuela.³⁹ The cost in dollars for China amounts to as much as USD 2.3 billion annually, equalling 0.09% of GDP (on the basis

³⁷ Two main reasons for this are: (i) foreign borrowing by the central bank to increase gross reserves does not result in an expansion of the money supply (and subsequent sterilisation operations), whereas "borrowing" by the private sector does; (ii) the country receiving FDI inflows or portfolio inflows is not bearing an exchange rate risk associated with these types of "borrowing" (whereas the country which is investing is). By contrast, government and private sector bank borrowing involves not only a direct interest cost, but also leaves the country with an exchange rate risk associated with the borrowing (since the loan is likely to be denominated in foreign currency).

³⁸ It is also possible to borrow reserves through international (syndicated) bank loans. While this form of financing has diminished importantly for many EMCs, bank loans taken up by emerging European countries have increased rapidly in recent years.

³⁹ Based on the very high spread quoted for Argentina, its cost of holding reserves would be 0.7% of GDP. Since there was no external market borrowing by Argentina in 2005, such a calculation is not however very meaningful.

Chart 4 Different channels towards reserve accumulation



of mid-2007 data). For Argentina and Venezuela, the costs of holding reserves are around 0.5% of GDP, reflecting the relatively high spread over US bond yields they have to pay. It should be added here that over the last couple of years, borrowing costs for EMCs were on average at a historically low level.

An alternative way to estimate the cost of holding reserves is to focus on the opportunity costs of accumulating reserves. This approach, while relying less on hard data, is more consistent with countries earning their reserves by running current account surpluses rather than borrowing from their reserves. Surplus countries experience an increase in their external claims; in other words, their net foreign asset position improves. The authorities of these countries should be aware of the return on holding these claims, and what they forego by not cashing in these claims immediately, i.e. by eliminating the current account surplus.⁴⁰ Given EMCs' relatively low per capita level of income, their opportunity costs of postponing investment or consumption should be much higher than the opportunity cost for an advanced economy such

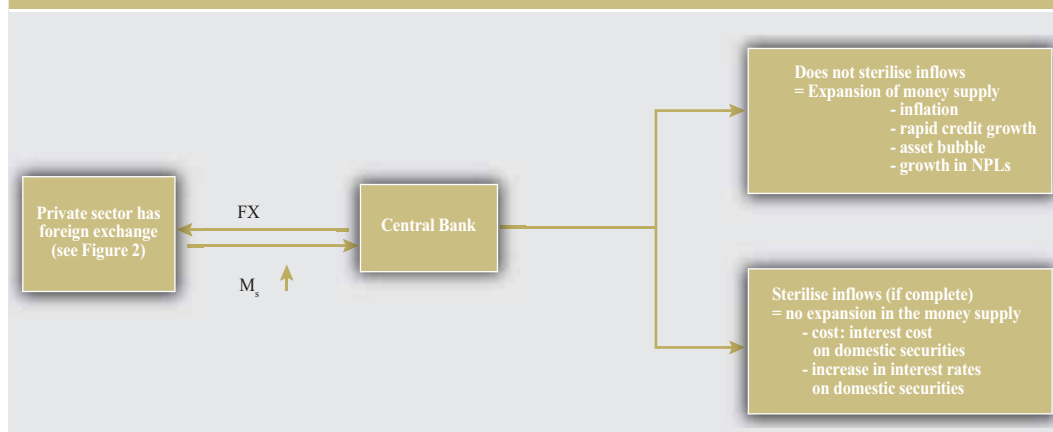
as, for example, Norway, which is also running large current account surpluses and saving the proceeds rather than experiencing increased consumption and investment in the short run.

As a first step, the cost of holding reserves is measured by estimating the opportunity costs of foregone fixed investment in Table 2. The opportunity costs of holding reserves have sometimes been equated with the yield on government bonds.⁴¹ This would seem to constitute an underestimation, as the marginal productivity of capital should normally be higher than the cost at which the government can borrow domestically. It is investment foregone through holding additional reserves that constitutes the true opportunity cost of non-

40 Specifically, the country "cashes in" when it eliminates the current account surplus by increasing imports (for a given level of exports). This is likely to happen as investment and/or consumption rises.

41 See, for instance, Frenkel and Jovanovic (1981). Jeanne and Ranciere (2007) use a similar but more sophisticated approach, estimating the opportunity costs of holding reserves using two variables: (a) the US term premium (the difference between long and short-term rates), and (b) the difference between emerging market yields and US short-term Treasury paper.

Chart 5 Reserve accumulation from a central bank perspective



borrowed reserves. Based on a range of low and high marginal productivity of capital estimates, as calculated by the World Bank in project evaluations, we apply a low and high estimate of the opportunity costs of holding reserves at 10 and 20% respectively.⁴² From this the estimated investment proceeds of reserves (5.45%)⁴³, as incorporated in Table 2, are subtracted. This measure of the opportunity costs of holding reserves yields much higher estimates than the method on which Table 2 is based. For China this yields very large dollar amounts, translating into between 1.9 and 5.9% of GDP. Large costs are also incurred by South Korea, Russia, India and Hong Kong S.A.R. in absolute amounts.

Although the calculations in Tables 3 and 4 rest on a number of broad approximations, it is worth noting that, regardless of which method is used to calculate the cost of holding reserves, the same five countries appear in the top ten list of countries incurring the highest annual costs: China, Malaysia, Russia, Thailand and Venezuela.

The costs of holding of reserves, as calculated in Tables 3 and 4, are not directly visible to policymakers, except in those cases where it is the central bank or the government which is borrowing to augment reserves. In all other cases, it is the private sector which is the involved party, either (i) directly when it borrows abroad, (ii) less directly when it receives FDI and portfolio inflows, both

representing commitments to pay non-residents a return in the future, or (iii) when it accepts an increase in its net foreign assets – thereby delaying consumption or investment – by importing less than it exports.

In the next section the focus is shifted from the costs of holding reserves from a macro perspective to the perspective of a central bank, applying a balance sheet approach to the cost of holding reserves.

6.2 THE COSTS OF HOLDING RESERVES: THE BALANCE SHEET APPROACH

Since the costs discussed in sub-section 6.1 are both difficult to measure and generally widely shared across the economy, they tend to receive limited attention in policy debates. Moreover, it should be kept in mind that the beneficiaries of the inflows, whether borrowers or exporters, are initiating these inflows for profit-maximising reasons. The costs and risks to the economy only become apparent when recognising that, in a number of the EMCs, inflows are taking place in the context of an undervalued exchange rate regime, and/or because of the existence of

⁴² See, for instance, Caselli and Feyrer (2006). Hauker (2005) measures the opportunity costs of holding reserves by estimating the social return on public investment.

⁴³ Countries with relatively large reserve holdings have increasingly turned to higher yielding assets in which to invest part of their reserves, which over time should increase the return. This will lower somewhat the opportunity costs of holding reserves.

Table 3 Annual costs of holding reserves for selected countries

(as of June-2007)

	Borrowing costs ¹	Investment proceeds ²	Difference	Holding costs ⁴	
	(%)	(%)		billions USD ³	% of GDP
Venezuela	8.65	5.45	3.20	0.87	0.48
Argentina	8.35	5.45	2.90	0.90	0.42
Ukraine	6.67	5.45	1.22	0.27	0.25
Turkey	7.00	5.45	1.55	0.91	0.23
Malaysia	5.85	5.45	0.40	0.33	0.22
Russia	6.17	5.45	0.72	2.13	0.22
Philippines	6.66	5.45	1.21	0.24	0.21
Peru	6.28	5.45	0.83	0.14	0.15
Indonesia	6.76	5.45	1.31	0.54	0.15
Brazil	6.71	5.45	1.26	1.08	0.10
Colombia	6.30	5.45	0.85	0.13	0.10
China	5.66	5.45	0.21	2.24	0.09
Chile	6.00	5.45	0.55	0.11	0.07
Hungary	5.82	5.45	0.37	0.08	0.07
Mexico	6.21	5.45	0.76	0.58	0.07
South Africa	5.97	5.45	0.52	0.12	0.05
Poland	5.64	5.45	0.19	0.09	0.03

Sources: Board of Governors of the Federal Reserve System, JP Morgan, IFS and own calculations.

1) Costs are US Treasury yields (ten-year Treasury constant maturity rate) plus the country spread (JP Morgan's Emerging Market Bond Index Plus).

2) Six-month US Treasury bill yield plus 50 basis points (assuming that part of the reserves are invested in non-government paper and/or at longer maturities).

3) Percentage cost times total reserves.

4) Holding costs are scaled by end-2006 reserves and GDP figures.

capital controls. Hence, the exchange rate is not allowed to play its adjustment role, while capital controls limit the options available for the recipients of foreign exchange. Moreover, given the relatively small economic size of most EMCs and their often underdeveloped and inadequately supervised financial systems, the sheer magnitude of capital inflows can lead to imprudent risk management, as was illustrated in the run-up to the Asian financial crisis. Therefore, rather than focusing on the costs described above, most observers have shifted their attention to the policy mix available to manage capital inflows (or current account surpluses), and the costs associated with this policy mix. In essence, the discussion focuses on the risks and costs policymakers and, in particular, central banks, are facing.

A central bank only faces immediate financial costs when it decides to offset (sterilise) the expansion of the money supply associated with the foreign exchange inflow, unless the central bank is actually borrowing the reserves (e.g. from the IMF). However, it will face other

costs such as higher inflation – not easily measured in financial terms – when it does not attempt to offset the expansion in the money supply. Moreover, accumulating reserves exposes its balance sheet to exchange rate fluctuations. Assuming that it is the private sector that is generating the foreign exchange inflow, obtaining reserves does not carry costs in the sense discussed in sub-section 6.1: from a central bank perspective there is neither an interest rate cost at which the central bank borrows the foreign exchange, nor a foregone opportunity cost. As depicted in Figure 2, when the private sector exchanges foreign exchange for domestic currency with the central bank, the money supply expands. Again, in purely financial terms, this is cost-free from the central bank's perspective.⁴⁴ Moreover, if the central

⁴⁴ For presentational ease we assume that it is the private sector which is generating foreign exchange (either via current account surpluses or capital inflows), and that the country has an exchange rate regime which is not purely floating. Thus, as Figure 2 shows, the central bank becomes involved when the private sector seeks to exchange its foreign exchange receipts into domestic currency. Exchanging, say, US dollars for domestic currency does not have an adverse impact on the central bank's balance sheet.

Table 4 Net opportunity costs of holding reserves for selected countries

(as of End-2005)

	Percent ¹		USD billions ^{2,3}		As a % of GDP ³	
	Low	High	Low	High	Low	High
Hong Kong S.A.R.	4.55	14.55	6.1	19.4	3.20	10.2
Malaysia	4.55	14.55	3.7	12.0	2.48	7.9
China	4.55	14.55	48.6	155.5	1.85	5.9
Thailand	4.55	14.55	3.0	9.5	1.44	4.6
Russia	4.55	14.55	13.4	43.0	1.37	4.4
Korea, South	4.55	14.55	10.3	32.8	1.16	3.7
Romania	4.55	14.55	1.3	4.1	1.05	3.3
Czech Republic	4.55	14.55	1.4	4.5	1.00	3.2
Israel	4.55	14.55	1.3	4.2	0.95	3.0
Ukraine	4.55	14.55	1.0	3.2	0.94	3.0
India	4.55	14.55	7.8	24.8	0.88	2.8
Hungary	4.55	14.55	1.0	3.1	0.86	2.7
Peru	4.55	14.55	0.8	2.4	0.82	2.6
Philippines	4.55	14.55	0.9	2.9	0.78	2.5
Venezuela	4.55	14.55	1.2	4.0	0.68	2.2
Turkey	4.55	14.55	2.7	8.5	0.68	2.2
Argentina	4.55	14.55	1.4	4.5	0.66	2.1
Poland	4.55	14.55	2.1	6.7	0.62	2.0
Chile	4.55	14.55	0.9	2.8	0.61	1.9
Colombia	4.55	14.55	0.7	2.2	0.52	1.6
Indonesia	4.55	14.55	1.9	6.0	0.51	1.6
Mexico	4.55	14.55	3.5	11.1	0.41	1.3
South Africa	4.55	14.55	1.0	3.4	0.41	1.3
Brazil	4.55	14.55	3.9	12.4	0.36	1.2

Sources: Board of Governors of the Federal Reserve System, IFS and own calculations

1) The gross opportunity cost of holding reserves is based on estimates of the low and high ends of the marginal productivity of capital in emerging markets (10-20%). Net costs are found by subtracting the estimated investment proceeds (see note 2 of Table 2).

2) Percentage cost times total reserves.

3) Scaling is done using end-2006 reserves and GDP figures.

bank uses this foreign exchange to purchase US securities, it will generate income. This is consistent with Tables 3 and 4, where it is implicitly assumed that it is the central bank which generates this income, and the private sector which bears the “cost”, whether measured as a borrowing or an opportunity cost. However, central banks’ primary objective is not to generate a profit, but rather to achieve price and/or macroeconomic stability. It is this mandate which is put at risk by large capital inflows, and therein lie the non-monetary costs which the central bank and the economy face.

While these non-monetary costs cannot be quantified properly, they can be identified clearly in qualitative terms. They are basically represented by an unwanted expansion of the money supply. Whenever the central bank purchases foreign exchange from the private sector it injects liquidity into the system, which

is tantamount to pursuing an expansionary monetary policy. This expansion may or may not be desirable. Certainly, if the amount of foreign reserves entering the country is very large relative to the size of the economy, it is highly likely that, at some point, the expansion of the money supply will lead to inflationary pressures (as listed in Figure 2) and thus threaten the central bank’s objective.

As a result of the potentially destabilising effects of large foreign exchange inflows, many central banks attempt to sterilise such inflows. There is of course a cost involved: the central bank exchanges currency (thereby losing interest income) for either government securities (on which it earns interest) or its own bonds (on which it has to pay interest). Hence, if the central bank chooses to sterilise the inflow, it will still have income generated from holding US government paper, but it will

Table 5 Estimates of the cost of the sterilisation (2001-2006)

	Domestic interest rate ¹	Investment proceeds ²	Difference	Net annual cost of sterilisation (% of GDP)	Capital loss due to 15% appreciation (% of GDP) ³
Romania	20.8	3.22	17.5	1.03	3.5
Turkey	43.3	3.22	40.1	0.97	2.3
Ukraine	20.7	3.22	17.5	0.68	3.1
Russia	10.3	3.22	7.1	0.66	4.5
Venezuela	22.8	3.22	19.6	0.57	2.4
Peru	23.5	3.22	20.3	0.36	2.7
Argentina	20.0	3.22	16.8	0.32	2.2
India	11.4	3.22	8.2	0.29	2.9
China	5.6	3.22	2.4	0.20	6.1
Brazil	18.6	3.22	15.4	0.16	1.2
Hungary	8.8	3.22	5.6	0.15	2.8
South Africa	9.7	3.22	6.5	0.12	1.4
Korea, South	5.5	3.22	2.3	0.09	4.0
Indonesia	16.4	3.22	13.2	0.09	1.7
Philippines	9.9	3.22	6.7	0.08	2.6
Colombia	15.8	3.22	12.6	0.08	1.7
Thailand	5.1	3.22	1.8	0.08	4.7
Mexico	9.5	3.22	6.2	0.05	1.4
Malaysia	3.7	3.22	0.5	0.04	8.2
Poland	5.5	3.22	2.3	0.04	2.1
Hong Kong S.A.R.	4.5	3.22	1.3	0.04	10.5

Sources: Board of Governors of the Federal Reserve System, IFS and own calculations.

Notes:

1) Treasury bill rates and government yield rates where available in the IFS, and commercial lending rates otherwise; average 2001-2006.

2) Six-month US Treasury yield plus 50 basis points over the period 2001-2006 (assuming that part of the reserves are invested in non-government paper and/or at longer maturities).

3) Calculated as the difference between reserves in USD at the end of 2006, converted into domestic currency at the actual domestic currency/USD exchange rate (end-2006) and a 15% appreciated exchange rate. Note however that not all reserves are actually held in USD; the potential capital loss is for illustrative purposes only.

forego interest as a result of selling domestic government securities. Note, however, that the private sector or government will have a corresponding interest income from holding central bank bonds or government securities. As a result, sterilisation is not considered as a macroeconomic cost in sub-section 6.1.

Table 5 provides some estimates of the costs which a number of central banks incurred by sterilising foreign exchange inflows in 2006. The amount sterilised is approximated by taking the difference between the increase in international reserves and the increase in base money, as was done in IMF (2005).⁴⁵ For example, international reserves rose by 1.7 trillion renminbi in China in 2005. However, base money was not allowed to grow by the full amount, increasing by only 1.3 trillion renminbi that year. As a broad approximation, we

attribute the difference – approximately USD 50 billion – to sterilisation operations.⁴⁶

Taking into account that central banks also earn interest on their reserves, the cost of sterilisation in 2005 appears quite modest as a share of GDP in most cases. As for China, the central bank could virtually conduct this operation without cost or, according to IMF (2004), actually generate a positive income on its sterilisation operations.⁴⁷ Reflecting high domestic interest rates and a relatively large increase in reserves compared to its GDP, the cost of sterilisation

45 Figure 1.13 in IMF (2005), World Economic Outlook, p. 34.

46 In reality, other factors can influence the relationship between increases in base money and net foreign assets, including changes in banks' reserve requirements of, and one-off transfers from reserves to undercapitalised banks.

47 See IMF (2004): "People's Republic of China: 2004 Article IV Consultation", Staff Report, November.

was highest in Romania, amounting to 1.03% of GDP.

Although these sterilisation costs seem modest, there are other factors that need to be taken into consideration. First, it may become increasingly costly for the central bank to conduct sterilisation operations as their size increases. For example, economic agents are likely to demand a higher interest rate to hold government paper or central bank bonds.⁴⁸ According to IMF (2004), this is exactly what has happened in China, where the central bank has had to accept somewhat higher interest rates in order to induce market participants to purchase central bank paper. To the extent that sterilisation operations contribute to higher domestic interest rates, they can fuel further capital inflows. Despite the capital controls in place, the fact that “errors and omissions” have recently turned positive (and are growing) is one indicator that investors, seeking higher yields and anticipating exchange rate appreciation, are increasingly finding ways around the controls. In addition, while sterilisation may at best help curtail inflationary pressures, it does not halt the underlying reasons for reserve accumulation. Thus, while policymakers’ attention is shifted to addressing symptoms rather than the causes, the annual costs may initially be modest but could substantially cumulate over time. In addition, as the central bank builds up reserves, it increasingly leaves itself vulnerable to the effects of exchange rate appreciation.

In addition to the costs of sterilisation, the central bank’s balance sheet is exposed to exchange rate risk when it accumulates reserves. The last column in Table 5 estimates these costs.⁴⁹ Specifically, the cost in terms of a capital loss on reserves on account of a 15% appreciation of the domestic currency against the dollar ranges from 1.2% to 1.4% in Brazil and South Africa to 8.2% and 10.5% Malaysia and Hong Kong S.A.R., respectively, with relatively high costs also for China, Thailand, Russia and South Korea (again assuming that all reserves are held in dollars, which is not the

case as is reflected in sub-section 6.3). Such losses would have a significant impact on the revenue which the government receives through central bank profits. In fact, a large appreciation would probably imply (heavy) central bank losses⁵⁰, at least to the extent that such losses are recognised in its books. It may well be, however, that many central banks in EMCs do not account for such losses in the way that central banks in industrialised countries generally do. Nonetheless, a financial cost exists and, unless reversed, will surface at some point.⁵¹ The extent to which emerging Asian countries’ policies would be influenced by such (potential) losses is uncertain. In this connection it may be useful to turn briefly to the composition of reserves.

6.3 THE COMPOSITION OF INTERNATIONAL RESERVES

Given the potential risks and costs associated with reserve accumulation in US dollars, central banks with rapidly growing reserves may wish to diversify their portfolios. Diversification can take place both in currencies and in instruments. The latter has been going on for a considerable time already, with central banks looking for higher yields by, for instance, investing also in US agency paper rather than only in US Treasury bills. For countries whose reserves comfortably exceed the size of a liquidity buffer or intervention arsenal, government securities with longer maturities (and higher yields), as well as relatively small amounts of riskier

48 As Higgins and Klitgaard (2004) note, this is the case when reserve and domestic currency securities are not perfect substitutes. If they were, local investors would not require higher yields on domestic securities to shift their portfolios toward domestic securities.

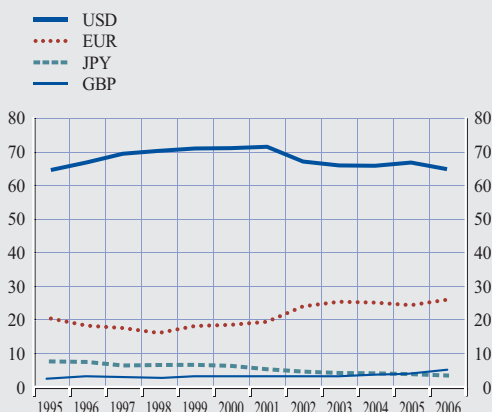
49 This percentage has been chosen entirely for illustrative purposes.

50 Green and Torgerson (2007) note that a 10% appreciation of the currencies of the seven largest emerging market reserve holders would wipe out the capital of their central banks except for one country.

51 Higgins and Klitgaard (2004) and IMF (2004) provide estimates of capital losses in China which are somewhat lower. This probably relates to differing assumptions regarding the currency composition of the country’s reserves. For example, if assuming that 80% of China’s reserves are in US dollars, the impact of a 15% renminbi/USD appreciation would only be 4.4% of GDP (as opposed to 5.5% as reflected in the table).

Chart 6 The currency composition of international reserves – all countries

(as a percentage)



Sources: IMF Currency Composition of Official Foreign Exchange Reserves (COFER) database and ECB computations. Note that prior to 1999, the euro percentage share includes euro legacy currencies.

assets, have become part of their portfolio. Indeed, the advice given by the Bank for International Settlements to central banks in the management of their reserves is to “tranche” them into a liquidity portfolio and an investment portfolio.⁵² Another tendency worth noting is for countries with reserve levels that are (much) more than adequate to cover any intervention needs to establish separate entities that manage overabundant reserves with the primary objective of achieving relatively high long-term returns. Earlier examples of such separate funds exist in Kuwait, Singapore and Norway. In South Korea and Russia such entities have been established more recently. If this tendency becomes stronger, significant amounts of excess reserves could be channelled over time into longer-term investments and would no longer be counted as part of official reserves.⁵³ At the same time, there is a possibility that an asset shift to separate investment entities will lead to additional, albeit gradual, diversification out of the US dollar.

With regard to the issue of currency diversification of reserves, there are many anecdotal indications, but insufficient hard statistical evidence at present as to the actual

extent of this process. It is clear however, that a number of central banks in emerging market countries are pursuing a strategy of greater diversification of their reserves, which is sometimes borne out by public statements by high-ranking officials. However, the available global statistics hardly reflect this development. This may be partly due to the fact that reporting by member countries to the IMF on the currency composition of their reserves is deficient. Over 50% of the reserves of developing countries are not included in the IMF statistics on the currency composition of reserves. The central banks that do not report are mainly situated in Asia (see IMF 2005, p. 110).

Because of this lack of comprehensive data, which is a significant drawback for analysis and policymaking, it is necessary to piece together various strands of information to obtain a more reliable picture of the extent of reserve diversification. While diversification away from the dollar and into the euro is quite limited concerning industrial countries, it is stronger for other central banks, with reserves in euro amounting to 30% of the total at the end of the third quarter of 2006 (see Chart 5).

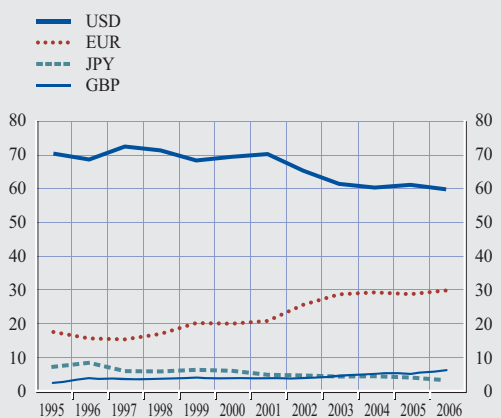
It is often suggested that currency diversification is occurring mainly, or perhaps wholly, at the margin, i.e. central banks are keeping less of their newly acquired reserves in dollars and more in euro and possibly in other currencies. Some central banks have indicated in recent statements that this is indeed the case. What seems clear, however, is that overall a considerable degree of inertia exists among central banks in managing their reserves. As Charts 6 and 7 show, the share of the US dollar in official foreign exchange holdings has remained high, though declining fairly significantly in 2002, while the euro share has increased by practically the same percentage of the total. This seems to have coincided with the

⁵² See Rigaudy (2005), p. 34.

⁵³ This seems to be an important part of the explanation of the recent limited build up of reserves by oil-exporting countries, despite the jump in their foreign exchange earnings on account of much higher oil prices (see Box 3).

Chart 7 The currency composition of international reserves – developing countries

(as a percentage)



Sources: IMF Currency Composition of Official Foreign Exchange Reserves (COFER) database and ECB computations. Note that prior to 1999, the euro percentage share includes euro legacy currencies.

replacement of the virtual euro by the “visible” euro in the form of notes and coins, which may well have stimulated general interest in holding euro. The share of other currencies in official holdings is quite modest.

With the share of the euro in official reserves gradually increasing, the question has been raised in the literature as to what extent this share may grow further at the expense of the dollar. In some instances it has even been suggested that – under certain conditions – the share of the euro could eventually surpass that of the dollar as an international reserve currency (see Chinn and Frankel, 2005).⁵⁴ As stated before, historical experience shows that changes in the behaviour of central banks with respect to their reserve management, especially

regarding currency composition, tend to come about only gradually.⁵⁵ It should also be emphasised that the ECB neither encourages nor discourages the international role of the euro, but rather leaves it to be determined by market participants.⁵⁶ Nonetheless, there has been some discussion of possible schemes to deal with reserve diversification were this process to take place abruptly. While this is likely to be a low probability event, it could be disruptive if it were to materialise. In this context a few possible remedies have been suggested. Apart from the suggestion to have the US government issue foreign currency-denominated bonds, as it did in the 1960s (the so-called Roosa bonds) if a dollar overhang was perceived to exist, a substitution account could also be established, as per Kenen (2005). This account, which would be administered by the IMF, would allow official holdings of dollars to be converted into SDRs. Although this scheme came close to fruition in 1980, it failed to receive the support of some major IMF shareholders.⁵⁷

54 In recent years quantitative research has started to be conducted with respect to the optimal currency composition of international reserves; see Papaioannou et al. (2006). Another consideration may have been to ensure that in the future, can be avoided recourse to the IMF, and the policy conditionality attached to its loans.

55 Another consideration may have been to ensure that in the future, can be avoided recourse to the IMF, and the policy conditionality attached to its loans

56 See various communiqués of the Group of Seven and of the International Monetary and Financial Committee of the IMF.

57 While the importance of the US dollar as a reserve currency steadily increased in the first decades of the 20th century, it only emerged as the dominant international currency after the demise of the gold exchange standard in the 1930s, and only took over sterling’s role fully after World War II. “

7 POLICY ISSUES AND CONCLUSIONS

7.1 GENERAL FINDINGS

The unprecedented accumulation of foreign exchange reserves in recent years by monetary authorities, especially in EMCs, has raised a number of important issues. The extent to which the rapid increase in reserves can be attributed to self-insurance against financial crises, such as the Mexican, Asian, Brazilian, Russian and Argentine crises that occurred in the second half of the 1990s and early in the new century, has already been examined. It seems clear that in the aftermath of these severe financial crises, many emerging market countries have built up foreign exchange buffers to deal more efficiently with potential runs on their currencies.⁵⁸ However, a pragmatic benchmark approach for assessing the adequacy of reserves provides strong evidence that quite a few emerging market countries, especially in Asia, have attained levels of foreign exchange reserves that far exceed what would be needed for reasonable self-insurance purposes. The cost of holding reserves, which can be substantial when reserve holdings are large in relation to GDP, strengthens this finding.

This raises the question of the motives behind accumulating reserves beyond self-insurance needs. A major explanation appears to be the desire of a number of countries to keep their exchange rates from appreciating beyond a level that the authorities deem in the interests of the country, in particular to sustain export-led economic growth. This practice, which is generally seen by trading partners of these countries as maintaining an undervalued exchange rate, has led the international community to advocate greater exchange rate flexibility, especially in some Asian countries.⁵⁹ Recognising that increased flexibility not only constitutes a contribution towards solving the problem of large global current account imbalances, but could also bring other benefits for the domestic economy, the currencies of Asian countries have in recent years undergone a degree of appreciation, ranging from quite

substantial in South Korea to fairly limited in China. At the same time, the pace of reserve accumulation has shown little sign of abating during this period.

Reserve accumulation as a by-product of maintaining an undervalued exchange rate by means of large-scale intervention in the foreign exchange market can have negative effects in the countries engaging in such a strategy. Very strong export growth, coupled with an investment boom resulting from a highly competitive exchange rate, can lead the economy to overheat and result in inflationary pressures, not only regarding consumer goods and services, but also in terms of real and financial assets. There is also the risk of protectionist action initiated by trading partners. The solution, according to international organisations and major economic powers, is for countries in emerging Asia to allow greater exchange rate flexibility as well as to instigate a number of domestic reforms. Blanchard and Giavazzi (2005), for instance, advocate that China should adopt a “three-handed approach”, consisting of improving possibilities for individuals to insure themselves against risk (a more robust retirement system, providing health insurance and some other measures), reducing or reallocating investment (away from manufacturing to higher public investment in health and education), as well as appreciation of the renminbi. Another avenue for reducing the pace of reserve accumulation is to liberalise capital movements. Prasad and Rajan (2005) have formulated an interesting proposal for controlled capital account liberalisation. They advocate the securitisation of capital inflows by means of establishing closed-end investment funds in the recipient country. Residents then buy shares in the funds, with the funds in turn buying foreign exchange and purchasing foreign assets. The advantages are that this reduces the

58 Review of the International Role of the Euro” (2004), p 9. On the euro’s stature as an international currency, see also De Beaufort Wijnholds and McKay (2006).

59 See Boughton (2001), pp. 936-943, on the history of this proposal. Recently, Truman and Wong (2006) have proposed an international reserve diversification standard.

costs of sterilisation as well as diversification by domestic investors into an international portfolio. It would also allow central banks to control the timing and size of capital inflows.

Stronger currency appreciation will imply a decrease in – or even cessation of – reserve accumulation. This has the added advantage that it contains the opportunity costs of holding reserves. Measuring these opportunity costs is not straightforward, however, and several approaches can be pursued, leading to different outcomes. One way is to calculate the difference between the costs of borrowing reserves and the yield earned on investing the proceeds. Another method, theoretically more satisfactory but rendering only broad approximations, is to define the opportunity costs of holding reserves as the foregone yield on real investment. Under this approach, cost estimates can be quite substantial as a percentage of GDP. Finally, a of the purely financial cost of sterilising the monetary effects of the inflow of foreign exchange can be calculated, along with its conversion into domestic currency through central bank intervention. In some cases, however, where domestic interest rates are (kept) very low, the cost of sterilisation may – at least for a limited time – be minimal or even negative.

Even though greater currency appreciation leads to benefits by containing the opportunity costs of holding reserves, it also implies a cost in terms of capital losses on foreign exchange reserves, as measured in domestic currency. Such losses can be relatively sizeable in countries with large reserve holdings experiencing significant appreciation. The desire to avoid such losses is likely to contribute to the resistance to currency appreciation that various countries have displayed (and sometimes still display), although non-economic factors could be of more importance in this respect. Such factors may, for instance, be based on the view of the political authorities that no or only gradual appreciation of the currency is beneficial for maintaining internal political stability.

The accumulation of large amounts of official reserves can lead to an increased degree of currency diversification. The distribution of reserve holdings by currencies tends to be based on a number of factors, such as risk diversification, effective yield, liquidity and asset diversity of the financial markets in reserve currency countries, geographical orientation of foreign trade and capital account transactions, the currency composition of external debt and possibly political considerations. The dollar has maintained its position as the major reserve currency, while the euro has established itself as the second main global reserve currency. While the share of the euro in the composition of global reserves has increased to a limited extent, sudden changes are unlikely in view of the historical experience that central banks' reserve management tends to be adjusted only gradually. The ECB's position continues to be neither to encourage nor discourage the euro's international role.

7.2 IMPLICATIONS FOR THE INTERNATIONAL MONETARY SYSTEM

Turning to the possible implications of the massive increase in foreign exchange reserves over recent years for the international monetary system, the following developments seem the most relevant. To start with, borrowing from the IMF has fallen to a low level in view of the comfortable reserve position that most emerging market countries have attained since the financial crises that hit them between 1995 and 2001. Major borrowers, in particular Argentina and Brazil, have paid off their debts in full and ahead of schedule to the IMF. Credit outstanding to the IMF has fallen from a peak of SDR 70 billion in 2003 to SDR 10 billion at the end of 2006. While early repayment of large debtors is in itself a positive development, the waning need to use the IMF's resources may have an impact on the international adjustment process. Countries with relatively large reserves but following less than optimal macroeconomic policies, such as maintaining an overvalued

exchange rate or a high rate of inflation, could continue along this path for an extended period of time without having to turn to the IMF and be subjected to its policy conditionality.

Such a “crowding out” of the IMF could have negative spillover effects for other countries, for example through a lack of policy discipline in some EMCs. The IMF relies largely on the interest payments it receives from its debtors (charges) to finance its interest payments to creditor countries (remuneration), its administrative expenses and the building up of its precautionary balances. At the relatively low level of IMF credit outstanding at present, the Fund will face a considerable shortfall in its income position. Although this may not be a structural development, the consensus view is that measures have to be taken to ensure the IMF’s financial viability in the future. A group of eminent persons under the chairmanship of former Bank of International Settlements General Manager Andrew Crockett has made a number of proposals aimed at making the IMF less reliant on a single source of income. Its main recommendations are to sell a limited amount of the Fund’s gold and to use the proceeds to generate income, as well as to broaden the possibilities for generating additional revenue by expanding the IMF’s investment activities, within strict limits to avoid excessive use (see Crockett, 2007).

Although the degree of reserve ease in EMCs is generally high, some feel that there is a need for the IMF to provide a kind of insurance facility on which they could draw in case of sudden capital outflows. An earlier attempt to provide such a service resulted in the introduction of the CCL by the IMF in 1999. However, this instrument lapsed without having ever been used under a sunset clause in 2003. A new insurance instrument would have to be designed in such a way that it would not suffer from the shortcomings of the CCL, such as its lack of a clear exit strategy. Views differ on the desirability of establishing an insurance facility. Some consider such a facility as filling a gap in the credit instruments that the Fund

offers to its members, whereas others question the need for such a separate instrument without conditionality.

Finally, countries accumulating very large reserves are playing a significant role in financing global external imbalances by investing a sizeable part of their foreign exchange holdings in financial assets in reserve currency countries. Attention has focused in particular on the purchases by major reserve holders, especially in emerging Asia and increasingly in oil exporting countries, of dollar-denominated assets, especially securities issued by the US government. Estimates of the contribution of such purchases to the financing of the US current account deficit range from a relatively modest fraction to as much as three quarters.⁶⁰

Such financing facilitates a longer duration of large global imbalances. According to a study by IMF staff (2005)⁶¹, financial globalisation has led to the possibility that adjustment of external imbalances can be delayed longer than before. If adjustment is delayed too long, however, serious consequences may follow when easy financing of external deficits comes to an end. Another consequence of the large-scale investment of official reserves in major financial centres is that long-term interest rates have in recent years stayed at historically low levels despite strong growth in the world economy. Estimates of the effects of such central bank investments on the interest rates of US government bonds range from around 40 basis points to as much as 200 basis points.⁶² While low capital market interest rates favour economic growth, their persistence in a phase

60 The upper figure estimated by Roubini and Setser (2005) appears to be an outlier.

61 See the Statement issued by G-7 financial leaders on December 3, 2005, which also mentions that “more rigorous, mutually reinforcing action is now needed”, and the Communiqué of the International Monetary and Financial Committee of September 24, 2005 which “urges further action” on these issues.

62 In its statement of 21 April 2006, the Group of Seven gave a quite detailed overview of policy actions required for bringing down global imbalances. These included a recommendation that some oil-exporting countries should allow their currencies to appreciate.

of mounting inflationary pressures can pose a dilemma.⁶³

As indicated above, monetary authorities across the world are faced with a number of important challenges largely associated with the continuation of large global current account imbalances and the attendant accumulation of reserves. Solving these problems will require action by various sides.⁶⁴

The need for collective action has been recognised in various fora. In several of their recent communiqués, both the Group of Seven and the Group of Twenty highlighted the need for the main players in the global economy to take policy action in order to avoid a so-called hard landing in the process of reducing global imbalances. In various speeches and publications, such as the World Economic Outlook, the IMF has repeatedly highlighted the need for an orderly adjustment of global imbalances and for the major countries to play their part in bringing this about. Moreover, the International Monetary and Financial Committee (IMFC) has emphasised the need for simultaneous action in various communiqués. These exhortations have led to a familiar mantra as to who should do what. In short, the US should contribute by reducing its government budget deficit and by raising the national savings rate; China should take action to achieve a higher level of consumption and more exchange rate flexibility; while Europe and Japan should strengthen their structural reform efforts in order to increase their potential growth rates. Lately, some recommendations have also been directed at oil-exporting countries, encouraging them to step up their expenditure in a responsible manner.⁶⁵

While this mantra has been regularly repeated, with small variations, actual policy action along the lines envisaged has been disappointing. The recognition of an implementation deficit and criticism of the IMF's alleged shortcomings in its surveillance of important economies led to an initiative by the IMF's Managing Director in early 2006 to embark on a multilateral consultation process, directed towards reducing

global external imbalances. This initiative evolved from a discussion in which initial suggestions for IMF special consultations with China were considered to be problematic as they could be seen as singling out one member country for special attention. In recognition of the fact that all global economic players should contribute to a lowering of the risk of a hard landing, it was decided to invite representatives from the US, the euro area, China, Japan and Saudi Arabia to participate in a multilateral discussion of issues surrounding the still-growing global imbalances. For such multilateral discussions to bear fruit, it is essential for them to take place in a fully confidential manner.

Some commentators, including the IMF's Managing Director⁶⁶, have emphasised that quick solutions should not be expected as these imbalances have taken a long time to build up, and given that policy actions typically need time to be formulated and implemented, let alone lead to the desired results. As global imbalances start to unwind, it can be expected that the ongoing exceptional reserve accumulation and its attendant effects will also be mitigated.

⁶³ See, for instance, De Rato (2006).

⁶⁴ Chairman Greenspan of the Federal Reserve spoke of a "conundrum".

⁶⁵ The upper figure estimated by Roubini and Setser (2005) appears to be an outlier.

⁶⁶ Chairman Greenspan of the Federal Reserve spoke of a "conundrum".

ANNEXES

ANNEX I

Table 6 Emerging market countries: estimated adequate and actual reserves

(USD Billions)										
	Short-term external debt		Internal drain proxy		EIU Country risk		Adequate reserves		Actual reserves	
	<i>a</i>		<i>b</i>		<i>c</i>		$a+b*c/100$		<i>Gross</i>	
	1999	2006	1999	2006	1999	2006	1999	2006	1999	2006
Floating regimes			5%-10%	5%-10%						
Brazil	70.3	52.1	7.4-14.8	32.5-64.9	60	45	74.7-79.1	66.8-81.4	34.8	85.6
Chile	8.5	13.6	1.5-3.1	3.8-7.6	29	23	9.0-9.4	14.5-15.3	14.6	19.4
Indonesia	31.8	23.0	4.5-9.1	7.6-15.3	63	53	34.6-37.5	27.0-31.1	26.4	40.9
Israel	11.4	23.3	9.8-19.6	7.0-14.0	34	29	14.7-18.0	25.3-27.4	22.6	29.2
Korea	0.0	0.0	14.5-28.9	31.8-63.7	30	29	4.3-8.7	9.2-18.5	74.0	225.6
Mexico	63.8	44.8	8.2-16.5	12.0-23.9	53	34	68.2-72.5	48.9-53.0	31.8	76.3
Philippines	12.0	13.8	2.4-4.7	3.5-7.0	41	48	13.0-14.0	15.5-17.1	13.3	20.0
Poland	17.6	45.6	6.4-12.7	7.0-14.1	34	34	19.7-21.9	48.0-50.4	26.4	46.4
South Africa	13.2	12.7	3.8-7.6	8.1-16.3	49	38	15.1-16.9	15.8-18.9	64	23.1
Turkey	36.8	75.6	7.6-15.2	10.7-21.4	56	53	41.1-45.3	81.2-86.9	23.3	58.6
Intermediate regimes			10%-20%	10%-20%						
Argentina	40.0	27.8	8.9-17.8	6.6-13.2	54	51	44.8-49.7	31.2-34.5	26.3	30.9
China,P.R.	27.3	217.4	146.2-292.4	443.2-886.4	42	43	88.7-150.1	408.0-598.5	557.7	1068.5
Hong Kong	27.3	217.4	35.3-70.6	53.2-106.5	30	21	37.9-48.5	228.5-239.7	96.2	133.2
Colombia	8.7	9.9	1.0-2.1	4.9-9.8	56	42	9.3-9.8	12.0-14.0	8.0	15.3
Czech Republic	21.1	37.6	3.5-6.9	11.0-22.0	33	37	22.3-23.4	41.7-45.7	12.8	31.2
Hungary	12.9	18.4	2.1-4.2	6.6-13.1	39	55	13.7-14.5	22.1-25.7	11.0	21.5
India	12.1	22.8	17.7-23.3	65.5-130.9	41	39	16.8-21.6	48.4-73.9	32.7	170.7
Malaysia	10.2	19.8	8.0-16.0	20.1-40.2	33	35	12.9-15.5	26.8-33.9	30.6	82.1
Peru	6.8	4.5	0.9-1.7	2.6-5.3	46	34	7.1-7.5	5.4-6.3	8.7	16.7
Romania	1.4	21.0	0.7-1.5	5.0-9.9	64	42	1.9-2.4	23.1-25.2	1.5	28.1
Russia	54.4	67.7	1.8-3.7	0.0-0.1	76	41	55.8-57.2	67.7-67.7	8.5	295.6
Thailand	28.4	33.9	6.7-13.4	22.6-45.3	40	45	31.0-33.7	44.1-54.3	34.1	65.3
Ukraine	4.0	1.5	0.4-0.8	5.1-10.3	68	50	4.3-4.6	4.1-6.6	1.0	21.8
Venezuela	11.8	17.8	1.8-3.6	3.8-7.5	51	56	12.7-13.6	19.9-22.0	12.3	27.2

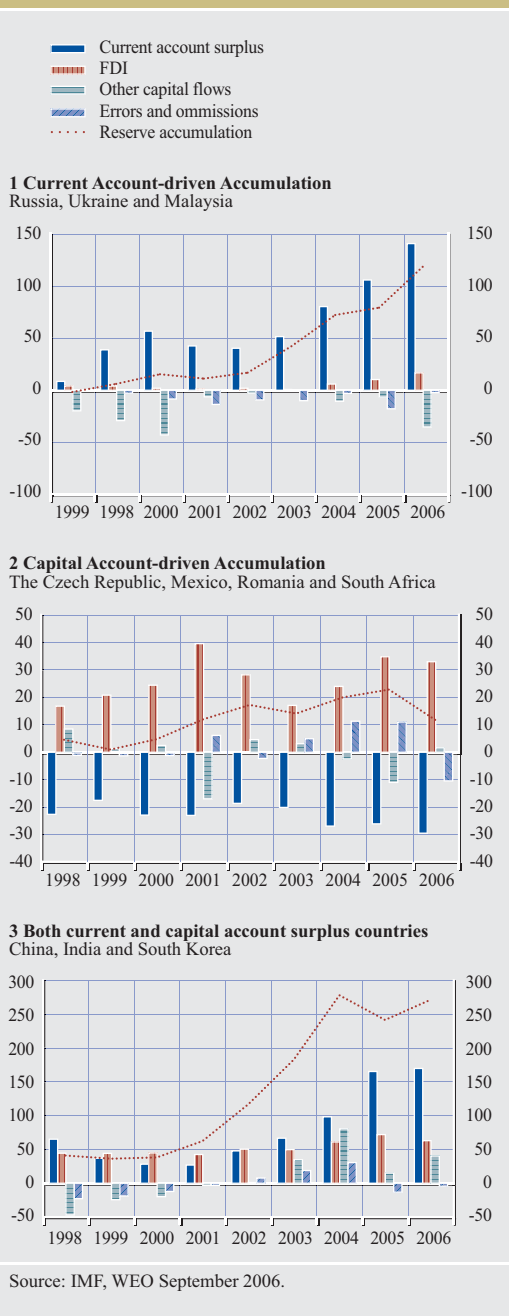
Sources: IMF, International Financial Statistics (reserves, money), WEO (short-term external debt, remaining maturity basis), the Economist Intelligence Unit (country risk index).

Notes: The exchange rate classification is based on the IMF's Annual Report on Exchange Arrangements (1999 and 2006), where a de facto classification is made, India, Indonesia, Peru, Russia and Thailand were classified as floaters in 1999, whereas Israel, Poland and Turkey were classified as intermediate regimes. Internal drain proxy: fraction of M2 considered to mobilisable for immediate capital outflows: 5-10% for floaters, and 10-20% for intermediate regimes and hard pegs.

ANNEX 2 THE CHANNELS OF RESERVE ACCUMULATION

This annex describes the channels through which reserves were accumulated from 1999 to 2003.

Chart 8 Decomposition of Factors Contributing to Reserve Accumulation



Focusing on the ten EMCs that doubled their reserves since 1999, three distinct groups emerge, as Figure 1 shows: (i) current account surplus countries (Russia, Ukraine and Malaysia) (ii) capital account surplus countries (the Czech Republic, Mexico, Romania and South Africa); and (iii) countries that experienced both current and capital account surpluses (China, India and South Korea).⁶⁷ Dividing the rapid accumulators into groups is helpful in terms of structuring the discussion on the underlying motives for accumulation. It should be kept in mind that there is no direct causal relationship between large current account surpluses and reserve accumulation; current account surpluses will only result in reserve accumulation when combined with central bank intervention in the foreign exchange markets, for instance to prevent or mitigate an exchange rate appreciation. Moreover, it is also worth noting the diversity of the countries running current account surpluses: Russia's current account surplus is clearly oil-driven, whereas those of Malaysia (and Thailand and South Korea) date back to the Asian crisis of 1997-98 and, initially, reflected the collapse of domestic investment and increased precautionary saving.

67 The ten countries are: the Czech Republic, India, Mexico, Russia, South Africa, South Korea, China, Malaysia, Romania and Ukraine. Alternatively, we could have looked at the largest accumulators in absolute terms. Doing so would have implied replacing South Africa and Ukraine (which both started accumulating from a very low base) with Thailand and Brazil.

REFERENCES

- Aizenman, Joshua and Yaewoo Lee (2006), “Financial versus Monetary Mercantilism: Long Run View of Large International Reserve Hoarding”, International Monetary Fund Working Paper 06/280.
- Banco Central de Venezuela (2004), “Informe Sobre los Niveles de las Reservas Internacionales en Venezuela”, Caracas.
- Banco de la Republica (Colombia) (2003), “Análisis del Nivel Adecuado de Reservas Internacionales”, Bogota.
- Bank for International Settlements (2005), Quarterly Review on International Banking and Financial Market Developments (March).
- Bergsten, Fred (2005), “An Action Plan to Stop the Market Manipulators Now”, Financial Times, 15 March.
- Bird, Graham and Ramkishan Rajan (2003), “Too Much of a Good Thing? The Adequacy of International Reserves in the Aftermath of Crises”, World Economy, Vol. 26 No 6, pp. 873-891.
- Blanchard, Olivier and Francesco Giavazzi (2005), “Rebalancing Growth in China: A Three-handed Approach”, MIT Department of Economics Working Paper 05-32.
- Boughton, James B. (2001), Silent Revolution: The International Monetary Fund, 1979-1989, Washington, DC: International Monetary Fund.
- Caselli, Francesco and James Feyrer (2006), “The Marginal Product of Capital”, Paper presented at the IMF 7th Jacques Polak Annual Research Conference – Capital Flows, 9-10 November.
- Chinn, Menzie and Jeffrey Frankel (2005), “Will the Euro Surpass the Dollar as Leading International Reserve Currency?”, Paper presented at NBER Conference on G7 Current Account Imbalances (June)
- Clark, Peter B. and Jacques J. Polak (2004), “International Liquidity and the Role of the SDR in the International Monetary System”, IMF Staff Papers, Vol. 51, No 1, pp. 49-91.
- Crockett, Andrew (2007), “Report by the Committee to Study Sustainable Long-term Financing of the IMF”.
- De Beaufort Wijnholds, J. Onno (2003), “Five Financial Crises: Lessons for Prevention and Resolution”, in A. P. Ros and H. R. T. Vollebergh, Ontwikkeling en Overheid, The Hague: SDU.
- De Beaufort Wijnholds, J. Onno and Arend Kapteyn (2001), “Reserve Adequacy in Emerging Market Economies”, International Monetary Fund Working Paper 01/143.

- De Beaufort Wijnholds, J. Onno and Julie McKay (2006), “Living up to Expectations? Taking Stock of the International Role of the Euro”, in Joaquim Roy (ed.), *The Euro and the Dollar in a Globalized Economy*, forthcoming.
- De Rato, Rodrigo (2006), “Progress in Implementing the Fund’s Medium-term Strategy”, Speech at the Foreign Correspondents Club, Tokyo, 3 August.
- Dooley, Michael, David Folkerts-Landau and Peter Garber (2003), “An Essay on the Revised Bretton Woods System”, NBER Working Paper 9971 (September).
- (2004), “The Revised Bretton Woods System: The Effects of Periphery Intervention and Reserve Management on Interest Rates and Exchange Rates in Center Countries”, NBER Working Paper 10332 (March).
- (2005), “Savings Gluts and Interest Rates: The Missing Link to Europe”, NBER Working Paper 11520 (August).
- Dunaway, Steven V., Lamin Leigh and Xiangming Li (2006), “How Robust Are Estimates of Equilibrium Real Exchange Rates: The Case of China”, International Monetary Fund Working Paper 06/220.
- European Central Bank (2005), “Financial Flows to Emerging Market Economies: Changing Patterns and Recent Developments”, *Monthly Bulletin*, January, pp. 59-73.
- (2005), “Review of the International Role of the Euro”, December.
- (2006), “The Accumulation of Foreign Reserves”, Occasional Paper No 43 (February).
- Frankel, Jeffrey (2004), “On the Renminbi: The Choice between Adjustment under a Fixed Exchange Rate and Adjustment under a Flexible Rate”, mimeo, Harvard University.
- Frenkel, Jacob and Boyan Jovanovic (1981), “Optimal International Stochastic Framework”, *Economic Journal*, 91 (June), pp. 507-514.
- Geithner, Timothy F. (2007), “Developments in the Global Economy and Implications for the United States”, Remarks at the Council on Foreign Relations, New York, 11 January.
- Genberg, Hans, Robert McCauley, Yung Chul Park and Avinash Persaud (2005), “Official Reserves and Currency Management in Asia: Myth, Reality and the Future”, *Geneva Reports on the World Economy* No 7.
- Goldstein, Morris (2004), “China and the Renminbi Exchange Rate”, in Fred Bergsten and John Williamson (eds), *Dollar Adjustment: How Far? Against What?*, Institute for International Economics, pp. 197-230.
- Goldstein, Morris and Nicholas Lardy (2004), “What Kind of Landing for the Chinese Economy?”, *Policy Briefs in International Economics*, Institute for International Economics (November).

- Green, Russell and “Lessening or a Burden?”, United States Treasury, Office of International Affairs, Occasional Paper No 6 (March).
- Group of Seven (nd), various communiqués.
- Guzman Calafell, Javier and Rodolfo Padilla del Bosque (2003), “International Reserves to Short-term External Debt as an Indicator of External Vulnerability: The Experience of Mexico and Other Emerging Economies”, in Ariel Buira (ed.), *Challenges to the World Bank and IMF: Developing Country Perspectives*, Group of Twenty-Four, Washington, DC.
- Hauner, David (2005), “A Fiscal Price Tag for International Reserves”, International Monetary Fund Working Paper 05/81.
- Higgins, Matthew and Thomas Klitgaard (2004), “Reserve Accumulation: Implications for Global Capital Flows and Financial Markets”, *Current Issues*, Vol. 10, No 10, September/October, Federal Reserve Bank of New York.
- International Monetary Fund (2003), “Mexico: Selected Issues Papers: Reserve Adequacy in Mexico”, Staff Country Report, SM/04/250.
- (2004), “Liquidity Management”, Staff Memorandum, SM/04/149.
- (2004), “People’s Republic of China: 2004 Article IV Consultation”, Staff Report, November.
- (2005), *World Economic Outlook*, April.
- (2006a), Independent Evaluation Office, *An Evaluation of IMF Support to Jordan, 1989-2004*.
- (2006b), People’s Republic of China: 2006 Article IV Consultation – Staff Report, 31 October.
- Jeanne, Olivier and Romain Rancière (2006), “The Optimal Level of International Reserves for Emerging Market Countries: Formulas and Applications”, International Monetary Fund Working Paper 06/229.
- (2007) “Self-insurance through International Reserves”, in Törbjörn Becker et al., “Country Insurance: The Role of Domestic Policies”, Occasional Paper No 254, pp. 14-21.
- Kenen, Peter (2005), “Stabilizing the International Monetary System”, mimeo, Princeton University, Contribution to the Roundtable on “The Dollar, the Euro, and the International Monetary System” at the Annual Meeting of the American Economic Association, Philadelphia, 8 January.
- Keynes, John Maynard (1930), *A Treatise on Money*, London: Macmillan.
- McCauley, Robert (2005), “Distinguishing Global Dollar Reserves from Official Holdings in the United States”, *BIS Quarterly Review*, pp. 57-72.

- Papaioannou, Elias, Richard Portes and Gregoriou Siourounis (2006), “Optimal Currency Shares in International Reserves: The Impact of the Euro and the Prospects for the Dollar”, European Central Bank Working Paper No 694.
- Prasad, Eswar and Raghuram Rajan (2005), “Controlled Capital Account Liberalization: A Proposal”, International Monetary Fund Discussion Paper 05/07.
- Pringle, Robert and Nick Carver (2005), “Trends in Reserve Management – Results of a Survey of Central Banks”, RBS Reserve Management Trends, Central Banking Publications.
- Redrado, Martin (2006), “International Reserve Accumulation as a State Policy”, Presentation, Buenos Aires (September).
- Rigaudy, Jean-François (2005), “Ten Years of Reserve Management”, RBS Reserve Management Trends, Central Banking Publications, pp. 29-44.
- Roubini, Nouriel and Brad Setser (2005), “Will the Bretton Woods 2 Regime Unravel Soon?” Symposium on the “Revived Bretton Woods System: A New Paradigm for Asian Development?”.
- Truman, Edwin and Anna Wong (2006), “The Case for an International Reserve Diversification Standard”, Institute for International Economics, Washington, DC.

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