

IMF Working Paper

SURVEY OF RESERVE MANAGERS: LESSONS FROM THE CRISIS

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Monetary and Capital Markets Department

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Abstract

This paper reports in detail on a survey that was circulated to reserve managing central banks of IMF member countries in April 2012. The survey aims to gain further insight into how reserve managers have reacted to the crisis to date. The survey also aims to understand how reserve managers arrive at their strategic asset allocation and how they operate their risk management frameworks in practice. Some of the key themes that emerge from the survey include potential procyclical and counter cyclical behavior by reserve managers, increased focus placed on returns and wide variability across countries in how the currency composition of reserves is derived.

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GLOSSARY

AC	Advanced country (WEO classification)
ALM	Asset and Liability Management
BRIC	Brazil, Russia, China and India
COFER	Currency Composition of Official Foreign Exchange Reserves
EM	Emerging Market
EMC	Emerging Market Country
FX	Foreign currency
GFSR	Global Financial Stability Report
HTM	Hold to Maturity
IFRS	International Financial Reporting Standards
ISDA	International Swaps and Derivatives Association
LIC	Low Income Country (World Bank classification of countries with per capita income of less than \$ 3975)
MIC	Middle and other (i.e. not advanced) high income countries (over \$3975 per capita income)
MTM	Mark to Market
REITs	Real Estate Investment Trusts
SDR	Special Drawing Right
SWF	Sovereign Wealth Fund
TIPS	Treasury Inflation Protected Securities
WEO	World Economic Outlook

CURRENCIES

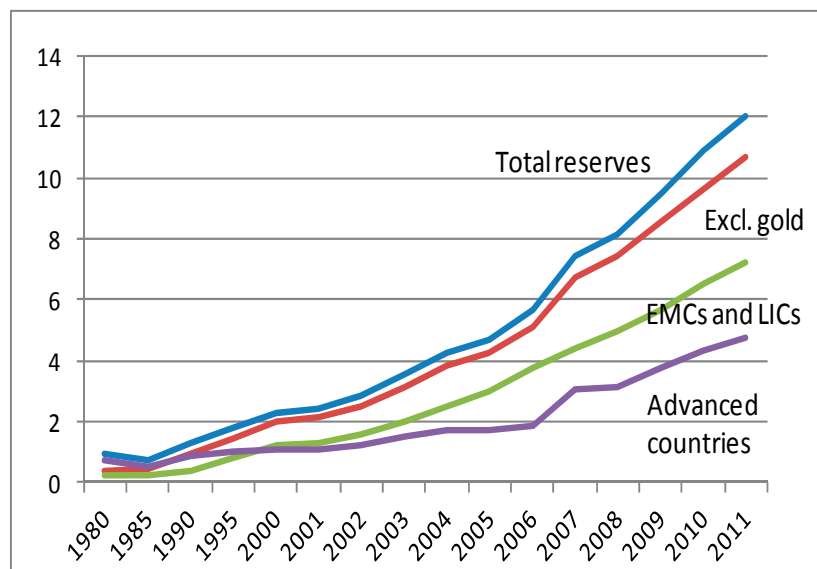
AUD	Australian dollar
CHF	Swiss franc
DKK	Danish krone
EUR	Euro
GBP	British pound
JPY	Japanese yen
NK	Norwegian krone
NZD	New Zealand dollar
SEK	Swedish krona
USD/US\$	U.S. Dollar

I. INTRODUCTION

Reserve holdings have risen fivefold over the past ten years with increases larger than that expected under traditional metrics. This trend of increased reserve levels was particularly noticeable in Emerging Market Countries (EMCs), especially in the BRICs (IMF, 2011) but also, for example, in Switzerland. Reserves are projected to increase further as they broadly keep pace with trade and trade outgrows GDP.

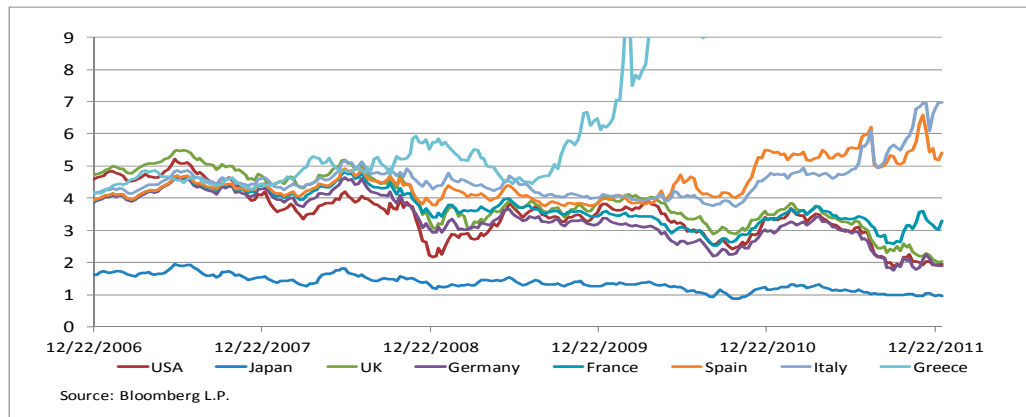
The magnitude and management of these vast resources can have a profound effect on markets and central bank balance sheets. Reserve managers face important decisions on their asset allocations, including currency composition and asset classes, to ensure that the reserves meet the key goals of safety, liquidity and return. Reserves by now amount to the equivalent of one third of the OECD bond markets. The bulk of the reserves are invested in dollars, and their composition has not kept pace with the large shifts in the world economy. The size of the preferred habitat of reserves, high quality short-term government debt, also has not kept pace with the increase in reserves.² This can have profound effects on the one hand on interest rates, and on the other hand on decisions of reserve managers who have to move outside the preferred habitat, with all the attendant potential consequences on the balance sheets of central banks.

**Figure 1. The Trend in Global Reserves
(in trillions of US\$)**



Source: IMF, IFS. The reserves data include gold at market prices.

² Official reserves are projected to increase from the equivalent of 29 percent of OECD debt (issued by countries with CDS spreads under 200 bp) in 2011 to 38 percent by 2016.

Figure 2. Ten-year Government Bond Yields for Selected Advanced Countries

This paper reports in detail on a survey conducted by the IMF staff³ that seeks to understand in greater detail the lessons from the crisis and how reserve managers deal with a number of fundamental issues that can affect the global financial markets and central bank balance sheets.

- The survey therefore commences with a section that seeks to understand the problems reserve managers were facing and their core reactions in terms of asset reallocations and risk management systems. It also seeks to understand if and whether reserve managers can and do consider the implications for global markets.
- The next section of the survey seeks to shed more light on asset allocation decisions of central banks. The so-called strategic asset allocation; which determines currency composition, maturity structures and asset classes (credit risk), has long-term effects on markets and on central bank balance sheets. It also forms the background against which central banks respond to the crisis environment.
- The following section of the survey seeks to understand the short-term asset reallocation or rebalancing processes that central banks use. The choice of process may have short-term cyclical implications for markets and the central bank balance sheets.
- Finally the survey concludes with some forward-looking questions.

The main results of the survey are used in the above-mentioned report for the IMF Board. However, to improve understanding of this important topic, there is a benefit to put out the full results and to do so more widely. Surveys among reserve managers are frequently conducted, but usually by private or quasi-private institutions. These surveys are then either

³ Crisis and Asset Allocation: Some Lessons for Managing International Reserves, IMF WP forthcoming.

not generally available or available only at very steep prices. Moreover annual surveys tend to focus more on short-term changes and topical issues.⁴

The remainder of the paper is organized as follows. It commences with a summary of the findings, with the important issue of procyclicality discussed in a separate box, followed by a characterization of respondents. The main part of the paper consists of a discussion of the responses to each of the survey questions.

II. SUMMARY OF KEY FINDINGS

Key findings of the survey are summarized below.

Crisis Response

- The deep crises of the last five years have brought out credit and liquidity problems in reserve portfolios. Illustrating the unusual nature of the crises, every advanced country (AC) in the sample reported experiencing at least some difficulties with managing their reserves over the crisis.
- As a result of these problems, seven out of ten reserve managers changed their asset allocation. More specifically, about half of all central banks pulled back on their level of commercial bank deposits in very high numbers and 35 percent of all respondents reduced their exposure to unguaranteed bonds.
- Surprisingly, reserve managers also reduced their holdings of longer-term high-quality (AAA) bonds. With interest rates falling throughout the crisis, early reductions in interest rate exposures have, with hindsight, been relatively costly.
- From a global perspective it is encouraging that half of the respondents (including many of the larger reserve holders) who engaged in asset reallocation considered the potential inconsistent signaling effects of their actions on the markets in which they invest.
- Moreover, going forward, well over half of the reserve managers would consider altering reserve management practices to account for procyclicality issues. Especially

⁴ Central banks are generally hesitant to fully disclose their reserve management policies and decisions; as too much disclosure can potentially impact on the effectiveness of its reserve management activities. Detailed public information on the composition of reserve portfolios and how these portfolios are managed by reserve managers is relatively scarce. The data for the SDDS reserve template provide a good insight in the broad categories.

many European central banks would consider doing so. Most reserve managers would consider holding a higher proportion of safer assets, and would also contemplate applying more robust frameworks. Middle and other high income countries (MICs) and lower income countries (LICs), especially, were open to the idea of coordination either between central banks or led by an international organization.

- Surprisingly few reserve managers, in the small community of central bankers, contacted the central bank of the reserve issuing country before taking action on asset reallocations, but they do often talk to central banks facing similar issues before such actions.

Strategic Asset Allocation (Currency/Interest Rate Risk)

- Reflecting in part problems with advanced country currencies, and shifts in global trade patterns, about half of respondents, holding about \$2200 billion in reserves, said that they are currently considering adjusting the currency composition of their reserves. Many are contemplating shifts to advanced country currencies other than the traditional reserve currencies included in the SDR basket (with high interest expressed in commodity currencies such as AUD and CAD). The commodity currencies can be seen as a proxy for EMC currencies that are often not considered investable yet, due to convertibility and illiquidity concerns.
- Especially MICs are considering investing in the Renminbi and other EMC currencies, but few of these countries have commenced doing so. Several large reserve managers in MICs who intend to invest are, however, still on the fence. ACs that are interested in exploring EMC currencies contemplate investing in the Renminbi more so than in other EMC currencies.
- More than four-fifths of reserve managers in the sample make use of the common practice of tranching; for example, for investment purposes or to immunize liabilities. Interestingly, ACs makes less use of tranching than MIC or LICs.
- Half the reserve managers surveyed use an overall return target to determine the duration of their reserve portfolios. This could perversely lead to very long-dated investments in a low interest rate environment, and vice versa.
- A surprising result is how few central banks pay attention in setting duration targets to their flow liabilities (wages, refreshing currencies), despite the fact that these liabilities can be seen as a liability with a very long duration that could require high duration assets as an offset.

Risk Management, Benchmarks, and Rebalancing

- New asset classes are gaining popularity, with a surprisingly high number (one in seven) of reserve managers exposed to equity markets (especially in ACs).

- The increased focus on return is complemented with improved risk management frameworks. These risk management frameworks have introduced a range of new risk measures while placing more importance on operational risk.
- However credit risk management systems are still heavily reliant on credit ratings. Credit rating changes continue to be a key influence on reserve management decisions, with 4 out of 5 reserve managers relying on ratings as the key instrument for assessing credit risk, although CDS spreads are increasingly used as an additional signal.
- A single ‘A’ rating from one of the main rating agencies is the most common cut-off used below which no exposures are permitted in reserve portfolios. Of note is the finding that MICs are more conservative than both LICs and ACs in choosing the rating cut-off.
- When a minimum credit rating trigger is breached, nearly half of respondents take the decision regarding whether to cut or hold the position to senior management level. ACs have more flexibility when minimum credit ratings are breached, with a significant majority having the option to hold on to the position following approval from senior management. This reduces their exposure to procyclicality.
- Many reserve managers also make a clear distinction between sovereign bonds and other forms of debt in arriving at credit management decisions, with more discretion given in the former case. This also means that sovereign rating downgrades are not automatically followed by forced selling by reserve managers.
- It is quite noteworthy how widespread the use of active management of interest rate risk is, when compared to the management of currency risk. Active management among ACs is virtually universal, but it is also very widespread among MICs and LICs. This perhaps reflects the view that markets are not fully efficient, that active management provides incentives for market monitoring that contributes to better market intelligence for policy purposes and that the reserve managers understand bond markets and interest rate mechanisms well.
- Rebalancing practices can have significant implications for returns, and also help smooth global currency movements. Rebalancing portfolios for currency risk is carried out by nearly half of reserve managers once a predetermined level of departure from the benchmark is reached. A surprising number of reserve managers carry out rebalancing at relatively low frequencies. Technical analysis, which is often procyclical, plays only a minor role in currency decisions. However, a broader sense of currency weakness is an important consideration for reserve managers.

New Initiatives and Fundamental Solutions

- Reserve managers believe that they can adopt a number of initiatives to limit the adverse impact of potential risk factors, with a preference for the use of more hedging instruments, but a large minority is considering more fundamental solutions. Nearly one-quarter of respondents feel that reducing the outright level of reserves would be beneficial to reduce risk factors. One in ten reserve managers are considering creating Sovereign Wealth Funds (SWFs) or shifting balances to SWFs.
- LICs have a relatively higher preference for investing in gold to shield portfolios from potential risk factors. However, a potential concern here is that the demand for gold could be driven by backward looking motives, i.e. extrapolating the trend in the price of gold rather than as a means to hedge against the tail risk of a surge in inflation.

Box 1. Procyclicality—Reserve Management vs. Financial Stability

The recent sub-prime and sovereign debt crises have highlighted how reserve managers have added to the procyclicality in global financial markets. Pre-crisis, reserve managers had taken on higher levels of credit risk through investments in securitizations and lesser quality sovereign bonds and through deposits with lesser rated financial institutions. For example Wooldridge (2006) reports on a trend of reserve managers gradually shifting into higher-yielding, higher-risk investments, and Borio, Galati, Heath (2008) stress the gradual shift towards return oriented strategies.

Respondents to the survey confirmed that half of them pulled back on their level of commercial bank deposits as the crisis progressed, in line with the flight to quality trend evident throughout the market. This is in keeping with the estimation that central banks' exposure to the banking sector was reduced by over \$500 billion over the period July 2007 to March 2009 (Pihlman and van der Hoorn, 2010). Similarly, exposure to countries under pressure from the markets was cut back, as credit ratings fell below minimum permitted ratings (see also McCauley and Rigaudy, 2011).

Central banks can reduce the procyclical repercussions of their actions in a number of ways. For example, practices that focus on longer timeframes to evaluate risks, place more emphasis on tail risks and exploit flight to quality phenomena could help to reduce excessive procyclicality. The survey results show that only 11.8 percent of reserve managers are in favor of longer holding periods for assets during times of market stress but 55.9 percent consider it appropriate to adhere to risk frameworks that are better tested for tail risk, highlighting the diverse nature of policy actions that could be pursued. A large majority would also agree to hold safer assets. A related issue is the fact that risk management frameworks are still heavily reliant on rating agencies, adding to procyclicality concerns.

The role of the credit rating agencies in financial markets has come to the fore over the recent crisis. The survey shows that 80 percent of asset reallocation decisions were triggered by rating downgrades and that credit risk management systems remain tightly linked to credit ratings. A sophisticated approach was adopted by one respondent with reduced reliance on credit ratings and the development of an in-house credit risk system. Reducing reliance on ratings could help stem procyclical divestments but should not be considered a panacea.⁵ There has been much debate, and even criticism, about the part the rating agencies played in the

⁵ There is little evidence that alternative to credit rating agencies, such as “in-house” systems, would result in superior outcomes. In-house credit rating systems require significant investment in human resources, IT capabilities and frequent updates. Moreover credit rating agencies do aim to rate through the cycle, and in house systems may aim for a lower standard in this regard, worsening the procyclicality.

euro area sovereign debt crisis thus far. Despite the many questions raised during the US sub-prime crisis regarding the overreliance of the markets on credit ratings, they still continue to hold significant sway in assessing a country's credit risk. Sovereign bond indices are widely used by reserve managers and the removal of a sovereign from an index following a downgrade below a minimum threshold can result in forced selling and hence portfolio reallocation. Similarly, internal investment policy guidelines can include references to ratings in their portfolio allocation rules and so downgrades can also lead to forced selling for this reason. Such forced selling can result in the remaining instruments in the portfolio becoming more concentrated with less diversification. As well as bond and issuer rating changes, the downgrade of counterparties by the rating agencies means reserve managers are likely to have become more restricted in terms of whom they could trade and place deposits with. This again has led to more concentration, with possible implications for the level of competition between brokers for trade pricing.

There can be a discord between internal reserve management decisions and external financial stability considerations. The survey shows that only half of reserve managers who engaged in asset reallocation decisions over the crisis considered the potential inconsistent signaling effects of their actions. Furthermore, views among reserve managers were evenly split on the question of altering reserve management practices to account for procyclicality issues. This raises the question of whether there should be more interaction at senior management level within central banks on possible conflicting mandates. While risk, reserve management and financial stability functions are understandably separate within a central bank; at a high level (possibly Board level) greater thought and analysis could be given to this complex issue, rather than completely relying on a rules based approach to reserve management.

A number of reserve managers adopted a more gradual change in their asset allocation, as opposed to an immediate shift in the composition of their assets, which possibly reduced procyclical effects. There are a number of rational reasons for this; for example, being a forced seller of bonds in a falling market can lead to large losses on the holdings. If bonds are held in a hold-to-maturity (HTM) book, the reserve manager has declared his intention to hold the bonds until maturity and so selling prior to this time may not be an option. If bonds are held in a mark-to-market (MTM) book, bonds are accounted for at current market prices. Central banks are particularly sensitive to reputational risk and would not like having to report a loss on their reserve portfolio, especially if such losses could be avoided in any way. By holding on to assets longer, possibly until maturity, reserve managers can potentially avoid the probability of having to report losses. Another reason for advocating gradual adjustments in asset allocation is the risk that instantaneously selling a large amount of securities into the market could severely affect prices, and hence could exacerbate the problem. This is particularly of concern in thin markets.

Central bank reserve managers have renewed their focus on safe-haven assets as the crisis has intensified. Reserve managers have had to deal with volatile markets over the past five years. The crisis has led to increased scrutiny by the markets of both sovereign credit risk and liquidity risk. The previously unthinkable scenario of the default of a euro area sovereign has now become a distinct possibility. Sovereign bond yields and CDS spreads have risen dramatically as this risk is priced in. Credit ratings were reduced for a number of sovereigns, banks and other issuers over the crisis. In this context, the renewed focus on traditional liquid asset classes along with increased focus on diversification is not surprising (see Pringle and Carver, 2012). However this trend raises the issue of the current scarcity of safe-haven assets. Furthermore, traditional safe assets are extremely expensive as demand levels are high; in some cases bonds are trading at negative yields. A more fundamental and long-term solution to this problem is needed. Otherwise, the flow of reserve funds to safe-haven assets will lead to lower interest rates, forcing other participants to chase yields elsewhere in the market. Of course, such a trend raises its own financial stability issues.

III. PROFILE OF RESPONDENTS

All 156 reserve managing central banks of IMF member countries were requested to fill out the survey. This total of 156 is considerably smaller than the membership of the IMF as quite a few central banks in currency unions do not manage their own reserves⁶. The survey was sent in April 2012 with all responses received by mid-June 2012. 67 countries responded, a response rate of 43 percent, covering countries accounting for about half of global GDP and one third of reserves. The average reserve holding of respondents was \$66 billion.

The respondents came relatively evenly from advanced, middle and low-income countries: 23 were ACs, 25 were MICs, and 19 were LICs. 6 LICs included in the survey have a population of less than 1 million. Nonetheless, few differences were found between these LICs and the overall population of LICs, and therefore no distinction is made in the analysis and tables.

Table 1. Sample Characteristics of Respondents

	GDP (in billions of US dollars)	Population (in millions)	Reserves (in billions of US dollars)
Total	32928	2782	4447
ACs	24163	544	3064
MICs	6381	572	1015
LICs	2384	1666	368
Average	491	42	66

Sources: IMF, IFS.

As is customary in surveys of reserve managers, the response rate is relatively high in Europe. As a result the response rate among ACs is considerably higher than the rest of the sample. Compared to other surveys (e.g., Carver and Pringle, 2012) a greater number of responses were received from all parts of the world.

Table 2. Distribution by Continent⁷

Continent	Number of respondents	Percentage of respondents
Europe	28	42%
Americas	14	21%
Africa	10	15%
Asia	10	15%
Oceania	5	7%
Total	67	100%

⁶ Some survey respondents were from central banks located in currency unions.

⁷ The source of this and further tables is the survey.

IV. DETAILED RESPONSES

A. Crisis Response

1. What type of concerns/difficulties have you experienced in managing your reserves during the crises episodes of the last 5 years, if any?

	Choice	Total	AC	MIC	LIC
1	Level of reserves	31.3%	26.1%	24.0%	47.4%
2	Liquidity of reserves	50.7%	56.5%	48.0%	47.4%
3	Credit risk of reserves	80.6%	82.6%	76.0%	84.2%
4	Currency composition (e.g., increased needs for certain currencies)	29.9%	34.8%	20.0%	36.8%
5	Other issues relating to the composition of reserves (e.g., concerns related to specific asset classes)	37.3%	34.8%	52.0%	21.1%
6	Did not experience any difficulties	9.0%	0.0%	16.0%	10.5%
7	Other	14.9%	21.7%	8.0%	15.8%
	Number of respondents	67	23	25	19

Pre-crisis, there was an increased focus on returns with reserve portfolios expanding into riskier asset classes. The 2006 Reserve Management Trends Survey (Pringle and Carver, 2006) observed a growing shift into riskier assets, with more investment in agency paper in particular. A survey carried out by the BIS in 2007⁸ (Borio, Galati, and Heath, 2008) found similar results, with a notable shift into agency paper and securitizations to increase the risk/return profile of reserve portfolios.⁹

Not surprisingly, in light of the nature of the crisis and the history of expanding credit risk, the bulk of central bank reserve managers experienced difficulties with credit risk. It is notable that every AC reported experiencing at least some and often multiple difficulties over the period, highlighting the widespread nature and severity of the crisis. A common theme raised by respondents in the open question was the impact of downgrades on their reserve portfolios and the difficulties that these downgrades caused.

About half of the Central Banks, and especially ACs who are typically large holders of assets, reported problems with the liquidity of their reserves. Also, some of the smaller LICs reported having difficulties with liquidity of some assets. The increased attention

⁸ The survey was carried out at end-2006 among 28 central banks accounting for some 80 percent of world reserves. The material was revised and updated in mid-2007.

⁹ The traditional range of asset classes (treasury bills, bank deposits and highly rated government and supranational bonds) were still making up the bulk of reserve portfolios.

placed on liquidity risk can be viewed as a natural fallout from the crisis, as many assets became increasingly illiquid, especially for larger holders.

LICs were especially concerned with the overall level of reserves, with nearly half of LICs citing this as a crucial concern. Overall the level of reserves represented a concern for about a third of respondents. This is a surprising result given the historically high level of reserve coverage and the modest drawdowns in reserves experienced over the crisis. One in four of ACs surveyed rated the level of reserves as being of concern. While for a few, this indicated an excess of reserves, for others the level of reserves was insufficient, either because they experienced crisis and for example had to call on the IMF for support, while others experienced the need for greater liquidity buffers.

2. What measures did you take to address these concerns?

	Choice	Total	AC	MIC	LIC
1	Immediate changes to asset allocation	70.1%	73.9%	76.0%	57.9%
2	Strengthening risk management system	65.7%	39.1%	80.0%	78.9%
3	Use of reserves to provide liquidity or market intervention	41.8%	30.4%	52.0%	42.1%
4	Seeking other sources of liquidity (e.g., currency swaps, regional cooperation)	19.4%	26.1%	20.0%	10.5%
5	Building of institutional capabilities	29.9%	26.1%	24.0%	42.1%
6	No measures taken	4.5%	0.0%	4.0%	10.5%
7	Other	20.9%	26.1%	24.0%	10.5%
	Number of respondents	67	23	25	19

Seven out of ten reserve managers made immediate changes to asset allocation and strengthened risk management in response to the crisis. Reserve managers reacted swiftly to address concerns regarding credit and liquidity risk, cutting exposures to higher risk issuers. Most reserve managers operate under the constraint of investment policies and guidelines that require immediate rectifying measures once risks become unacceptably high. Although the increased appetite for risk that was evident pre-crisis was complemented at the time with a strengthening of risk management practices (Pringle and Carver, 2006), it appears that the improvement in risk management that took place was not sufficient. The strengthening of risk management systems is a logical reaction to such a severe and widespread financial shock. Four out of ten respondents had to make use of their reserves to provide liquidity or intervene in the market, indicating the importance of reserve liquidity. Quite a few, but not all of these countries, felt that the liquidity of some of their assets was a problem.

Immediate portfolio reallocation was carried out in the main by ACs and MICs, whereas improvements to risk management systems were mostly carried out by MICs and LICs. This can be interpreted as follows; risk management systems in ACs were already quite robust pre-crisis, so that heightened risk during the crisis episodes led to rapid corrective action by reserve managers. It might also mean that they were more exposed to credit risk and vulnerable countries. In contrast, LICs were not as quick to react to the crisis,

as measured by asset allocation changes, but of those who made such changes nearly all saw the need to strengthen their risk management systems as well.

3. **If you changed your asset allocation immediately (answered yes to question 2.1 above), what types of assets did you actively reduce as a share of total reserves during the crisis?**

	Choice	Total	AC	MIC	LIC
1	Deposits with commercial banks	73.2%	85.0%	61.9%	73.3%
2	Bonds without government guarantee (e.g., Agency, ABS, MBS, Corporate bonds)	53.6%	65.0%	52.4%	40.0%
3	Longer-term AAA government bonds	8.9%	10.0%	4.8%	13.3%
4	AA+/AA/AA- rated government bonds	5.4%	10.0%	0.0%	6.7%
5	Government bonds that were downgraded	42.9%	50.0%	38.1%	40.0%
6	Non-Core European government bonds	41.1%	45.0%	42.9%	33.3%
7	Equity	3.6%	5.0%	4.8%	0.0%
8	Other	14.3%	10.0%	19.0%	13.3%
	Number of respondents	56	20	21	15

Reflecting the profound effect of the crises on reserve managers' behavior, about half of all central banks pulled back on their level of commercial bank deposits and 35 percent of all respondents reduced their exposure to unguaranteed bonds. Pringle and Carver (2012) found that one-third of reserve managers believed that the euro-area crisis has put the future of the euro as a reserve currency at risk. Our survey finds that those countries that reduced their exposures to unguaranteed bonds also reduced their holdings of bonds that were downgraded and their holdings of non-core European government bonds.

Surprisingly, more reserve managers reduced their holdings of longer term high quality (AAA) bonds than slightly lower rated (other investment grade) government bonds.

With interest rates falling throughout the crisis, early reductions in interest rate exposures have, with hindsight, been relatively costly. This may have reflected the expectation that the crisis would be relatively short-lived.

The crisis also led to a reduction in exposures to European agency bonds, auction rate certificates and securitizations. The open question detailed some of the other asset classes in which exposures were reduced over the crisis. Of note, one Latin respondent said that particular types of Asset Backed Securities (ABS) were removed from the benchmark portfolio due to the lack of liquidity in these instruments and the resulting difficulties in accurately replicating such a benchmark.

4. What triggered the asset reallocation?

	Choice	Total	AC	MIC	LIC
1	Increased volatility	36.7%	42.9%	25.0%	46.7%
2	Rating downgrades	80.0%	85.7%	75.0%	80.0%
3	Worsening CDS spreads	41.7%	42.9%	50.0%	26.7%
4	Other sources of awareness of increased credit risk	60.0%	66.7%	50.0%	66.7%
5	Balance sheet risk management considerations	25.0%	28.6%	16.7%	33.3%
6	Reputational risk	45.0%	47.6%	50.0%	33.3%
7	Other	10.0%	4.8%	12.5%	13.3%
	Number of respondents	60	21	24	15

Rating downgrades and other credit risk indicators were the main triggers for the asset reallocations. Ratings remain essential for reserve managers, with ratings reportedly used by 4 out of 5 reserve managers. Reputational risk was a main consideration to pull back credit exposures: nearly all of the central banks concerned about reputational risk reduced exposures in response to credit downgrades.

ACs and MICs use CDS spreads as an additional tool for credit risk alerts, much more so than LICs. This may reflect that LICs have less institutional know how and had less sophisticated risk management systems pre-crisis (that might not have included dynamic indicators of risk such as CDS spreads). Smaller and relatively poor LICs did not use CDS spreads as additional risk measures. Many of the LICs who expressed balance sheet concerns appear to be concerned about income considerations.

Indeed other triggers for asset reallocation (as mentioned in the open question) included increased diversification to seek higher returns. A number of respondents stated that the low yield environment meant that diversification was necessary to seek higher returns, without increasing risk tolerances. It is not clear how these countries managed such diversification without adding to their risk profile.

5. When you made immediate changes to asset allocation, did you consider any of the following?

	Choice	Total	AC	MIC	LIC
1	Potential inconsistent signaling effects (i.e. risk reduction/flight to quality in reserves, while at the same time trying to calm the markets)	52.0%	86.7%	40.0%	33.3%
2	Contacting other reserve managers potentially facing similar issues	46.0%	40.0%	40.0%	60.0%
3	Effects on banking sector liquidity and global financial stability (assuming other reserve managers were doing the same)	38.0%	40.0%	35.0%	40.0%
4	Contacting the reserve currency issuing central banks (e.g., Fed, ECB, BoJ, or BoE) ahead of the actions	8.0%	13.3%	5.0%	6.7%
5	Other	16.0%	6.7%	20.0%	20.0%
	Number of respondents	50	15	20	15

ACs were much more likely to consider the potential inconsistent signaling effects of their actions, whereas LICs were more likely to contact other reserve managers facing similar issues. ACs were much more cognizant of the potential consequences of their reallocation decisions, possibly due to them having larger reserve portfolio sizes which would in general lead to a proportionally higher market impact. As many LICs have relatively small portfolios in comparison to ACs, reallocation trades may not have been sufficient to move the market. MICs fell somewhere between the two categories, but closer to the LICs in terms of their consideration of potential signaling effects.

6. **(1) If you are concerned about the implications of asset allocations in banking sector liquidity and global financial stability, would you consider altering your reserve/risk management practices to reduce procyclicality?**

	Choice	Total	AC	MIC	LIC	LIC ex SC
1	Yes	55.4%	57.1%	45.5%	69.2%	55.6%
2	No	44.6%	42.9%	54.5%	30.8%	44.4%
	Number of respondents	56	21	22	13	9

31 out of 56 reserve managers would consider altering reserve management practices to account for procyclicality issues. Many European central banks would consider doing so, although not all.

(2) If “yes,” what (policy) actions would you consider appropriate?

	Choice	Total	AC	MIC	LIC
1	Coordination with other central banks	44.1%	30.8%	54.5%	50.0%
2	Coordination facilitated by an international organization	38.2%	15.4%	54.5%	50.0%
3	Adhering to frameworks that are more robust and better tested for tail risk	55.9%	61.5%	63.6%	40.0%
4	Adhering to more strict procedures (e.g., involving senior management) before such decisions are taken	41.2%	23.1%	36.4%	70.0%
5	Longer holding periods during times of generalized market stress	11.8%	23.1%	0.0%	10.0%
6	Greater allocation of reserves to long-term assets	8.8%	7.7%	0.0%	20.0%
7	Holding more safe assets	73.5%	61.5%	72.7%	90.0%
8	Other	14.7%	23.1%	9.1%	10.0%
	Number of respondents	34	13	11	10

The most popular policy response of reserve managers to this issue of altering reserve management practices to factor in procyclicality issues is to hold a higher proportion of safer assets. This response implies that reserve managers’ primary reaction to the difficult issue of procyclicality is to retreat from perceived risky assets and focus their holdings in traditional safe haven investments. This answer indicates the preference to shield portfolios from credit and liquidity risk. Most central banks responded though by choosing more than

one option, often three or four steps were considered. Indeed the importance of having robust frameworks and assets that can withstand tail risk was also raised by the majority of respondents.

Among the alternatives, MICs and LICs are much more open to the idea of coordination led by an international organization than ACs are, and these two country sub groups also showed a higher preference for adherence to more stringent procedures before asset relocation decisions are taken. This may reflect the observation that ACs are more inclined to coordinate among themselves without the services of an international organization. For smaller, more dispersed, countries the latter may be a preferred option. Also, ACs may already have stricter procedures in place.

B. Strategic Asset Allocation

Currency composition

7. What are the main considerations in determining your currency composition?

	Choice	Total	AC	MIC	LIC
1	Currency composition of central bank's overall foreign currency liabilities	48.5%	39.1%	54.2%	52.6%
2	Currency composition of central government's short-term foreign currency liabilities	39.4%	17.4%	41.7%	63.2%
3	Currency composition of central government's overall external liabilities	40.9%	17.4%	54.2%	52.6%
4	Currency composition of the maturity mismatch in banks' FX book	4.5%	13.0%	0.0%	0.0%
5	Currency composition of the economy's (short term) external liabilities	28.8%	17.4%	20.8%	52.6%
6	Trade composition (e.g., the composition of imports)	40.9%	17.4%	50.0%	57.9%
7	The currency/currencies to which your currency is pegged or closely related	30.3%	8.7%	37.5%	47.4%
8	Depth and liquidity of the underlying asset markets (e.g., government bond markets)	50.0%	82.6%	45.8%	15.8%
9	Depth and liquidity of the FX markets (e.g., ability to run a swap book)	31.8%	47.8%	25.0%	21.1%
10	The nominal interest rate	21.2%	17.4%	16.7%	31.6%
11	Access to a Federal Reserve System or ECB swap line	0.0%	0.0%	0.0%	0.0%
12	Other	13.6%	26.1%	12.5%	0.0%
	Number of respondents	66	23	24	19

The considerations used for deriving the currency composition, the most important decision facing reserve managers, varies significantly according to the type of country.

- ACs are nearly all concerned about the depth and liquidity of the underlying asset markets and, to some extent, the currency markets. ACs hold large positions in the market and relatively small reserves compared to the capital markets, and thus liquidity to ensure significant intervention capacity is a relatively important

consideration. Four out of ten ACs also consider the foreign currency liabilities of the central bank. These include central banks that borrow (from their treasuries or on the international markets) for their reserves and central banks with IMF programs.

- LICs on the other hand base their currency composition on more structural factors such as the currency composition of the central banks' and the governments' external liabilities, and the composition of trade. Currency pegs also play a large role. LICs may have a higher probability to need to defend their currency and may be more susceptible to capital outflows during crisis times. LICs are likely to experience more gradual outflows so they can focus on what drives these flows rather than purely focusing on the immediate need for liquidity.
- MICs are closer to LICs in terms of their motives. The main surprise in the responses is the limited extent to which they factor in the economies short-term external liabilities (per the Greenspan Guidotti rule, see also IMF 2001, Bussière and Mulder 1999). For MICs such considerations would be typically more important than for LICs; for whom private liabilities are often much smaller.

A number of other factors are mentioned (in the open question) as important in determining the currency composition of reserves. These include expected macroeconomic developments within that country, the credit quality of the country issuing the currency and the volatility of the accounting currency.

8. Are you currently considering adjusting the currency composition of your reserves?

	Choice	Total	AC	MIC	LIC
1	Yes	56.3%	59.1%	56.5%	52.6%
2	No	43.8%	40.9%	43.5%	47.4%
	Number of respondents	64	22	23	19

Over half of respondents, with reserves of about \$ 2200 billion, state that they are considering adjusting the currency composition of their reserves.

9. If “Yes,” what types of currencies are you considering?

	Choice	Total	AC	MIC	LIC
1	Shifting composition between traditional reserve currencies (those included in the SDR basket, USD, GBP, EUR, JPY)	41.0%	35.7%	33.3%	60.0%
2	Holding other advanced country currencies, such as CHF, AUD, CAD, NZD, DKK, NOK, SEK	74.4%	71.4%	73.3%	80.0%
3	Holding Chinese renminbi (onshore/offshore)	33.3%	35.7%	40.0%	20.0%
4	Holding other emerging market currencies	30.8%	14.3%	46.7%	30.0%
	Number of respondents	39	14	15	10

Of those who are considering adjusting the currency composition of their reserves, the large majority, holding over \$1700 billion in reserves, are looking into increasing their holdings of other advanced country currencies, i.e., other than those currencies contained in the SDR¹⁰ basket. In other words, 43 percent of the total respondents are considering this adjustment. Carver and Pringle (2012) report that about 60 percent are considering investing in these currencies, a much higher percentage, possibly because they specified a long, five year, horizon. Most of our respondents are interested in the commodity currencies AUD and CAD. These commodity currencies may be attractive in their own right but can also function as a proxy for rapidly growing emerging market countries, which are less investable). Roughly a third of those respondents who are considering adjusting currency composition (20 percent of total respondents) indicated that they are actively considering adjusting the currency composition of their reserves to increase the weight of renminbi and a similar fraction are considering other emerging market currencies in their currency reallocation decisions. The former is much higher than the 45 percent Carver and Pringle (2012) report, which again may reflect the longer horizon used in their survey.

10. **If you answered “Yes” to 3) and/or 4) above, have you already invested in these currencies?**

	Choice	Total	AC	MIC	LIC
1	Yes	30.0%	28.6%	57.1%	0.0%
2	No	70.0%	71.4%	42.9%	100.0%
	Number of respondents	20	7	7	6

Just 6 countries, holding about \$500 billion in reserves, have already invested in renminbi or other EMC currencies, compared to 19 countries, holding nearly \$1600 billion in reserves that are considering investing in such currencies. Overall, reserve managers remain cautious and appear to be currently weighing up the benefits and drawbacks of adjusting their reserve currency allocations, and are examining the practical issues of such moves. Investing in renminbi or other EMC currencies can be operationally difficult, .e.g. the opening of local currency bank accounts, settling trades with local custodians, which can give rise to possible additional risk management challenges.

More MICs have already commenced their currency reallocation strategies toward Renminbi and EMC currencies than ACs, while no LIC that indicated an interest in adjusting their currency composition has made any concrete moves to alter currency weights. MICs seem to be the most keen to adjust their portfolios towards other currencies besides those traditional reserve currencies included in the SDR basket. However, several large reserve managers in MICs who intend to invest are still on the fence.

11. **If you answered “No” to the previous question, what have been the main reasons for not doing so?**

¹⁰ The Special Drawing Right (SDR) basket is comprised of USD, GBP, EUR and JPY.

	Choice	Total	AC	MIC	LIC
1	The currencies are not convertible	40.7%	33.3%	57.1%	36.4%
2	The currencies cannot be counted as 'Official Reserves' in IMF datasets	18.5%	0.0%	28.6%	27.3%
3	The currencies are too volatile to invest currently	11.1%	0.0%	14.3%	18.2%
4	The FX markets in these currencies are not deep and liquid enough	44.4%	11.1%	57.1%	63.6%
5	Credit risk considerations (ratings that are too low)	14.8%	0.0%	14.3%	27.3%
6	The underlying government bond markets are not sufficiently liquid	40.7%	33.3%	57.1%	36.4%
7	Quality of institutional framework, governance issues	37.0%	11.1%	28.6%	63.6%
8	Peers have not yet entered into these markets	14.8%	11.1%	14.3%	18.2%
9	Other	44.4%	88.9%	14.3%	27.3%
	Number of respondents	27	9	7	11

The main reasons given for not investing in renminbi or other EM currencies are a lack of liquidity and depth in those currencies' markets, the fact that the currencies are not convertible and that government bond markets in the currencies were not sufficiently liquid.

However, a number of reserve managers acknowledged (in the open question) that they were in the process of studying all the issues related to the question of currency reallocation and further deep analysis of the issues was warranted before any final decision could be taken. While the large majority of reserve managers have not yet invested in emerging market currencies, it does appear that the issue remains open for further review. Some of the reasons given for not adjusting the current currency composition included a lack of experience amongst reserve managers and risk analysts of the currency in question and a lack of knowledge regarding the onshore/ offshore access to the renminbi. Furthermore, one respondent mentioned that the fact the currency was not in the SDR basket was a factor in the decision not to invest.

Liquidity and interest rate risk

12. **Do you tranche reserves into portfolios with different objectives (e.g. liquidity and investment portfolios)**

	Choice	Total	AC	MIC	LIC
1	Yes	81.3%	72.7%	82.6%	89.5%
2	No	18.8%	27.3%	17.4%	10.5%
	Number of respondents	64	22	23	19

More than four-fifths of reserve managers in the sample make use of the common practice of tranching. Tranching allows reserve portfolios to be split up according to the

central bank's particular requirements; for example for different investment and liquidity objectives and distinct policy requirements.¹¹

Interestingly, ACs make less use of tranching than MIC or LICs. This may reflect the fact that they may not need reserves for frequent intervention purposes, and their risk systems allow a focus on overall benchmarks for their portfolios.

13. If you answered “Yes” to question 12 above, what are the main considerations in determining the relative size of these portfolios?

	Choice	Total	AC	MIC	LIC
1	Central bank's explicit liabilities	57.4%	43.8%	57.1%	70.6%
2	Historical needs (e.g., interventions)	72.2%	62.5%	71.4%	82.4%
3	Overall return target	33.3%	25.0%	33.3%	41.2%
4	Transaction costs	7.4%	0.0%	9.5%	11.8%
5	Other	29.6%	31.3%	38.1%	17.6%
	Number of respondents	54	16	21	17

Indeed, historical factors such as interventions are the main reasons for the relative size of existing tranching portfolios. More than half of respondents cite the explicit liabilities of the central bank as an important factor in determining the relative size of the tranching portfolios, indicating the importance of immunization in reserve management strategies, while a third state that the overall return targets forms part of the decision. In line with this, MICs and LICs place more emphasis than ACs on the central bank's explicit liabilities in determining the relative size of their portfolios, as many more LICs are likely to have higher external liabilities.

An important consideration in the determination of the relative size of portfolios is the size of the government's explicit liabilities. Factors such as the level of the government's short term liabilities and its payment needs along with consideration of credit inflows are mentioned frequently in the open question. Another factor that is raised is the potential demand for liquidity, for example due to large inflows and outflows due to interventions.

¹¹ A liquidity tranche would typically be invested in the most liquid and risk adverse instruments based on the assessment of the potential need for liquidity on demand. An investment tranche may be used where reserves are held to provide an additional cushion. In such cases greater emphasis is placed on return as well as the overriding concerns of liquidity and safety. In some countries, tranching is also used to immunize market and foreign exchange risks on the reserve balance sheet, by establishing characteristics for a particular asset portfolio that match those of a group of counterpart foreign liabilities (IMF, 2001).

What are the main considerations in determining the target duration for the reserves portfolio?

	Choice	Total	AC	MIC	LIC
1	Central bank's explicit liabilities	46.2%	50.0%	45.8%	42.1%
2	Projections about the level of reserves	32.3%	9.1%	25.0%	68.4%
3	Overall return target	50.8%	45.5%	50.0%	57.9%
4	Central banks' nominal liabilities (expenditures on wages etc.)	9.2%	9.1%	8.3%	10.5%
5	Other	36.9%	45.5%	41.7%	21.1%
	Number of respondents	65	22	24	19

Half the reserve managers surveyed use an overall return target to determine the duration of their reserve portfolios. This percentage is really quite high and at face value could be of some concern: it could lead to very long investments horizons in a low interest rate environment. Likewise, when interest rates are low duration may be short, reducing income. However, many central banks clarified that the return target is shorthand for avoiding negative income and/or capital preservation: and set a return target such that there is a minimal chance of a negative return.

For LICs, the adequacy of the reserves is the largest driver of duration—much more so than in ACs. LICs are far more likely to have reserve adequacy levels that vary widely over time. Methodologies for assessing the adequate level of reserves are better established for LICs and MICs, allowing assessments of the level of reserves to inform the likely drawdown of reserves and consequently the investment horizon.

A surprising result is how few central banks pay attention to their flow liabilities (wages, refreshing currencies) which can be seen as a liability with a very long duration that could require high duration assets as an offset. Discussions with reserve managers indicate that they have difficulty assessing such liabilities and the practice of calculating the net present value of central bank liabilities is not well established.¹²

Respondents mentioned that the methods used to determine target duration (as discussed in the open question) included Asset and Liability Management (ALM) techniques, and the shortfall approach. These methods are often used to take account of central bank or government liabilities and to give effect to the return target. Some countries also issue liabilities (on the market or to the government) with the specific purpose of

¹² This would be more appropriate for central banks with limited chance of drawdown of the reserves that are invested with a long maturity. Also to protect against such risk, investing in Treasury Inflation Protected Securities (TIPS) or other inflation protected assets would be most appropriate to cover such risks.

achieving a desired asset level and composition. Considerations of the overall level of risk appetite and government liabilities were also mentioned frequently.¹³

Asset classes/credit risk

14. What types of assets are you investing in (apart from gold) to enhance your rate of return?

	Choice	Total	AC	MIC	LIC
1	Longer-term government bonds	73.4%	72.7%	73.9%	73.7%
2	Credit related securities (e.g., agency and corporate bonds)	60.9%	68.2%	69.6%	42.1%
3	Asset backed securities (e.g., ABS and MBS)	18.8%	13.6%	26.1%	15.8%
4	REITs	3.1%	9.1%	0.0%	0.0%
5	Equities	14.1%	31.8%	8.7%	0.0%
6	Other	32.8%	22.7%	30.4%	47.4%
	Number of respondents	64	22	23	19

Reserve managers have been responding to the low interest environment by investing in longer dated government bonds and credit related securities to gain some yield pickup and enhance returns. The crisis has led to a revaluation of credit risk, and pull back from some investments (see above). Given the extremely low interest rate environment and the unusual set of risks, reserve managers have been reviewing other asset classes.

New asset classes have gained immensely in popularity. A surprising number (one in seven) of reserve managers are exposed to the equity markets, which is not an asset class traditionally associated with reserve portfolios, which a number of years back would be considered anathema. With the equity risk premium very high, a normalization of the world's growth prospects could result in significant pick-up in equity prices, offsetting the risk of declining bond prices. Real Estate Investment Trusts (REITs) on the other hand are still barely used despite long-term favorable inflation protection properties. A sizable minority of reserve managers makes use of securitizations to increase rates of return, but this proportion has barely grown in recent years due to problems experienced with these assets over the crisis.

While a full one third of ACs is by now invested in equities and one tenth has exposure to REITs, none of the LICs surveyed invest in these products. The percentage of LICs invested in securitized products is, however, relatively close to that of ACs. MICs are even

¹³ The application of ALM techniques involves calculating the duration of the liability side of the balance sheet and then matching this duration to the asset side of the balance sheet as appropriate. One respondent went as far as to say that they have no explicit duration target but instead completely rely on their ALM framework to set the length of their reserve portfolio. The use of risk factors is also widespread, with many respondents stating the risk/return trade-off is a key input into setting the target duration. A number of reserve managers employ a shortfall approach, whereby the duration of the portfolio is chosen such that the probability of negative returns is set as a pre-specified low level within a certain time period.

more invested in these products than ACs, but have barely set a foot on the path of equity and REIT investment.

Reserve managers indicated (in the open question) that they are also investing in supranational bonds, longer term Certificates of Deposits and Commercial Papers, dual currency deposits, covered bonds and callable bonds. One respondent stated that investments in TIPS and floating rate debt are being used to raise levels of return.

C. Risk Management, Benchmarks, and Rebalancing

15. Have you changed your risk management framework during or after the crisis?

	Choice	Total	AC	MIC	LIC
1	Yes	87.5%	90.9%	87.0%	84.2%
2	No	12.5%	9.1%	13.0%	15.8%
	Number of respondents	64	22	23	19

The overwhelming majority of reserve managers have adjusted their risk management framework over the last couple of years. As reserve management becomes more sophisticated and encompasses a wider range of investment assets, it is imperative that a corresponding higher weight is placed on the risk assessment side of the decision making process. It is evident that increased focus is being placed on risk management systems by nearly all reserve managers. This trend is clear across all three country sub groups.

16. If “yes,” which measures did you take to enhance your risk management?

	Choice	Total	AC	MIC	LIC
1	Strengthened management of operational risk	51.7%	33.3%	47.8%	81.3%
2	Reviewed/introduced new legal risk management measures (ISDAs, (G)MRAs)	35.0%	66.7%	26.1%	6.3%
3	Tightened monitoring of external managers	26.7%	14.3%	30.4%	37.5%
4	Changed/canceled securities lending programmes	28.3%	42.9%	34.8%	0.0%
5	Introduced new risk measures	78.3%	71.4%	69.6%	100.0%
6	Other	26.7%	33.3%	39.1%	0.0%
	Number of respondents	60	21	23	16

The adjustments that have been made to risk management frameworks have concentrated on introducing new risk measures and strengthening the management of operational risk. New and innovative ways to monitor and evaluate risks have been the main technique employed to enhance risk management.

This trend of reserve managers placing more attention on operational risk enhancements was particularly noticeable in LICs. Operational risk management may have been an area where LICs felt they were lacking pre-crisis. The fact that ACs took proportionally higher measures to review and improve their legal risk management is likely

due to the increased awareness of the markets of the potential risk of counterparty failure in the wake of the near failure of Bear Stearns and the failure of Lehman Brothers.

The open question highlights the varying level of sophistication in the different institutions' risk management systems. On an elementary level, some central banks developed counterparty limit systems, strengthened risk control procedures or increased resources to the risk management function. Others established a formal credit committee while one respondent stated a dedicated risk management unit was set up with separate reporting lines to those of the reserve management function. A number of reserve managers tightened their risk management frameworks, for example by introducing concentration limits or by modifying existing credit limits. It would be useful to know as well how many reserve managers switched from unsecured to secured investing (i.e., collateralized deposits/reverse repos).

17. **What are the key characteristics of your credit risk management framework?**

	Choice	Total	AC	MIC	LIC
1	The size of limits are linked to credit ratings (e.g., the limit for AA is higher than for A rated assets) or default probabilities (e.g., CDS spreads)	80.6%	91.3%	68.0%	84.2%
2	There are other considerations than the credit quality in determining the size (e.g., level of capital or market capitalization of the counterparty/obligor)?	55.2%	69.6%	56.0%	36.8%
3	The minimum credit rating below which no exposures are allowed is in the broad "AA" category (i.e. either AA+, AA or AA- is the cut-off point)	29.9%	13.0%	44.0%	31.6%
4	The minimum credit rating below which no exposures are allowed is in the broad "single A" category	50.7%	60.9%	36.0%	57.9%
5	The minimum credit rating below which no exposures are allowed is in the broad "triple B" category	17.9%	26.1%	12.0%	15.8%
6	When the minimum credit rating threshold is reached, the exposure needs to be automatically cut within a certain time period	38.8%	30.4%	52.0%	31.6%
7	When the minimum credit rating threshold is reached, the Governor or a Committee can decide whether to hold on the position on a case-by-case basis	47.8%	65.2%	36.0%	42.1%
8	Other	13.4%	26.1%	12.0%	0.0%
	Number of respondents	67	23	25	19

Credit rating changes continue to be a key influence on reserve management decisions, with 4 out of 5 relying on ratings as the key instrument for assessing credit risk.

However it is assuring to note that over half of respondents also factor in other considerations, beside explicit credit ratings, in their determination of counterparty or issuer exposure limits.

A single 'A' rating from one of the main rating agencies is most common cut-off used below which no exposures are permitted in reserve portfolios. This is followed by AA and then by B as the cut-off category. Of note is the finding that MICs are more conservative than both LICs and ACs in choosing the rating cut-off.

When a minimum credit rating trigger is breached, nearly half of respondents take the decision regarding whether to cut or hold onto the position to a senior management level. In some cases these decision could lie with the Governor of the bank while in others an internal investment committee are given some discretion to decide whether to hold onto the position. While opening up the decision of whether or not to divest of downgraded holdings can be made more subjective and create some reputational risk, by allowing it to be made on a case by case basis, on the positive side this approach allows the consideration of other factors (e.g., financial stability) besides focusing purely on credit risk. It also allows some time to make the decision, which can avoid an avalanche of sales pressures upon a downgrade. Just under two-fifths of respondents are obligated to cut the exposure within a certain time period once the credit rating falls below the minimum credit rating threshold.

ACs appear to be more open to considering other factors, apart from credit ratings, in determining the size of credit limits, while also permitting investments in lower rated securities in their reserve portfolios when compared to MICs and LICs. ACs also have more flexibility when minimum credit ratings are breached, with a significant majority having the option to hold on to the position following approval from senior management.

A common theme in the open question is the distinction made between sovereign bonds and other forms of debt when arriving at credit management decisions. A number of respondents stated that credit decisions regarding sovereigns were treated differently to other asset classes. For example, one respondent stated that limits for government issues are not explicitly linked to credit ratings but instead long term judgment on the credit quality of the issuer is used. Many respondents explained that while an automatic trigger to divest once minimum rating thresholds are breached is applied to bank bonds for example, in the case of sovereign holdings it is up to the Board of the central bank to decide on the response to downgrades. This shows that many reserve managers are aware of the potential signaling effects and financial stability concerns that could arise from a large scale selling of sovereign holdings. Another respondent replied along the same vein, stating that exceptions apply in the case of automatic cuts for sovereign exposures. One reserve manager further noted that for sovereign holdings they have introduced a system with many inputs related to the country's overall performance, apart from a singular focus on credit ratings.

18. What kind of interest benchmark(s) do you use?

	Choice	Total	AC	MIC	LIC
1	Standard Market Indices	44.8%	26.1%	56.0%	52.6%
2	Customized Market Indices	26.9%	43.5%	20.0%	15.8%
3	Fully customized in-house built and maintained benchmarks	25.4%	43.5%	12.0%	21.1%
4	Return target (e.g., relative to a reference rate such as LIBOR)	25.4%	13.0%	16.0%	52.6%
5	Other	4.5%	0.0%	12.0%	0.0%
	Number of respondents	67	23	25	19

The use of indices varies widely. Almost half of reserve managers utilize standard market indices to set their benchmark portfolios. Half of the reserve managers also use either customized market indices or fully customized (and in house maintained) benchmarks. Those who use customized indices often do so in addition to using standard market indices. One in four reserve managers also have an explicit return target, and about half of these countries use this as their main or sole benchmark.

Standard market indices are more popular in MICs and LICs whereas some form of customized index is commonly employed in ACs. Generic indices are more likely to be used in MICs and LICs, perhaps due to lack of resources in these countries to maintain a customized version of an interest benchmark. Of note, over half of LICs have an explicit return target which they then use to set their interest rate benchmark, which is three times more than MICs or ACs.

19. **Do you have deviation limits around the benchmark?**

	Choice	Total	AC	MIC	LIC
1	Yes	83.6%	91.3%	84.0%	73.7%
2	No	16.4%	8.7%	16.0%	26.3%
	Number of respondents	67	23	25	19

A significant majority of reserve managers have deviation limits around the interest benchmark. Nearly all reserve managers use deviation limits as part of their risk management processes. Although this trend is observed among the three country sub-groups, ACs are more likely than MICs (who in turn are more likely than LICs) to have deviation limits in place. It is not clear how the countries without deviation limits manage their risk tolerance.

20. **If “yes” for what purpose can the deviations be used?**

	Choice	Total	AC	MIC	LIC
1	Market movements	47.4%	52.4%	36.4%	57.1%
2	Tactical asset allocation	73.7%	71.4%	81.8%	64.3%
3	Active management	86.0%	90.5%	86.4%	78.6%
4	Other	5.3%	4.8%	4.5%	7.1%
	Number of respondents	57	21	22	14

The main roles of deviation limits in order of popularity are; to permit active management, followed closely by tactical asset allocation and then subsequently to exploit market movements. Passive managers do not take active positions against the benchmark, whereas active managers have the scope to deviate from the benchmark portfolio. Active management is widely used by reserve managers for interest rate risk. This result is quite surprising as active management can be challenging and can lead to significant risk, depending on the leeway given to deviate from the benchmark. So called tactical

benchmarks can be set by senior management against which reserve managers aim to outperform and this approach is also very common. Here too it can be seen that the share of tactical management is rather high. Just under half of respondents can use deviations from the benchmark in order to take advantage of market volatility.

It is quite noteworthy how widespread the use of active management of interest rate risk is, when compared to the management of currency risk. Active management among ACs is virtually universal, but it is also very widespread among MICs and LICs. This perhaps reflects the view: (i) that markets are not fully efficient; (ii) that active management provides incentives for market monitoring that contributes to better market intelligence for policy purposes; that (iii) the reserve management staff understand bond markets and interest rate mechanisms well; or (iv) that active management can take into account volatility and the implications of risk for the central bank balance sheet. It would be useful to know how successful central banks on average are in active management, and what precisely drives such management.

21. How often do you rebalance your portfolio for currency risk?

	Choice	Total	AC	MIC	LIC
1	Daily	9.5%	17.4%	8.7%	0.0%
2	Weekly	3.2%	0.0%	4.3%	5.9%
3	Monthly	19.0%	13.0%	17.4%	29.4%
4	When a preset threshold/limit for the deviation from the benchmark is reached	46.0%	34.8%	43.5%	64.7%
5	Other	47.6%	56.5%	47.8%	35.3%
	Number of respondents	63	23	23	17

Currency rebalancing practices can have significant implications for return.

Rebalancing at a low frequency or at wide margins can generate profits in case of mean reverting swings that exceed the limits or the timeframe for rebalancing. Naturally, in the case of trending foreign exchange markets, these central banks are more exposed to losses as well.

Rebalancing portfolios for currency risk is carried out by nearly half of reserve managers once a predetermined level of departure from the benchmark is reached.

¹⁴About one third of reserve managers carry out rebalancing at relatively high frequencies (monthly or more often). A surprising number of reserve managers (about 1 in 6) carry out rebalancing at lower frequencies (quarterly or annually). Most of these are, however, countries that use both preset limits and a low frequency rebalancing. A large group of countries (about 1 in 5) reports that they do not rebalance for currency risk, but their detailed explanations make clear that is because the reserve are primarily or fully in a single currency (e.g., some Eurozone central banks).

¹⁴ Ewe-Ghee (2006) also reports using econometric results that rebalancing is the dominant portfolio strategy.

Rebalancing at a very high frequency is most prevalent in ACs, while LICs mostly use preset limits or rebalance at a monthly frequency. Beyond some broad correlation with income level (and capacity) there are no clear distinctions between countries following the different practices.

A number of respondents explained that although they hold quarterly or annual reviews of portfolio currency risk, significant external shocks or large market movements can lead to currency allocations being revised immediately. Some reserve managers conduct an annual review of the currency composition of their portfolios in the context of an ALM framework while others reallocate based on their forecasts of foreign reserve levels, on their outlook for exchange rates or on flow requirements. A number of respondents stated that rebalancing decisions are made on a more ad hoc basis; with trigger events such as when the investment committee decides such a reallocation is warranted, or when external cash flows or foreign exchange market developments alter the optimal currency decision.

22. **If you answered affirmative to option 4 in the previous question (rebalancing when a preset limit is reached), what is the threshold for rebalancing?**

	Choice	Total	AC	MIC	LIC
1	The maximum deviation	54.5%	45.5%	72.7%	45.5%
2	When the portfolio hits a level of no more than two-thirds of the maximum deviation	9.1%	9.1%	0.0%	18.2%
3	When the portfolio hits a level of no more than one-third of the maximum deviation	6.1%	0.0%	0.0%	18.2%
	Number of respondents	33	11	11	11

Of those reserve managers who rebalance their portfolios for currency risk once a predefined threshold away from the benchmark is reached, the large majority wait to until the deviation is the maximum permitted. A small minority rebalance when a level of two-thirds of the maximum leeway is reached. An even smaller portion again rebalances earlier, that is once a level of one-third of the maximum leeway is reached. In particular LICs have a more cautious approach in rebalancing before the maximum limit is reached. But LICs also often have wider currency bands.

23. **How do you rebalance the portfolio?**

	Choice	Total	AC	MIC	LIC
1	Back to the benchmark	56.7%	66.7%	54.5%	47.1%
2	To a point that is less than two thirds of the maximum deviation from the benchmark	3.3%	0.0%	0.0%	11.8%
3	To a point that is less than one thirds of the maximum deviation from the benchmark	8.3%	0.0%	4.5%	23.5%
4	Other	38.3%	38.1%	50.0%	23.5%
	Number of respondents	60	21	22	17

Most reserve managers rebalance their portfolios for currency risk by bringing the portfolio back in line with the benchmark. However, a few reserve managers have flexibility in terms of their rebalancing currency target. Some reserve managers rebalance the portfolio to a point that is a fraction of the maximum permitted deviation from the benchmark. A few others have discretion as to how the rebalancing is performed. These reserve managers in particular review the market volatility and exchange rate outlook in determining whether to go fully back to the benchmark. The proportion of reserve managers with flexibility is slightly higher among LICs.

24. **What other elements trigger a change in the currency composition? Please check all that apply.**

	Choice	Total	AC	MIC	LIC
1	The emergence of a market trend (e.g., the spot exchange rate moves above the 50- or 200- day moving average)	14.3%	5.6%	9.5%	29.4%
2	Concerns at the policy level about the fundamental weakness of a currency	58.9%	44.4%	57.1%	76.5%
3	When stop-loss rules (based on the exchange rate level) are triggered	3.6%	5.6%	4.8%	0.0%
4	Other	41.1%	55.6%	52.4%	11.8%
	Number of respondents	56	18	21	17

High level policy concerns regarding the fundamental weakness of a currency are the principal reasons for a change in currency composition. This result is not surprising in the context of the attention that has been placed on the euro currency in recent years, and to a lesser extent the dollar. The redenomination risk of euro area countries has never been higher, as policy makers continue to grapple with how to tighten and improve the monetary union. The U.S. lost its triple A rated status from Standard and Poor's in 2011 following the government's decision to raise the debt ceiling. The other two main rating agencies, Moody's and Fitch, still rate the U.S. as triple A but have the sovereign on negative outlook.

This observation is especially true in the case of LICs; however LICs also place more weight on technical analysis in arriving at a decision to amend their currency composition. Over three-quarters of LICs factor in concerns regarding the weakness of a currency in their decision to readjust currency compositions, which is higher than that observed in the other two country sub-groups.

A wide variety of other elements can trigger a change in the currency composition of a reserve portfolio; however some reserve managers never adjust their target currency composition. Reserve managers that use ALM techniques to set the optimal portfolio distributions focus on changes in the composition of liabilities as a driver for asset side changes. A number of reserve managers stated that the target currency composition of their portfolios is not adjusted, as they have single currency targets for their portfolios. The importance of active management was also raised, with active management decisions including the currency composition with strategic benchmark deviation bands. Conversely, some respondents stated that no active management positions are taken in foreign exchange

markets, but rather that currency composition changes were considered as part of strategic long term reviews. Other relevant factors that can trigger a currency change are changes in the SDR basket.

25. What practices could central banks adopt to limit the adverse impact of potential risk factors?

	Choice	Total	AC	MIC	LIC
1	Using more hedging instruments, such as inflation-indexed bonds	49.1%	50.0%	52.0%	44.4%
2	Holding more gold	17.5%	7.1%	12.0%	33.3%
3	Creating SWFs or shifting balances to existing SWFs	12.3%	14.3%	12.0%	11.1%
4	Diversifying exchange rate holdings to match revised risk profiles	38.6%	50.0%	40.0%	27.8%
5	Pursuing increased exchange rate flexibility	7.0%	0.0%	8.0%	11.1%
6	Reducing the level of reserves	24.6%	21.4%	24.0%	27.8%
7	Other	19.3%	21.4%	16.0%	22.2%
	Number of respondents	57	14	25	18

Reserve managers believe that central banks can adopt a number of initiatives to limit the adverse impact of potential risk factors, with a preference for the use of more hedging instruments. Increasing the use of hedging instruments could limit the portfolio risk, including tail risks such as an increase in inflation, and nearly half of the reserve managers surveyed think that this is a sensible approach. Over one-third of reserve managers are of the opinion that diversifying present exchange rate holdings to better match current risk profiles is prudent—this echoes the responses on investing in non SDR currencies. Nearly one-quarter of respondents feel that reducing the outright level of reserves would be beneficial to reduce risk factors, which seems to be a rational response.

A significant minority of reserve managers do consider that the time has come to consider more fundamental alternatives such as investing in SWFs, increased exchange rate flexibility and reducing levels of reserves. One in ten is considering creating SWFs or shifting balances to SWFs. Of these countries most are commodity exporters, but a few countries are not, and do not yet have, SWFs. Only a few countries consider exchange rate flexibility as a solution to reduce the need for reserves, and these intentions seem to reflect broader policy considerations. By far the most widely contemplated change would consider is a reduction the level of reserves, which is considered by one in four reserve managers.

LICs have a relatively higher preference for investing in gold to shield portfolios from potential risk factors and seem to be less willing to diversify foreign exchange holdings to match revised risk factors. The ongoing uncertainty in world markets has bolstered the demand for safe haven assets such as gold. However, a possible concern here is that the demand for gold could be driven by backward looking motives, i.e. extrapolating the trend in the price of gold rather than as a means to hedge against the tail risk of a surge in inflation. While LICs appear to be less open to the idea of diversifying current foreign exchange

holdings to match updated risk profiles, they are relatively more likely than ACs to consider pursuing increased exchange rate flexibility to counter potential risk factors.

Holding more diversified assets or constructing a risk framework that is more robust and better able to deal with tail risks are other practices that could be pursued by reserve managers to limit possible risks. A number of respondents mentioned that further diversification of the portfolio could limit future risks by increasing expected return levels without changing risk tolerance levels. Building risk frameworks that are better able to account for tail risks could also assist with the goal of confining possible risk factors. The fact that interest rates are at extremely low levels at the moment and the potential consequences if they were suddenly increased was raised by one reserve manager as a serious risk. Other future challenges that were mentioned included how to manage credit risk going forward, the necessity to preserve capital, dealing with high concentration within the portfolio and how to operate in an environment where return levels are very low.

26. **Do your reserve management practices differ depending on whether reserves are considered ample or excessive? Could you identify if for these reserves, you:**

	Choice	Total	AC	MIC	LIC
1	Take more credit risk	23.0%	21.1%	30.4%	15.8%
2	Take more liquidity risk	34.4%	42.1%	34.8%	26.3%
3	Have a different currency composition	16.4%	21.1%	17.4%	10.5%
4	Have a longer duration	31.1%	26.3%	21.7%	47.4%
5	Other (please specify, for example: Ample/excess reserves are not identified; Ample/excess reserves are not managed differently)	52.5%	68.4%	52.2%	36.8%
	Number of respondents	61	19	23	19

About half of the reserves managers (32) take more risk for those reserves that are considered ample. Of the other countries, most (14) countries do not identify ample or excessive reserves, a few (3) do not consider that they have excess reserves, and one in six of the total sample (8 countries) manage ample reserves the same as other reserves.

Of those reserve managers who manage ample reserves differently, most take on more liquidity and duration risk. This is a consistent reaction. Johnson-Calari, Grava and Kobor (2007) make the case that return is more important for excess reserves. Interestingly a number of reserve managers take on additional credit risk, but not duration risk, including several ACs. This suggests that there are annual reporting (balance sheet) limitations that reduce the scope for taking on more interest rate risk. This also explains why ACs seem to be more prepared to take on liquidity risk. LICs on the other hand have fewer problems with duration risk. A few respondents highlighted that the overall accumulation of reserves has resulted in the inclusion of new asset classes in the portfolio to enhance the risk / return profile.

REFERENCES

- Bakker, Age and Ingmar van Herpt, 2007, "Central Bank Reserve Management: New Trends, from Liquidity to Return," Edward Elgar Publishing Limited.
- Borio, Claudio, Gabriele Galati, and Alexandra Heath, 2008, "FX Reserve Management: Trends and Challenges," BIS Paper 40, available at <http://www.bis.org/publ/bppdf/bispap40.htm>.
- Bussière, Matthieu and Christian Mulder, 1999, "External Vulnerability in Emerging Market Economies - How High Liquidity Can Offset Weak Fundamentals and the Effects of Contagion," *IMF Working Paper* [WP/99/88](http://www.imf.org/external/pubs/ct/2000/09/wpaper/0901.htm).
- IMF, 2000, "Debt- and Reserve-Related Indicators of External Vulnerability," available at <http://www.imf.org/external/np/pdr/debtres/index.htm>.
- IMF, 2001, "Guidelines for Foreign Exchange Reserve Management," available at <http://www.imf.org/external/np/mae/ferm/eng/index.htm>.
- IMF 2001, "Issues in Reserves Adequacy and Management", available at <http://www.imf.org/external/np/pdr/resad/2001/reserve.htm>.
- IMF, 2011, "Assessing Reserve Adequacy," available at <http://www.imf.org/external/np/pp/eng/2011/021411b.pdf>.
- Johnson-Calari, Jennifer, Roberts Grava, and Adam Kobor, 2007, "Trends in Reserve Management," in Bakker and van Herpt 2007.
- Lim, Ewe-Ghee, 2006, "The Euro's Challenge to the Dollar: Different Views from Economists and Evidence from COFER (Currency Composition of Foreign Exchange Reserves) and Other Data," IMF WP/06/153.
- McCauley and Rigaudy, 2011, "Managing Foreign Exchange Reserves in the Crisis and After," BIS Paper 58, available at <http://www.bis.org/publ/bppdf/bispap58.pdf>.
- Pihlman, Jukka, and Han van der Hoorn, 2010, "Procyclicality in Central Bank Reserve Management: Evidence from the Crisis," IMF Working Paper 10/150, available at <http://www.imf.org/external/pubs/cat/longres.cfm?sk=23991.0>.
- Pringle, Robert and Nick Carver, 2006, "Trends in Reserve Management—2006 Survey Results," in RBS Reserve Management Trends 2006 (London: Central Banking Publications).
- Pringle, Robert and Nick Carver, 2012, "Trends in Reserve Management—2012 Survey Results," in RBS Reserve Management Trends 2012 (London: Central Banking Publications).
- Philip D. Wooldridge, 2006, "The Changing Composition of Official Reserves," BIS Quarterly Review, September 2006.