International Reserves and the Global Financial Crisis

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July 7, 2010

The global financial crisis wrecked havoc on world markets and has led to major economic dislocation around the world. Initially it was the developed countries that bore the brunt of the crisis, but by mid-2008 the crisis was global; financing for emerging markets dried up and credit spreads for emerging market debt rose dramatically, raising concerns about their ability to refinance their debt. Many trade-oriented countries saw exports plunge leading to sharp contractions of GDP. Countries with high levels of debt were also hard hit, with many countries forced to devalue and a long list in danger of default (e.g. Venezuela, Ukraine, Argentina, Pakistan, Latvia, Emirate of Dubai, Iceland, Lithuania, and Lebanon). Some countries were hit more strongly by the crisis (especially in Central and Eastern Europe) while others, at least initially, appeared more shielded. Our study aims to understand how pre-crisis reserve accumulations as well as other characteristics of countries (trade and capital account openness, levels of private and official foreign debt, exchange rate regime) together with the policy decisions made during the crisis (fiscal and monetary policy, exchange rate devaluation, reserve decumulation) can explain cross-country differences in post-crisis economic and financial performance.

Our project begins with an analysis of initial conditions in order to better understand the choices countries faced when the global crisis struck. An important component of this analysis will be a focus on pre-crisis foreign reserve accumulation. In the years since the regional crises in the 1990s a number of countries, especially in East Asia, were thought to have built up excessive foreign reserve portfolios. If the main rationale for accumulating reserves was to provide precautionary self-insurance, the global financial crisis would seem to be the ultimate vindication for that strategy. Yet recent studies by Blanchard, Faruqee and Das (2010) and Aizenman and Sun (2009) find that even countries with high levels of reserves were reluctant to use (or lose) them. They find little evidence that reserves were important buffers to the crisis.

The decision by governments not to deplete reserves during the crisis does not provide evidence against the positive role for reserves in self-insurance. Indeed high reserve stocks prior to the crisis may have protected countries against speculative attacks which would have otherwise occurred. Reserves in this context may be analogous to the lender of last resort

facilities in central banks.

The derivation of optimal reserve levels has long been contentious. Recent experience suggests that models have underestimated the threshold level of reserves after which risk perceptions about a country rise dramatically. Further, the widely differing initial levels of reserve stocks held by emerging countries indicates significant heterogeneity in desired threshold levels (perhaps based on past experience during crises as Hashimoto and Ito (2007) emphasize). More importantly, recent evidence suggests that once reserves fall below the threshold, net new capital inflows abruptly end leading to debt rollover problems and capital flight. These capital flow reversals can, in turn, increase the pace of decumulation of reserves. These feed-back channels suggest there may be important non-linearities that need to be taken into account to better understand the role of reserves.[1] South Korea through the current crisis is a case in point. In 2008 there was concern that Korea's total external debt maturing over the coming year would exceed its level of international reserves. In addition to depleting some of its reserves, Korean authorities opted to draw on their swap line with the Fed in the midst of the crisis in order not to breach their perceived threshold level of reserves.

Our project will attempt to measure country-specific reserve thresholds based on the structure of the economy (capital account openness, dependence on trade, development of the domestic financial system), the size of the problems that might arise in each country (fiscal soundness, health of the banking system, etc), the potential role of speculators, and what total resources a government has to respond to these problems, including reserves. Our approach will focus on all the resources that might matter (e.g. a country with a SWF and reserves, and/or swap lines, is likely to be perceived differently than one with only reserves) in order to gauge how (and whether) these resources influenced the economic and financial performance of countries during the global crisis.

How our Project Fits into the Existing Literature

International reserves held by monetary authorities (typically in the Central Bank, Treasury, or Ministry of Finance) are part of national wealth, and were originally important for countries with fixed exchange rates that wanted to avoid costly adjustments to disturbances in the external sector of the economy. For example, if a country ran a current account deficit, reserves could be used by the government to forestall an exchange rate depreciation that might otherwise occur. However, in this view of reserves, as a country's level of wealth increases over time, or if a country moves away from a fixed exchange rate regime, it is less clear how much of a share of

[1] We plan to draw on the global game literature as well as Krugman (1979) crisis modeling techniques to incorporate the role of speculation in our model.

the national wealth should be devoted to international reserve assets. It is worth noting that foreign reserves are usually backed by domestic liabilities Reserves held by the Central Bank are typically backed by domestic currency, and in some countries Central Bank Bills issued to the market. Likewise, reserves held by the fiscal authority are typically financed with domestic government bills. Hence, international reserves in many countries are not net national assets. Holding large stocks of international reserves can be viewed as a nationally operated carry-trade, if returns on the reserve assets are higher than the domestic interest rate; or quasi-fiscal costs, if the returns on the reserve assets are lower than the domestic interest rate.

Heller (1966) provides one of the first attempts at calculating an optimal country specific level of international reserves based on what he termed the precautionary motive. The three parameters he thought important to this calculation include: (1) the cost of adjusting to an external imbalance (measured as the propensity to import); (2) the cost of holding liquid international reserves (measured as the difference between the return on the reserves relative to a benchmark return on domestic bonds); and (3) the probability that there will actually be a need for reserves of a given magnitude (based on the history of past external imbalances).

In the period following the 1971 break down of the Bretton Woods system, while many industrial countries moved away from fixed exchange rate systems toward more flexible regimes, countries continued to hold reserves despite the disappearance of their original purpose which was to help finance current account imbalances. In practice there seem to have evolved a number of "rules of thumb" to determine optimal reserve levels loosely based on Heller's precautionary motive. These rules included maintaining reserves equivalent to: (1) three months of imports (to offset current account shocks); (2) 5-20 percent of M2 (to be able to shore up confidence in the value of the domestic currency in the event of a currency crisis); and (3) the value of all debt obligations falling due within the following 12 months (in the event of a sudden disappearance of short-term capital inflows)[2.]

All of these rules of thumb imply a desire on the part of governments to acquire reserves to serve as a cushion against adverse economic shocks of one form or another, and as such can be categorized as satisfying Heller's precautionary motive. Frenkel and Jovanovic (1981) provide a more formal approach to modeling the precautionary motive for holding reserves using a stochastic inventory-theoretic framework. Their model indicates that optimal reserve holdings increase with the volatility of reserves (which are presumably influenced by current account shocks, the value of the domestic currency, and capital inflows) subject to a fixed cost of reserve accumulation and the opportunity cost of holding reserves. Ben-Bassat and Gottlieb (1992) follow in this buffer stock modeling tradition while also linking international reserves with

[2] This is often referred to as the "Greenspan-Guidotti rule".

sovereign risk.

An alternative view of reserve accumulation is that it is the byproduct of a government strategy to keep the international value of the domestic currency low in order to boost export growth. In this view purchases of foreign reserves are not motivated by a desire to smooth consumption in the face of external shocks, but rather they are the unintended consequence of sterilized interventions in the foreign exchange market.[3] This rationale for reserve accumulation, typically labeled the mercantilist motive, has been advanced by Dooley, Folkerts-Landau and Garber (2003) as a description of the development strategy followed by many East Asian countries, particularly China.

There have been a number of recent empirical studies attempting to measure whether the precautionary or mercantilist motive better explains foreign reserve accumulations by both industrialized and developing countries. These studies generally find evidence in support of both motivations (see, for example, Aizenman and Lee (2007)), while at the same time finding that neither motivation fully explains the upsurge in reserve accumulations by developing countries starting in 2000 (Jeanne (2007) and Jeanne and Ranciere (2007)). Three recent studies that come to the conclusion that reserve accumulations through 2007 were not excessive include: Obstfeld, Shambaugh and Taylor (2008) who gauge reserve adequacy against the size of the banking sector, Hashimoto and Ito (2007) who focus on the adequacy of reserves to maintain exchange rate stability, and Dominguez (2010) who focuses on the role for reserves in countries with underdeveloped financial markets.

There are also a few studies that examine reserve policy during the most recent global crisis. Aizenman and Sun (2009) document that many emerging market countries chose not to deplete their international reserves as part of the adjustment mechanism. Further, they find that the main factor distinguishing countries that did rely on reserves was their heavy trade orientation (measured as openness, oil export share and commodity export ratio). One interpretation of this finding is that countries that accumulated reserves for mercantilist reasons prior to the crisis were less wary of depleting reserves when export markets collapsed, while those countries that accumulated reserves for precautionary reasons opted for adjustment via exchange rate depreciation rather than reserve depletion. Obstfeld, Shambaugh and Taylor (2009) document the heavy reliance on swap lines of inter-governmental credit during the crisis, especially by developed countries that did not have large reserve accumulations. They suggest that swap lines may substitute for reserves for some countries.

[3] There is a large literature exploring the motivation for and efficacy of sterilized intervention policy in developed countries (see, for example, Dominguez and Frankel (1993), Dominguez (2006b), Ito (2003, 2004, 2005 and 2007b) and Ito and Yabu (2007)). The efficacy of sterilized intervention policies in developing countries has been less widely studied, in large part because governments have been reluctant to provide detailed data on their operations. Reinhart and Reinhart (2008) document the extent to which the accumulation of foreign exchange reserves has been sterilized by developing countries since 1990.

This project will attempt to link the earlier literature on the motives for reserve accumulation together with the idea of non-linear threshold effects to better understand the role that reserves played in the current crisis. We will allow for the possibility that precautionary and mercantilist motives for reserve accumulation may have been importantly connected for some countries in the pre-global crisis period, and may have contributed to the global imbalances that are often cited as playing a causal role in the global crisis. Countries that experienced crises and decumulation of reserves in the 1990s were in the process of rebuilding reserves in the years prior to the global crisis. Reserve accumulation by these countries will have put downward pressure on their own currencies and contributed to external surpluses.

Framework of Analysis

This project will extend the cross-country panel data approach used in Hashimoto and Ito (2007) and Dominguez (2010). In the first-stage estimates of reserve accumulation we will differentiate self-insurance and mercantilist motives by including explanatory variables that are related to exports but not finance, potential candidates are measures of industrial structure and comparative advantage. We will also integrate the potential for speculative attacks in the context of the self-insurance motive. Our working assumption is that the target size of foreign reserves for emerging market economies will largely depend on interest rate differentials, exposure to short-term capital liabilities and the perceived likelihood of speculative attack. Second-stage estimates will relate these country-specific reserve thresholds to economic and financial performance during the global crisis.

One of the consequences of the large accumulations of reserves in emerging countries is a new consciousness among monetary authorities of the risk of foreign reserve valuation losses[4] as well as criticism from the US concerning excessive official holdings of dollar-denominated assets. In order to avoid these economic and political costs a number of countries with large reserve stocks have begun to pursue strategies that diversify their reserve holdings[5] and create new fund categories. Although these funds are often not officially defined as foreign reserves, nonetheless they could be used in times of crisis. These new trends in reserve policy will be explored in this paper.

[4] Dominguez, Fatum and Vacek (2010) examine the implications of systematic reserve decumulation (intended to mitigate valuation losses) on domestic currency movements.

[5] The dollar remains the dominate currency denomination for reserves, though there is some evidence that countries have begun to diversify into euro and yen, see Dominguez (1999, 2006a)

Description of the Data

The definition of foreign reserves has evolved over time. Conceptually reserves should be denominated in foreign currency, owned by the government, and should be highly liquid. There is an interesting historical progression between how emerging countries treated reserves in the 1990s (before and during crises) and how the IMF responded with new restrictions on these funds. For example, Mexico did not disclose its reserve position in the ten months prior to its 1994 crisis. The IMF was criticized for its perceived lack of surveillance and responded by increasing its emphasis on transparency and disclosure of foreign reserves and other data. Likewise, during May-July 1997 Thailand became a counterparty to huge speculations against the Thai baht and lost sizable foreign reserves in forward positions, but their statistics (which only provided current positions) showed ample reserves (this reporting was IMF-consistent at the time). After the crisis the IMF responded by requiring reporting on forward contracts. The Korean government during November – December 1997 deposited foreign reserves into Korean commercial banks, so that "usable" reserves were much lower than true reserves (this example, as well as other Asian country responses to capital outflows with dwindling foreign reserves, is described in detail in Ito (2007a)). In response the IMF now requires disclosure of reserve holdings into specific categories of assets: foreign securities holdings, deposits to domestic banks, deposits to foreign banks, etc.

The Korean case points to the question of where foreign reserve assets should be held.[6] The IMF's Special Data Dissemination Standard (SDDS) requires that countries disclose the composition of international reserves by asset class (gold, SDRs, currency and deposits, securities, financial derivatives) as well as the location of reserves (deposits held in other national banks, BIS and IMF, deposits held in domestic and foreign commercial banks).[7] Likewise, countries subscribing to the SDDS are required to disclose information regarding reserve-related liabilities. We plan to include this detailed accounting information on reserve holdings as part of this project, along with the history of changing IMF data dissemination standards, and the current list of compliant countries.

Apart from what "counts" as reserves, and where they are held, during times of crisis

[6] Japan, along with a number of other countries, holds a portion of its official dollar deposits, which are counted as reserves, in domestic banks. The problem with this is that these deposits are not claims on a foreigner, unless commercial banks hold enough foreign assets themselves. When Japan puts together its BOP accounts it includes the increase in reserves as a financial outflow. At the same time it must remove that same amount from the outflows of its banks. But the banks may use the official dollar deposits to buy, for example, US Treasury bills. So the data show the Japanese official sector increasing dollar deposits and the U.S. thinks it sees the Japanese private sector buying or holding T-bills, while the Japanese BOP show a reduction in the private bank claims on the U.S.

[7] In economies in which extensive reserve assets are held outside of the central bank, supplementary information is required on the institutional sector of holdings of those reserve assets (only external claims actually owned by the monetary authorities can be classified as reserves assets).

countries may have incentives to over-state reserve stocks. During the various regional crises in the 1990s many emerging market countries either declined to provide timely reserve data, or valued assets inappropriately to show larger reserve holdings. As a consequence the rules of reserve asset valuation and disclosure were recently tightened by the IMF (these are documented in the IMF's Balance of Payments Manuel 6th edition (BPM6)) so that compliant countries only report assets they can use in a BOP crisis.

Outside of crisis periods, it is also the case that countries with large reserve stocks, including China, some Asian countries, and the Middle East countries, may have incentives to "understate" reserves, in an attempt to deflect criticism of mercantilist motives and excessive reserves. A number of these countries have begun to hold some of their assets in forms not classified as reserves under the BPM6 rules. The IMF is now trying to set down rules in order to get timely and complete reporting that captures these official non-reserve assets (which include, but are not limited to, sovereign wealth funds). We hope to take advantage of this new data collection effort and include these wider definitions of reserve assets in our analysis.

Finally, our project will examine the role of swap arrangements (FRB swaps during the recent crisis; CMIM in Asia) and how they relate to, or substitute for, reserves.

Implications for Policy

The project will have important implications for both emerging market economies (in Asia, Europe, and Latin America) and some OECD countries regarding the economic definition (which may be different from the IMF definition) of foreign reserves, the costs and benefits of holding foreign reserves, and the appropriate/sufficient (if not optimal) size of foreign reserves needed to avoid a currency crisis. Our hope is that this project will further our understanding of the role, definition, and economic rationale for foreign reserves, which will, in turn, allow us to assess whether reserves can reduce a country's vulnerability to global crises.

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