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International Reserves and Swap Lines in Times of Financial Distress: Overview and Interpretations

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Abstract

In this paper I review the use of precautionary measures aimed at mitigating emerging markets' exposure to fragility associated with financial integration. The discussion draws possible lessons from the ongoing global liquidity crisis. The fear of losing international reserves (IR) constrained most emerging markets more than the fear of floating. The fear of using IR during a crisis suggests that emerging markets (EMs) opt to revisit the gains from financial globalization. High levels of IR may be required for the self insurance offered by those reserves to be effective. Under such circumstances, countries may benefit by supplementing the hoarding of IR with Pigovian tax-cum-subsidy policies. These policies would reduce external borrowing, and would fund the marginal hoarding of IR. The fear of losing IR also suggests a greater demand for regional pooling arrangements and swap lines as well as possible new roles for international financial institutions (IFI).

JEL Classification: F15, F21, F32, F36, G15

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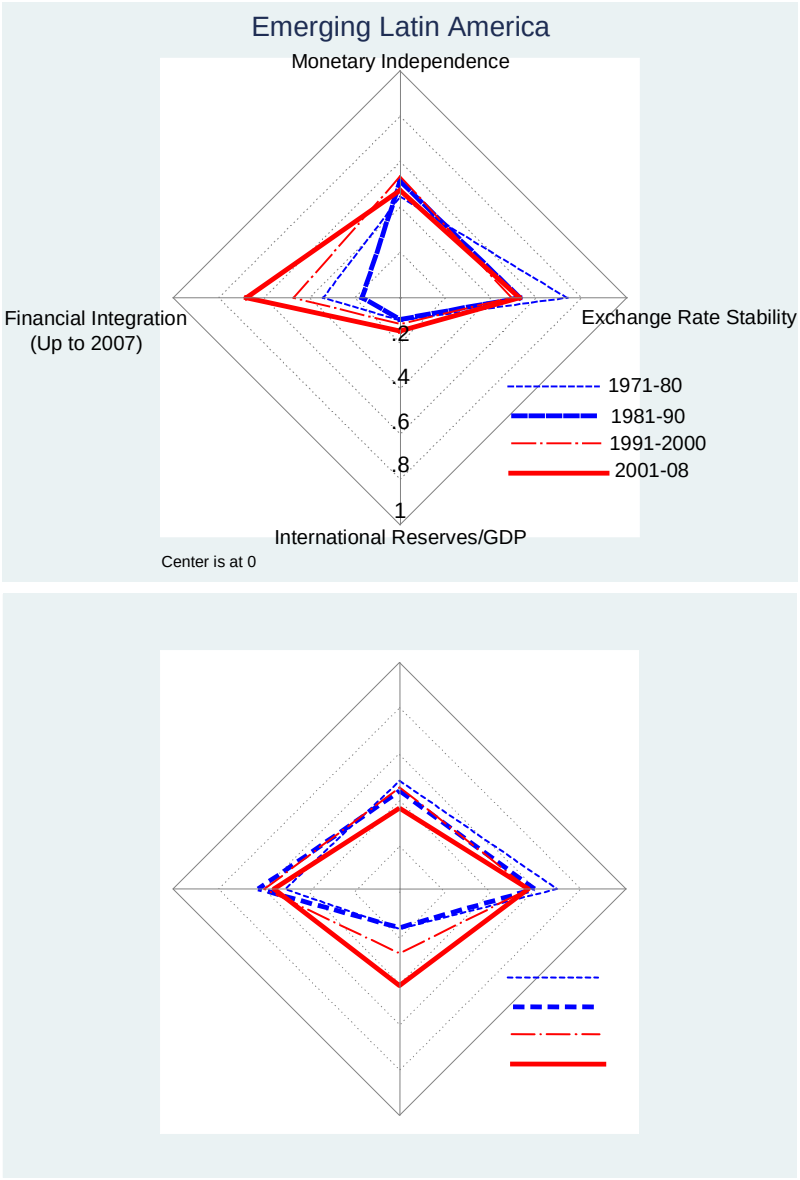
1. INTRODUCTION

In this paper I discuss the implications of the ongoing global liquidity crisis on developing countries' use of precautionary measures aimed at mitigating their exposure to financial crises. The global liquidity crisis raises questions about the degree to which large hoarding of international reserves (IR) suffices to deal with the financial exposure of emerging markets (EMs) in an efficient way. The crisis also renews the debate about the desirability of unfettered financial integration of developing countries. I provide an overview of this debate, and assess possible future options.

Over the last two decades, emerging countries have opted for increasing financial integration. Mundell-Fleming's "trilemma" implies that they must either forego exchange-rate stability (if they wish to preserve a degree of monetary independence) or forego monetary independence (if they wish to preserve exchange rate stability). Aizenman, Chinn, and Ito (2008) found that emerging countries have moved towards greater exchange-rate flexibility and deeper financial integration buffered with sizable reserve holdings. Both trends are more pronounced for the EMs than for the non-emerging developing countries. The data also points to differential trends among emerging Asia and emerging Latin America (LATAM). Figure 1 applies "Diamond charts" for emerging Asia and emerging LATAM, tracing the changing patterns of the trilemma configurations. Each of the charts shows the levels of the three trilemma policy goals and IR (as a ratio to GDP). The origin in the charts is normalized so as to represent zero monetary independence, pure float, zero international reserves, and financial autarky. The trilemma variables are normalized to a range of zero to one, where one corresponds to achieving the desired policy goal. A comparison of the regions reveals that emerging LATAM moved much more rapidly towards financial integration than emerging Asia. Emerging Asia opted to hoard more IR than emerging LATAM. Both blocks moved towards greater exchange rate flexibility. These trends have enabled them to retain a fair degree of monetary autonomy without hampering financial integration— a sort of "middle-ground Trilemma's configuration."

Figure 1: Regional Patterns of the Trilemma and IR Configurations in EMs[1]



Notes: "Emerging Asian Economies" include the People's Republic of China (PRC); Hong Kong, China; Indonesia; Republic of Korea (Korea); Malaysia; Philippines; Singapore; and Thailand.

"Emerging Latin America" includes Argentina, Brazil, Chile, Colombia, Ecuador, Jamaica, Mexico, Peru, Trinidad and Tobago, and Venezuela.

Source: Aizenman, Chinn, and Ito (2009).

[1] Monetary Independence is defined as: MI = $0.5[1-corr(i_i, i_j)]$, where i refers to home countries and j to the base country. Exchange Rate Stability (ERS) is defined as $ERS = 0.01/[0.01 + stdev(\Delta(\log(exch_rate))]$. II also apply a threshold to the exchange rate movement as has been done in the literature. Financial Openness/Integration is the Chinn and Ito index, which is based on information regarding restrictions in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) (see Aizenman, Chinn, and Ito [2008] for further details).

Indeed, the response of many EMs to the current crisis fits the "middle ground" trend—allowing real exchange rate depreciation mitigated by selling IR to take the first brunt of the adjustment. The absence of deeper adjustment in EMs (so far) as compared to the severe impact of the crisis in industrialized economies, testifies to the degree to which proper management of the trilemma's middle ground enables a softer landing in the aftermath of major external events. The combination of hoarding large stockpiles of IR and the growing exchange rate flexibility facilitated adjustment to deleveraging pressure induced by the crisis.

In Section 1 I outline the debate about desirable adjustment of EMs during the first phase of the on-going crisis. I start by discussing the experience of the Republic of Korea (hereafter Korea)—a prime example of a country that opted for deeper financial integration in aftermath of the 1997-8 crisis, buffered with large hoarding of IR. The limited ability of the large initial stockpile of Korean IR (about US$250 billion) to stabilize domestic financial markets in the aftermath of the current crisis, renewed discussion about the desirability of financial integration. Provision of self insurance to deal with growing exposure to sudden stop and deleveraging crises may require large and perhaps inefficient levels of IR hoarding. Looking at the experience of all EMs, their adjustments during the current crisis reveal a switch from "fear of floating" during 1970s–1980s toward "fear of losing IR." Intriguingly, only half of the EMs used their IR during first phase of the current crisis as a shock absorber, depleting not more than one-third of their initial IR. The other half of the EMs opted to adjust to the crisis mostly through exchange rate depreciations. I end the section with an overview of the use of provisional swap lines during the crisis.

In Section 2 I reflect upon and assess future policy options. A way to alleviate sudden stops and deleveraging pressure may be a Pigovian tax-cum-subsidy scheme. Specifically, I consider an economy where domestic entrepreneurs borrow externally to fund long-term projects, exposing the economy to balance sheet fragility. Premature liquidation of long-term investment is associated with deadweight loses due to fire-sale congestion externalities. Under such circumstances, competitive laissez-faire equilibrium is inefficient. Each entrepreneur ignores the marginal impact of his borrowing on increasing expected costs of a deleveraging crisis, and the impact of higher hoarding of IR on reducing the expected cost of a crisis. The fire-sale externality reduces the marginal social benefit of borrowing below the private benefit, and increases the marginal social benefit of hoarding IR above the private one. The optimal policy calls for taxing external borrowing, and subsidizing hoarding reserves. If such a tax-cum-subsidy policy is implemented before foreign capital flows in, then the policy would limit exposure of the recipient country to possible deleveraging. The scheme induces domestic agents to internalize the externality associated with external borrowing and deleveraging crisis. A virtue of the tax-cum-subsidy scheme is that the optimal borrowing tax funds the optimal subsidy on hoarding IR. This scheme may mitigate concerns about costly hoarding of large stockpiles of IR needed to self-insure against a deleveraging crisis.

In Section 3 I discuss the case for deepening regional pooling arrangements, and the possibility of the emergence of a yuan (CNY) anchored currency block in the future.

1.1 IR as Self Insurance During a Crisis: the Crisis Experience of EMs

The experience of Korea during the last fifteen years outlines the contours of the debate about self insurance by means of hoarding reserves. To recall, following the 1997–8 East Asian crisis, Korea embraced financial integration, buffered with large hoarding of IR. The large stockpiles of IR provided Korean authorities with precautionary savings to cushion against sudden stops and deleveraging. Figure 2 overviews these trends (1992–2008), tracing the short and long-run external debt to gross domestic product (GDP) ratio, share of

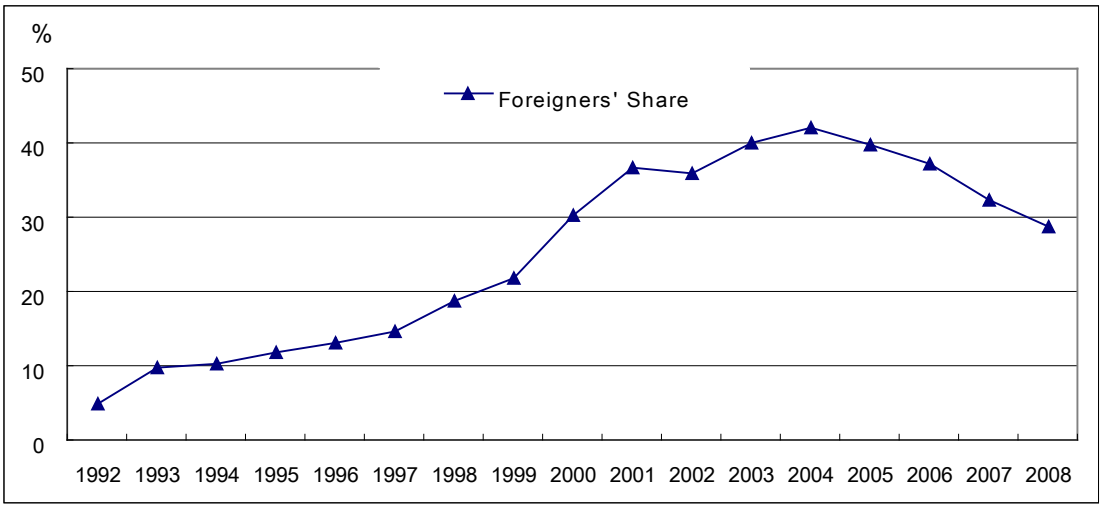
foreign ownership of stock market, and IR to GDP ratio in Korea. The financial integration led to rapid increase in the foreign ownership share of the Korean stock market, from less than 5% in 1992 to more than 40% in 2004. This was also a time when the ratio of the valuation of Korean stocks held by foreigners to Korean GDP reached about 30%. While IR:GDP hovered around 5% before the 1997–8 crisis, the financial upheaval triggered by the crisis induced major change in the hoarding of IR. IR accounted for more than 25% of the GDP by 2004. By that time, Korea's IR exceeded the short term external debt by more than 2.5 times, and in 2004 Korean's IR exceeded its total external debt.[2]

[2] I am grateful to Yeonho Lee for sharing the data. See Aizenman, Lee, and Rhee (2007), where I show that the 1997–8 crisis led to structural changes in the hoarding of Korea's international reserves—the Korean monetary authority gives much greater attention to a broader notion of "hot money," inclusive of short-term debt and foreigners' shareholding.

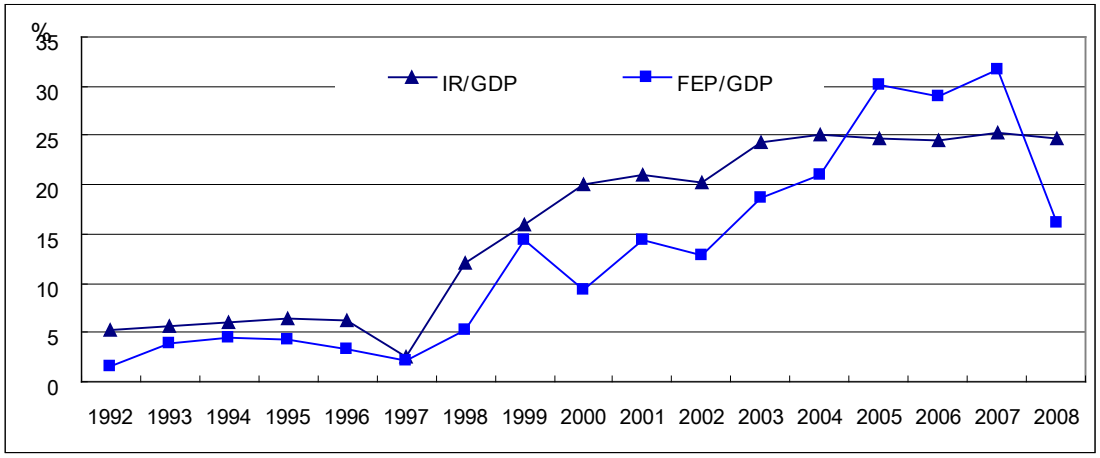
Figure 2: Korea 1994–2008

Korean Experience, IR:GDP, External Debt:GDP, and Foreigners' Equity:GDP

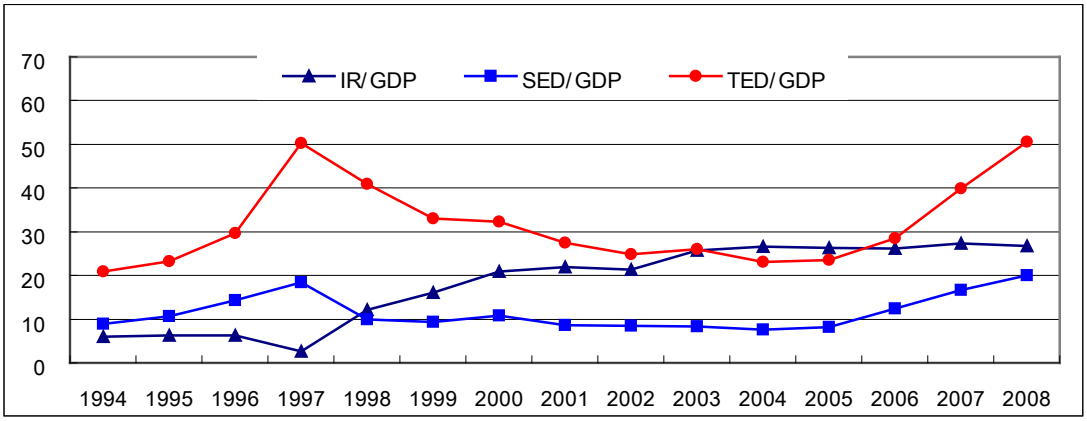
(a) Foreigner's Share of Korean's Equity Market



(b) IR:GDP and Foreigners' Equity Position:GDP



(c) IR:GDP and External Debt:GDP



Notes: FEP = foreigners' equity position based on market value of foreigners' shareholdings.

SED = short-term external debt, TED = total external debt.

Source: Aizenman (2009).

Less than ten years after the 1997–8 East Asian crisis, by conventional yardsticks Korea's IR:GDP ratio seemed more than adequate, with IR that exceeded short-term external debt and allowed financing of several quarters of imports. Indeed, observers raised questions

about the growing costs of stockpiling these reserves, asserting that their level in EMs, including Korea, potentially exceeded the social optimum (see Jeanne and Ranciere [2005]). Yet, the onset of the current global liquidity crisis and the ensued deleveraging changed the above-mentioned perception. During the first stage of the 2008–9 global liquidity crisis, Korea's reserves dropped by roughly US$60 billion in half a year, a decline of about 25%. Indeed, reserves were key to the bailout package the Korean government unveiled in second half of 2008. The principal element of the package was a US$100 billion, three-year government guarantee for banks' debt raised abroad before July 2009. This sum was more than sufficient to cover Korean banks' foreign debt maturing by June 2009. The latter has been estimated by the Korean Ministry of Strategy and Finance to be about US$80 billion. Yet, observes noted that, despite the large hoarding of IR used to finance the bailout package, market concerns were not abated.

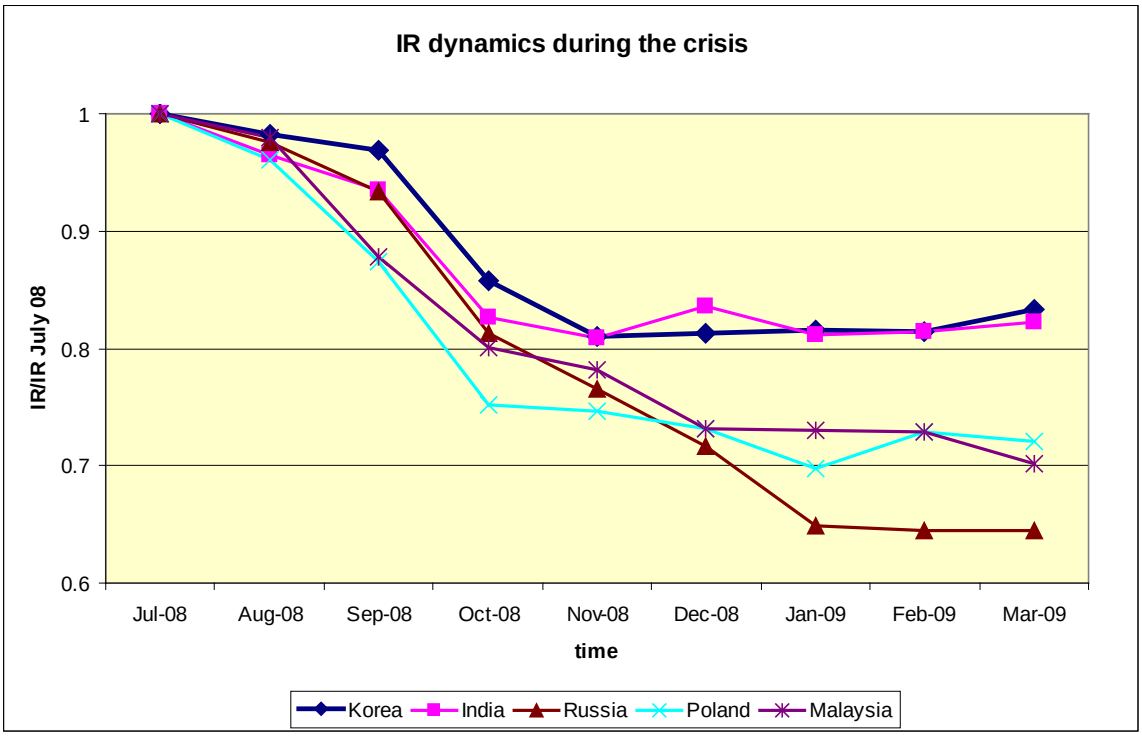
> "Similar guarantees had failed to allay fears of financial meltdown at the beginning of the Asian crisis in 1997 and they failed again. As in 1997, the market reactions were indifferent. Only when Korea secured a swap line amounting to $30 billion from the Fed on October 30 the foreign exchange market settled down somewhat, but not very long. The foreign exchange rate shot up to 1,509 won per dollar three weeks after the swap had been announced, which was apparently not enough to remove uncertainties surrounding Korea's ability to service its foreign debt. Korea also managed to arrange won-local currency swaps with the central banks of both China and Japan, each amounting to an equivalent of $30 billion on December 13. Only when it was made clear that the Fed would renew the swap agreement, foreign investors' confidence in the Korean economy improved and stability in the foreign exchange market returned toward the end of the first quarter of 2009."
>
> Park (2009: p.16).

Looking beyond Korea, other EMs cushioned their adjustment to the global financial crisis by a combination of exchange rate depreciation and partial depletion of their IR.[3] Yet, after the first phase of adjustment, central banks have been reluctant to further draw down their reserves. This reluctance possibly reflected the fear that further depletion of IR may signal growing vulnerability—a potential adverse externality arising from "keeping up with the Joneses' IR". Figure 3 portrays the IR dynamics during the first year of crisis in Korea, India, Russia, Poland and Malaysia, July 08-March 09, reporting the ratio of IR (US dollar) relative to their level in July 08. The inverted S curve is consistent with the "fear of losing IR." Central banks used a share of their IR in first quarters of the crisis to finance deleveraging pressures, thereby mitigating currency depreciation. Yet, after losing not more than third of their initial reserves, countries became more averse to further drawing down their stocks of IR. Choice of the speed of drawing-down accumulated IR is a delicate one. It hinges on the anticipated future course of the global economy, the domestic adjustment capacity and the degree of financial integration of the country in question. The trade-offs for a country like India differs from those of Chile. India is less integrated with the global financial system and Indian government has less room for fiscal adjustment due to its significant and growing fiscal deficits. Brazil, Chile and other EMs have preferred to adjust to the current crisis mostly through exchange rate depreciation. It is possible that the latter group of EMs have been saving their IRs for leaner years to self-insure against potential prolonged period of weakness in their terms of trade.

[3] The Bank of Russia adopted a bailout package similar to the Korean one, dealing with domestic banks' exposure. The Russian package was implemented in the context of intense involvement of the Russian state in managing its vast natural resources, including a willingness to impose what amounted to de facto capital controls. Russia's large stock of reserves before the crisis (exceeding US$600 billion) had prevented a complete collapse of its banking system.

Figure 3: IR Dynamics During the Crisis Window:

India, Korea, Poland, Malaysia, and Russia, August 2008 to March 2009



Source: Aizenman (2009).

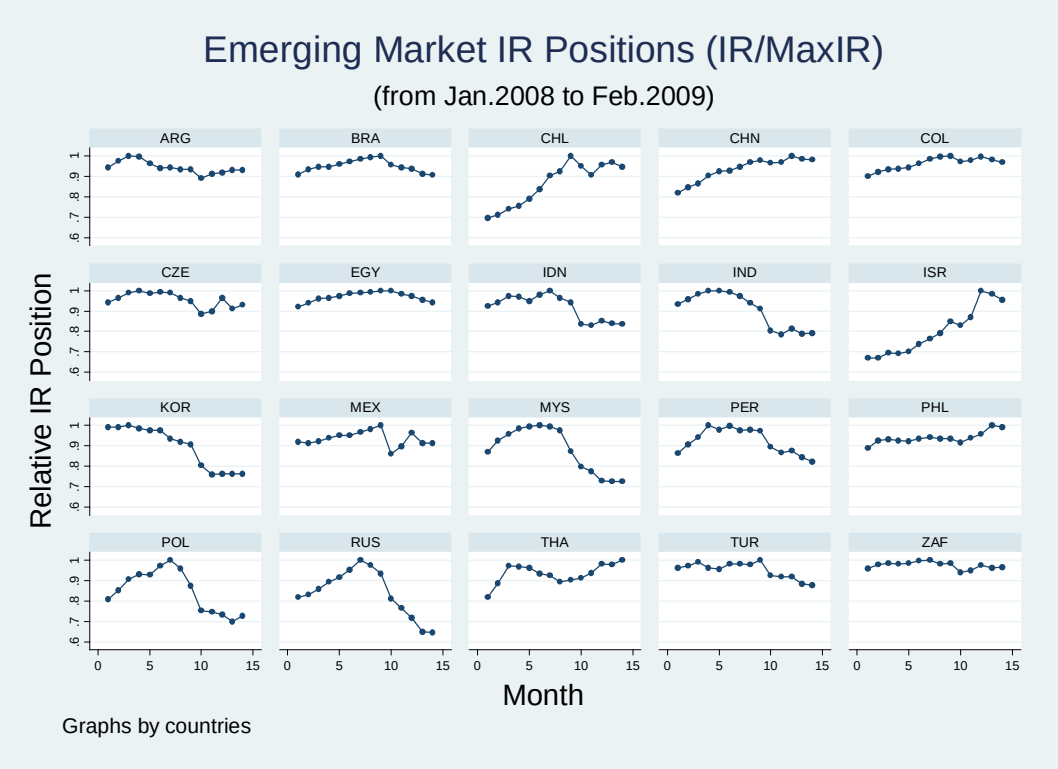
Further insight about the "fear of losing IR" can be gained by looking at the differential patterns of using IR during the crisis across all EMs. To recall, investigating the patterns of exchange rates, interest rates, and IR during 1970–1999, Calvo and Reinhart (2002) inferred the prevalence of the "fear of floating." Countries that claim they allow their exchange rate to float, mostly do not. Instead, the authorities frequently attempt to stabilize the exchange rate through direct intervention in foreign exchange market and through open market operations. The fear of floating may also provide an interpretation for the massive hoarding of IR during the last ten years by EMs and other developing countries. Alternative explanations of IR hoarding however include the precautionary and/or mercantilist motives (Aizenman and Lee [2007, 2008]), as well as the reincarnation of the Bretton Woods system (Dooley et al. [2009]). The present crisis imposes daunting challenges to EMs. The "flight to quality," deleveraging, and the rapid reduction of international trade affected EMs from mid-2008, thereby testing their adjustment capabilities. While in several earlier crises episodes, EMs were forced to adjust mostly through a rapid exchange rate depreciation, the sizable hoarding of IR during the late 1990s and early 2000s provided the same countries with a richer menu of choices.

Aizenman and Yi (2009) looked at the degree to which the large hoarding of IR "paid off," during the current crisis in terms of allowing EMs to adjust by drawing down their IR. Their study follows the adjustment of 21 EMs during the window of the crisis and reveals a mixed and complex picture.[4] Figure 4 presents the countries' monthly IR measured relative to the highest IR level from January 2008 until February 2009. Regression analysis shows that EMs with large primary commodity exports, especially oil exports, tended to experience large

[4] The EMs' sample is composed of the countries listed in the FTSE (The Financial Times and Stock Exchange) and MSCI (Morgan Stanley Capital International) emerging market indexes. It did not include Singapore and Hong Kong, China because of their special economic structure, specializing in entrepôt services. In addition, due to the dramatic effect of the IMF's aid on Hungary's reserves changes, it was excluded from the sample (Hungary's IR had increased nearly by half in the two months after the IMF's stabilization package). The study also excluded Morocco and Pakistan due to unavailability of the relevant data.

IR losses in the current global crisis. Countries with a medium level of financial openness and a large short-term external debt ratio also on average lost more of their initial IR holdings. Most of the countries that suffered large IR losses began depleting their IR during the second half of 2008, and many of them still have not recovered their precrisis level of IR holdings. Intriguingly, only about half of the EMs relied on significant depletion of their IR as part of the adjustment mechanism. The study proceeded by dividing the sample of EMs into two groups: countries that have sizable IR losses and countries that have either not lost IR or quickly recovered from their IR losses. The first group is defined as countries that lost at least 10% of their IR during the period of July 2008 to February 2009 relative to their highest IR level. Among the 21 EMs, nine countries belong to the first group.[5]

Figure 4: IR: Maximum IR, Jan. 2008 to Feb. 2009, Identical Scale for all Countries



Note: Country abbreviations are Argentina (ARG), Brazil (BRA), Chile (CHL), The People's Republic of China (PRC), Colombia (COL), Czech Republic (CZE), Egypt (EGY), India (IDN), Indonesia (IND), Israel (ISR), Malaysia (MYS), Mexico (MEX), Peru (PER), Philippines (PHL), Poland (POL), Russia (RUS), Korea (KOR), Thailand (THA), Turkey (TUR), South Africa (ZAF).

Source: Aizenman and Sun (2009).

To gain further insight, the study compared precrisis demand for IR:GDP of countries that experienced sizable depletion of their IR, to that of countries that didn't, and found different patterns between the two groups. Trade related factors (trade openness, primary goods export ratio, especially large oil exports) seem to be more significant in accounting for the precrisis IR:GDP level of countries that experienced a sizable depletion of their IR in the first phase of the crisis. These findings suggest that countries that internalized their large exposure to trade shocks before the crisis used their IR as a buffer stock in the first phase of the crisis. Their reserves losses followed an inverted logistical curve. After a rapid initial depletion of reverses, within seven months these countries reached a markedly declining rate of IR depletion, losing not more than one-third of their precrisis IR. In contrast, for countries that refrained from a sizable depletion of their IR during the first crisis phase, financial factors account more than trade factors in explaining their initial level of IR:GDP.

[5] Countries facing large losses in stocks of IR include Brazil (BRA), India (IND), Indonesia (IDN), Malaysia (MYS), Korea (KOR), Peru (PER), Poland (POL), Russia (RUS), and Turkey (TUR).

The patterns of using reserves by the first group, and refraining from using reserves by the second group, are consistent with the ”fear of losing reserves” Such a fear may reflect a country's concern that dwindling IR may signal greater vulnerability, triggering a run on its remaining reserves. This fear is probably related to a country's apprehension that, as the duration of the crisis in unknown, depleting IR too fast may be suboptimal . Rapid depletion exposes the country to the risk of abrupt adjustment in the event that the crisis turns out to be deeper and more enduring than its initial intensity.

These findings suggest that there exists a clear structural difference in the precrisis demand for IR between EMs that were willing versus those that were unwilling to spend a sizable share of their IR during the first phase of the 2008–9 crisis. Trade related factors are more significant in accounting for the precrisis IR level of the countries that experienced a sizable depletion of their IR in the first phase of the crisis, in line with the buffer stock interpretation of the demand for IR. Countries that depleted their reserves in the first phase of the crisis, refrained from drawing their IR below one-third of the precrisis level. The majority of these EMs used less than a one-fourth of their pre crisis IR. Countries whose pre crisis demand for IR was more sensitive to financial factors, refrained from using IR altogether, preferring to adjust through larger depreciations. My results suggest that the adjustment of EMs during the ongoing global liquidity crisis has been constrained more by their fear of losing IR than by their fear of floating.

These observations raise new questions. More work is needed to understand why countries differ in the weight assigned to financial versus commercial factors, in accounting for their demand for IR. Intriguingly, the average exchange rate depreciation rate for the period from August 2008 to February 2009 was about 30% in both EMs that depleted and those that refrained from depleting their IR. A possible explanation could be that the shocks affecting EMs that opted to deplete their IR, were larger than the shocks impacting EMs that refrained from using their IR. Testing this hypothesis requires more data, not available presently, including information on the deleveraging pressures and balance sheet positions during the crisis. Moreover, this hypothesis, if valid, implies that countries prefer to adjust to bad shocks first through exchange rate depreciation, and then supplementing it with partial depletion of their IR when the shocks are deemed to be too large to be dealt only with exchange rate adjustments.

The fear of using IR also suggests that some countries opt to revisit the gains from financial globalization. Earlier research suggests that EMs that increased their financial integration during the 1990s to the mid-2000s, hoarded IR due to precautionary motives, as self-insurance against sudden stops and deleveraging crises. Yet, the crisis suggests that for this self insurance to work, it may require levels of IR comparable to a country's external financial gross exposure (see Park [2009] analyzing Korea's challenges during the crisis). In these circumstances, countries may benefit by supplementing hoarding with Pigovian tax-cum-subsidy policies (Aizenman [2009]). A possible interpretation for the fear of losing IR is the “keeping with the Joneses' IR” motive—the apprehension of a country that reduction of its IR:GDP ratio below the average of its reference group, might increase its vulnerability to deleveraging and sudden stops (see Cheung and Qian [2009] for evidence on “keeping up with the Joneses' IR” in East Asia). These factors suggest a greater demand for regional pooling arrangements and swap lines (see Rajan et al. [2005]), as well as possible new roles for IFI (World Bank, the International Monetary Fund [IMF], etc.). A better understanding of these issues is left for future research.

1.2 The Crisis and the Provision of Swap Lines

An example of alternative means of adjustment is the use of swap lines. A most intriguing development took place at the end of October 2008, when the US Federal Reserve (FED), the central banks of Brazil, Mexico, Korea, and the Monetary Authority of Singapore announced the establishment of temporary reciprocal currency arrangements or swap-lines,

worth US$ 30 Billion each. These facilities were designed to help improve liquidity conditions in global financial markets and to mitigate the spread of difficulties in obtaining U.S. dollar funding in fundamentally sound and well managed economies. The practical meaning of it was the unprecedented provision of US$120 billion in swap lines to four EMs by the US FED. It provided welcome relief and also sent an important signal. In the case of Korea, observers including Park (2009) credited this development with stopping the run on Korean reserves. While the FED extended such swaps lines to numerous Organisation for Economic Co-operation and Development (OECD) countries, these arrangements were extended by the FED to only four emerging markets.[6] This raises questions regarding the selection criteria behind the "chosen four EMs," and the degree to which these selective swap-lines accomplished the goals spelled out in the FED's press release.

While final evaluation of the impact of these swap-lines requires much more data and a longer time horizon, Aizenman and Pasricha (2009) found that the exposure of US banks to EMs is the most important selection criterion. Inclusion of US trade exposure, capital account openness, and credit history of countries, along with the US banks' exposure in the estimations, provides statistically accurate interpretation of the selected four swap-lines. Their result is consistent with a Diamond and Dybvig (1983) model of an open economy. In circumstances of unanticipated deleveraging, emergency swap-lines prevent or mitigate costly liquidation today, thereby allowing investment projects to reach maturity. Emergency swap-lines may provide valuable services in circumstances where the realized liquidity shock turns out to be much larger than the one expected ex-ante. The impetus for "a larger than anticipated" liquidity shock may come from "financial contagion," or from an adverse real shock reducing the expected productivity of the investment. The first scenario is exemplified by deleveraging shocks due to a credit crunch and "flight to quality," affecting creditors that co-financed investment in EMs. The second scenario may correspond to news about unfolding deep global recession—a recession that may cause further deterioration of EMs' terms of trade. The recent challenges facing various EMs reflect a mixture of both scenarios. Swap-lines may also provide valuable positive option value. By averting massive liquidation today, if things improve by end of the investment gestation period, the higher surplus would support higher profits and will reduce the ultimate cost of the capital flight. This in turn would possibly enhance the welfare of both the source and the recipient countries (i.e., the US and the four EMs).

Their analysis suggests that swap-lines had relatively large short-run impact on the exchange rates of the selected EMs, but much smaller effect on the spreads (measured relative to that of other EMs that were not the recipients of swap-lines). Specifically, non-swap countries experiences an average depreciation of 0.15% on the day after the swap announcement, whereas swap countries witnessed their exchange rate appreciate, on average, by about 4%. Yet, all the swap countries faced a subsequent depreciation of their exchange rate to a level lower than the pre-swap rate, thereby calling into question the long-run impact of the arrangements. A note of caution is in order here—as the selective swap-lines targeted countries with large US exposure, it potentially prevented even a deeper exchange rate depreciation of the four, as apparently was the case in Korea. Furthermore, only with the benefit of time would one be able to appreciate the fuller welfare implications of these arrangements.

The limited efficacy of the large stockpile of IR in preventing a run on reserves of countries such as Korea during a crisis calls into question the desirability of unfettered capital mobility.

[6] The ECB was a minor player in the provision of credit lines during the first quarters of the crisis. It provided Hungary and Poland with repo lines (Euros in exchange for eligible collateral), of €5 and €10 Billion, respectively. In contrast, the Bank Of China provided significant CNY swap lines to its trading partners—CNY70, 200, 100, 180, 80 Billions to Argentina; Hong Kong, China; Indonesia; Korea; and Malaysia, respectively (I am grateful to Shahin Vallee for providing the information). While useful, it's not clear that the CNY swap lines sufficed to deal with the US dollar shortages of some of these countries in the peak of the crisis.

While hoarding IR prevented a replay of the 1997–8 crisis dynamics in Korea, the large depreciation of the Korean won renewed concerns about the residual exposure to balance sheet effects associated with depreciation. At the limit, eliminating the balance sheet exposure may require hoarding dollar liquidity per dollar external liability, practically nullifying the gains from financial integration (Park [2009]). I turn now to evaluate possible future developments of policies and financial mechanisms to deal with the concerns discussed above.

2. IR AT TIMES OF GLOBAL FINANCIAL DISTRESS: REFLECTIONS AND ASSESSMENT OF FUTURE OPTIONS

A constructive way to evaluate the role of IR during the crisis is to apply the perspective of insurance mitigating exposure to risky activities. The self insurance benefits associated with IR can be understood using two benchmarks: no self-insurance, and full self-insurance. To illustrate, Korea in the early 1990s refrained from hoarding IR for self insurance against sudden stops. Korea's IR:GDP ratio was at a low level, of about 5%, comparable of the level of OECD countries at that time. This reflected the presumption that Korea was not exposed to sudden stop events, both by virtue of its limited financial integration, and its history of high growth and an impressive record of adjustments to adverse shocks. The 1997–8 crisis however vividly illustrated that Korea and all emerging markets embarking on financial integration were exposed to sudden stop events. The Asian crisis induced a regime switch wherein IR:GDP ratio in Korea more than quadrupled in less that ten years, reducing thereby the expected costs of possible sudden stops.

With most insurance schemes agents rarely get full insurance against the relevant hazard because a typical insurance is associated with loading factors, deductibles, moral hazard, and other such constraining features. Thus full insurance is frequently too costly to attain, and rarely observed. This applies to personal hazard like health and car insurance, as well as to the macro self insurance services provided by hoarding IR. Thus with partial insurance one should expect that the insurance would mitigate but would not eliminate the adverse effects of the hazardous event. In the context of financial integration, fully insuring against deleveraging may entail excessively costly hoarding. At the limit, the portfolio investment of foreign agents and the external borrowing of domestic agents should be matched by equivalent level of international reserves. Such a scheme implies that the country is fully insured at too high a cost, as pointed out by Park (2009). Yet, this argument does not negate the beneficial effects of self insurance, as the alternative of no self insurance would be too costly (see the costs of the East Asian crisis). Thus, the question facing the central bank is to find the optimal level of self insurance.

The theory of optimal insurance suggests that with hazards impacted by agents' behavior, optimality calls for a mixture of partial insurance and preventive methods reducing the frequency and intensity of the calamity (installing fire alarm and external lights in a house, driving a car at a lower speed, equipping a car with air-bags, etc.). This logic applies equally well to emerging markets' exposure to sudden stops and deleveraging shocks wherein a country may supplement hoarding IR with policies that would reduce its exposure to sudden stop events. As was pointed out by Rodrik (2006), such policies may include proactive steps to reduce exposure to external debt. Similarly, deleveraging foreign equity position in an emerging market tends to induce real depreciation, increasing thereby the country's vulnerability to a crisis due to worsening balance sheet exposure.

Aizenman (2009) outlines the case of supplementing hoarding IR with a Pigovian tax-cum-subsidy scheme. The logic of the scheme follows from the negative fire-sale externalities associated with large inflows of capital. Specifically, Eichengreen, Hausmann, and Panizza (2003), and the related balance sheet literature showed that external debt associated with

maturity and currency mismatches increases the downside risk of costly sudden stops crises. Greater balance sheet exposure frequently entails higher real depreciation triggered by deleveraging, inducing greater distress of the domestic banking system, and ultimately higher expected forgone output costs of a sudden stop and deleveraging crisis. If most foreign and domestic agents are price takers, each ignores its marginal impact on increasing the expected cost of such a crisis. This in turn entails an externality akin to "congestion", calling for a Pigovian tax-cum-subsidy scheme.

I construct a minimal model to explain the optimal self insurance offered by international reserves in mitigating the output effects of liquidity shocks. The structure of the model is akin to Diamond and Dybvig (1983)—investment in a long-term project should be undertaken prior to the realization of liquidity shocks.[7] Hence, the liquidity shock may force costly liquidation of the earlier investment, reducing second period output. As our focus is on developing countries, I assume that all financial intermediation is done by banks, relying on a debt contract. I simplify further by assuming that there is no separation between the bank and the entrepreneur—the entrepreneur is the bank owner, using it to finance the investment. At the beginning of period 1 entrepreneurs fund investment by external borrowing D to finance planned second period capital, $K_{2,p}$, and banks' reserves, R; $K_{2,p} = D - R$. At the end of period one, after the commitment of investment capital, a deleveraging liquidity shock Z materializes. A fraction *z* of foreign lenders demands their deposits back, Z = *z*D. Assuming away sovereign risk and bankruptcy constraints, the deleveraging shock is first met by selling reserves. Any excess of the liquidity shock zD above reserves R is met by pre-mature costly liquidation of $MAX\left\{0, Z-R\right\}$. The liquidation reduces the actual second period capital from $K_{2,p}$ to K_2, at a rate that depends on the adjustment cost, θ: $K_2 = K_{2,p} - (1+\theta)MAX\left\{Z-R,\ 0\right\}$. Premature liquidation implies that the impatient depositors get their money back without any interest payment. Only patient depositors are paid interest rate ρ upon the realization of the investment. Final output is produced at period 2. The second period output finances the repayment of outstanding debt left to maturity, $D(1-z)(1+\rho)$. Unused reserves hoarded in period 1, $MAX\left\{R-Z,\ 0\right\}$, provide the bank with a risk free return in the second period, $(1+r_f)MAX\left\{R-Z,\ 0\right\}$.

In this economy, bank intermediation exposes the economy to the risk of sudden stop and a deleveraging crisis that may induce costly premature liquidation of tangible investment. Hoarding IR mitigates this risk. I show that the optimal allocation involves a tax on external borrowing, and a subsidy on hoarding IR. The logic of this Pigovian tax-cum-subsidy scheme follows from the negative externalities associated with large inflows of capital. If reserves are not plentiful, a deleveraging crisis induces a large number of banks to liquidate investments at the same time. This would depress the selling price of tangible capital, increasing the cost of deleveraging—the fire-sale effect. Large deleveraging in emerging markets increases the demand for foreign currency, needed in order to meet the deleveraging. If foreign currency reserves are limited, the deleveraging pressure would bid up the price of foreign currency, requiring each bank to liquidate more of its investment to fund a given deleveraging pressure. While each bank takes potential fire-sale prices as given, as a group, they induce the fire sale prices. This leads to a fire-sale externality, akin to congestion (see Krugman

[7] Our model follows the tradition of Bryant (1980) or Diamond and Dybvig (1993) in that the source of liquidity shock lies with the lender, rather than the borrower (Holmstrom and Tirole 1998). However, our model assumes away the market equilibrium among lenders (be it the risk of runs or the difficulty of the decentralized provision of liquidity). Abstracting from the question whether market-based liquidity insurance is available, I focus on the implication of large adjustment cost—including but not restricted to the liquidation cost—on the demand for reserves as self insurance. In a similar vein, no distinction is made between the private sector and the monetary authorities which maintain the stock of international reserves.

[2000] on the experience of Korea in the 1997-8 crisis.)[8] I show that the fire-sale externality reduces the marginal social benefit of borrowing below the private benefit, and increases the marginal social benefit of hoarding IR above the private one. The optimal tax-cum-subsidy scheme reduces the distorted activity (external borrowing), inducing the borrowers to co-finance the precautionary hoarding of IR by means of the borrowing tax. Such a scheme may mitigate some of the recent concerns dealing with the costs of hoarding and using IR for self insurance purposes.

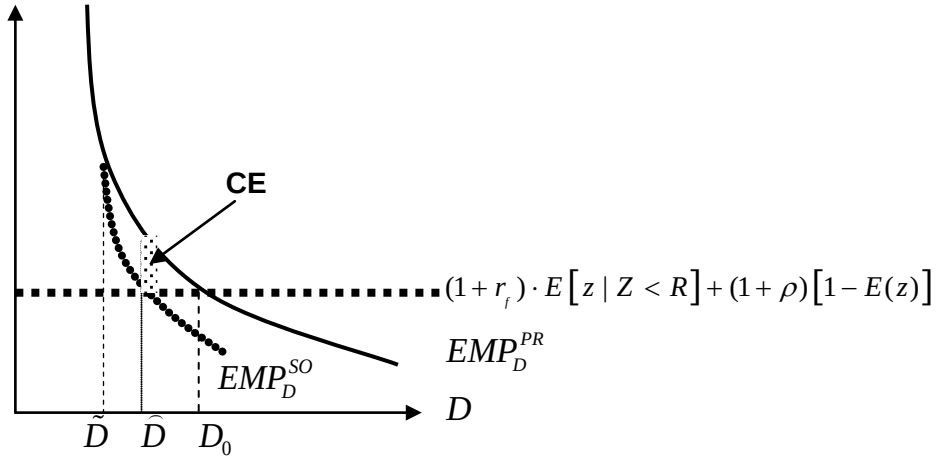
Figure 5 summarizes this discussion. It plots the expected marginal productivity of investment funded by external borrowing, drawn for a given level of international reserves. Curve EMP_D^{PR} corresponds to the conditions facing the atomistic entrepreneur, in the absence of borrowing taxes. The debt threshold level $\tilde{D}$ is the lowest external debt that induces liquidation [defined by $\tilde{D} = IR/\tau$]. A further increase in external debt increases the expected cost of liquidation. In the absence of tax-subsidy policies, external borrowing is given by D_0. Curve EMP_D^{SO} is the expected social marginal benefit of borrowed funds. It coincides with EMP_D^{PR} as long as the probability of costly liquidation is zero (for $D < \tilde{D}$). For $\tilde{D} < D$, the planner's curve EMP_D^{SO} is below the entrepreneur's curve ($EMP_D^{PR} > EMP_D^{SO}$), because it takes into account the negative fire-sale externality associated with marginal borrowing. For the given initial IR, the optimal external borrowing is $\hat{D}$, well below D_0. The fire sale externality is given by the dotted line, *CE*. The optimal borrowing tax is defined by that externality, shifting curve EMP_D^{PR} downwards. Note that Figure 5 is a partial equilibrium treatment, drawn for a given level of international reserves. A similar figure can be drawn for the bank's and the planner's demands for IR. In comparison to the initial, no borrowing tax equilibrium, the impact of policies is to reduce the distorted activity [external borrowing], co-financing the precautionary hoarding of international reserves by means of the borrowing tax.[9] [10]

[8] Bhattacharya and Gale (1987) investigated this externality in banking, as did Caballero and Krishnamurthy (2004) in international finance.

[9] See Levy Yeyati (2008) for the moral hazard challenge facing the central bank in a dollarized economy.

[10] The design of the Federal Deposit Insurance Corporation (FDIC) deposit insurance scheme in the US may be viewed as generating similar outcomes as the tax-cum-subsidy scheme outlined in this paper. The FDIC charges insurance premiums on bank deposits at a rate that ideally should reflect the riskiness of banks' investments. The insurance premium is akin to a tax on banks' borrowing. The provision of insurance by the FDIC acts in ways similar to subsidizing hoarding liquid resources to provide self insurance.

Figure 5: Sudden Stop and External Borrowing: the Case of Fire-sale Congestion Externality and Optimal External Borrowing Tax



Source: Aizenman (2009).

3. THE POTENTIAL GAINS FROM REGIONAL POOLING ARRANGEMENTS: THE EMERGENCE OF A CNY ANCHORED BLOCK?[11]

A frequent concern has been the growing costs of investing reserves in low yielding assets, thereby exposing the countries to possible losses (see Park [2007]). A less benign interpretation of these trends has been that the growing current account surpluses in East Asia, and current account deficits in the US may lead to instability, requiring adjustment down the road. The adjustment took the form of a hard landing, more specifically a global financial and economic crisis rooted in the US subprime crisis. The onset of the crisis led to various unanticipated consequences such as the initial appreciation of dollar due to the apparent flight to quality, and the massive proliferation of swap-lines between the US Fed and other central banks as well as innovative regional swaps and sharing IR arrangements in East Asia.

Some observers view the crisis as a transitory shock that would not bring about the end of the "dollar standard" or the Bretton Woods II system. However, others view the crisis as caused by the failure of the informal "dollar-standard" to deliver the purported benefit of greater global stability.[12] Accordingly, tensions in the global system imply the fragility of the "dollar-standard." The stability of the dollar standard ultimately rests on the willingness of the US to refrain from abusing its "privileged position." Attaining this stability requires low inflation in the US, a stable US real exchange rate, as well as stability of financial intermediation in the US. Macroeconomic and regulatory policy in the US over the last ten years has raised serious questions about the ability of the US to deliver these outcomes. In addition, the continued rapid growth of Asian emerging markets has reduced the world GDP share of the US with a matching increase in Asian world GDP share. This has raised questions about the sustainability and desirability of the "dollar standard" over time. The crisis also illustrated that the "superior intermediation services provided by the US" has been

[11] This section overviews the discussion in Aizenman, Jinjarak, and Park (2009).

[12] See McKinnon (2007) for an upbeat view of the "dollar standard," and Dooley et al. (2009) for Bretton Woods II.

overstated. All these factors are reflected in the weakening trend of the dollar against the euro and other "hard currencies" during the last 10 years.

The emergence of deeper economic cooperation within the Asian region, and the solid growth performance of the People's Republic of China (PRC) and India may weaken the precautionary motive for hoarding dollar reserves in Asia. Hoarding dollar reserves may be partially substituted by deeper regional swap-lines, innovative IR pooling arrangements, diversification of the currency composition of precautionary savings away from US dollar to other currencies, and redirection of more hard currency surpluses towards sovereign wealth funds.

While the "dollar-standard" is attractive under ideal circumstances, the inability of the US to adopt domestic policies required to secure attractiveness of the US dollar contributes to the gradual weakening of Bretton Woods II. Specifically, as long as the US tends to overplay its privileged position, the "dollar-standard" creates the risk of more persistent and bigger US current account deficits. In the absence of more profound financial restructuring in the US, the return to a "dollar-standard" upon the onset of global recovery exposes Asia to the hazard of another global crisis down the road. The decline of the relative economic importance of the US has been a gradual process that started with the global recovery after World War II. The takeoff of the PRC and India has intensified the relative decline of the US. Many observers expect these trends to continue, with emerging Asia deepening its regional integration and gradually moving towards greater convertibility. All these factors suggest that attempts to return to the pre crisis "dollar-standard" are suboptimal, and possibly infeasible.

The wish to return to the 'dollar-standard' reflects a backward looking mindset of the last 60 years rather than a realistic assessment of probable future trends. A plausible scenario is that I would converge to a tri-polar international monetary system based on the euro, the US dollar, and new monetary arrangements in Asia, possibly a region-wide currency. Such a tri-polar configuration may be associated with significant volatility. The challenge facing Asia is to find, during the transition from the dollar standard to a multi-polar system, a path facilitating the gradual financial maturing of the region, and adopt steps to reduce its exposure to future volatility. Deepening regional pooling and swap arrangements may be the logical conclusion of such efforts.[13]

To a degree, the Chiang Mai Initiative (CMI) may be viewed as a first step, which can be extended to support the emerging needs triggered by the current crisis. An issue that deserves further attention is the optimal duration and size of these swap-lines, balancing the interests of the parties involved, subject to possible moral hazard constraints and the structural factors explaining the linkages between various countries. The impact of introduction of swap-lines on the patterns of using and hoarding IR is complex. Several forces may be at work. Swap-lines may act to stabilize market concerns about the risk of losing control due to deleveraging pressures, thereby preventing downward pressure on IR and the exchange rate and substituting the need to hoard reserves. This was possibly the case for Korea, where the introduction of the FED swap-line prevented a replay of the crisis dynamics of 1997. In these circumstances, access to swap-lines would mitigate the need for Korea to hoard reserves to replace the US$60bn of reserves it used during the first phase of the crisis. Yet, uncertainty regarding the duration of these swap-lines, and lingering concerns that in absence of these swap-lines, the initial level of reserves is insufficient to prevent crisis dynamics, may induce Korea to further accumulate reserves in the future. Therefore, perceptions about the duration of swap-lines play a key role in determining the future path of reserves. To the degree that regional arrangements like the CMI offer pooling schemes of indefinite duration, they may mitigate the urge to hoard reserves. Greater use of regional

13 On the historical account of the early 19th century, Flandreau and Jobst (2009) find evidence in line with the prediction of Charles Kindleberger that currencies become international due to the importance of size (and thus the share in international trade), distance and inventory cost, consistent with the search-theoretic models of international currencies.

swap-lines may also reduce excessive hoarding precipitated by the wish to signal that a country's reserves are above the average of its neighbors (the "keeping up with the Joneses' IR" motive.)

A related issue that may be explored is the currency composition of swap-lines. There is no reason why swap-lines have to be denominated solely in US dollars. Just as countries typically hold reserves in different currencies, they could agree to help each other by providing a basket of currencies rather than a single currency. The denomination of swap-lines in non-dollar hard currencies will speed up the diversification of reserves away from dollars into other currencies. For example, euro-denominated swap-lines will raise the demand for euro reserves given that swap-lines are ultimately a mutual promise to provide liquidity support in case of emergencies and the promise will not be credible in absence of reserves. For Asian countries, a more realistic scenario is the denomination of swap lines in the currency of a dominant regional economy such as China or even a real or notional Asian currency. Such development would further hasten the shift away from dollar reserves and the emergence of an Asia-specific hard currency, like the Europe-specific euro. There is also an intriguing possibility that the broadening and deepening of the CMI could be transformed into a more permanent and institutionalized form of regional precautionary insurance against financial crisis.

Recent events call for re-evaluating the desirability and feasibility of pegging Asian currencies to the dollar as the keystone for the regional stability and future growth. The alleged gains from pegging to the dollar are debatable, and there is scarcity of studies that tested it carefully against alternative hypotheses. First, the instability of the dollar against the euro and other key currencies implies that pegging to the dollar would increase the domestic currency volatility against the euro, pound and other currencies. This effect may be suboptimal for countries that experience an increase in the share of trade with the euro block over time. One way to deal with this issue is to evaluate what would have been the optimal weight of achieving real exchange rate stability against a basket of currencies that reflects actual trading patterns of the region.

Recent studies dealing with the Trilemma (Aizenman, Chinn, and Ito [2008]) are consistent with the notion that EMs have moved towards the Trilemma middle ground, associated with greater exchange-rate flexibility and limited but growing financial integration, buffered with sizable reserve holdings.[14] This has enabled them to retain a fair degree of monetary autonomy, even as financial integration continued (see Indian and the PRC before the crisis, a time that both countries exhibited fast growth rate, while maintaining controlled financial openness and limited exchange rate flexibility). During that time, the PRC yuan appreciated significantly, without obvious downside effects. The onset of the crisis led to the renewed pegging of the yuan to the US dollar. However, it is not self-evident that returning to the yuan's rigid peg to the US dollar is desirable and sustainable once the world economy recovers. Applying data predating the crisis, Aizenman, Chinn, and Ito (2008) failed to find evidence that countries which pegged their currency to the dollar performed on average better than those that allowed controlled flexibility. During crises, many developing countries found that allowing the real exchange rate and monetary policy to take the initial brunt facilitated adjustment to the crises. Going forward, costs associated with investing IR in US dollar assets at times when the US dollar declines in value against the euro and other hard currencies, are projected to keep increasing.[15] These costs, and the favorable growth prospects of emerging Asia, should provide further impetus to the emergence of new regional schemes.

[14] Both trends are more pronounced for the emerging markets than for the non-emerging developing countries.

[15] See Obstfeld and Rogoff (2005), regarding the links between growing external debt-to-GDP ratio of the US and the future real depreciation of the US dollar as well as recent estimates of the deteriorating US external net liability position.

4. CONCLUDING REMARKS

The unfolding of the crisis of 2008–9 may be a watershed of financial globalization. Emerging markets that embraced rapid financial integration before the crisis found that they were overly exposed to deleveraging propagated from the US. The crisis vividly illustrated that even a very large IR war chest did not seem to provide efficient self insurance against contagion, and that the fear of losing IR constrained the adjustment of EMs more than the fear of floating. The risk is that some EMs would opt out of financial globalization. In this paper I outline a menu of options that deserves further exploration. Focusing on the challenges of each country in isolation, a tax-cum-subsidy policy is a plausible option. Such a scheme deals with the fire-sale congestion externalities induced by foreign borrowing financing longer term investment in the presence of deleveraging risks. Looking at the regional challenges, deepening trade networks and deeper trade dependency implies possible gains from IR pooling arrangements, and the formation of swap-lines among countries in Asia. The hope is that such schemes would alleviate concerns about the cost and the inefficiency of hoarding IR and would also reduce the susceptibility of Asia to deleveraging shocks, thereby preventing even more drastic policies that may curtail future financial integration.

REFERENCES

Aizenman, J. 2009. Hoarding international reserves versus a Pigovian Tax-cum-Subsidy scheme: Reflections on the deleveraging crisis of 2008-9, and a cost benefit analysis. manuscript, University of California, Santa Cruz (UCSC).

Aizenman, J., M. D. Chinn, and H. Ito. 2009. Assessing the Emerging Global Financial Architecture: Measuring the Trilemma's Configurations over Time. NBER Working Paper No. 14533. Cambridge, MA: NBER.

Aizenman, J., Y. Jinjarak, and D. Park. 2009. On the future of the 'dollar standard': International reserves and swap lines – substitutes or complements? manuscript, ADB.

Aizenman, J., and J. Lee. 2007. International Reserves: Precautionary versus Mercantilist Views, Theory and Evidence. *Open Economies Review* 18 (2): 191–214.

_____. Financial versus monetary mercantilism -- long-run view of large International reserves hoarding. *The World Economy* 31 (5): 593–611.

Aizenman, J., Y. Lee, and Y. Rhee. 2007. International reserves management and capital mobility in a volatile world: Policy considerations and a case study of Korea. *Journal of the Japanese and International Economies* 21 (1): 1–15.

Aizenman J., and G. K. Pasricha. (2008) Selective Swap Arrangements and the Global Financial Crisis: Analysis and Interpretation. *International Review of Economics & Finance* forthcoming.

Aizenman J., and Y. Sun. 2009. The financial crisis and sizable international reserves depletion: From 'fear of floating' to the 'fear of losing international reserves'? National Bureau of Economic Research (NBER) Working Paper No. 15308. Cambridge, MA: NBER.

Bhattacharya, S., and D. Gale. 1987. Preference Shocks, Liquidity and Central Bank Policy. In *New Approaches to Monetary Economics*, edited by W. A. Barnett, and K. J. Singleton. Cambridge, UK: Cambridge University Press.

Caballero, R., and A. Krishnamurthy. 2004. Smoothing Sudden Stops. *Journal of Economic Theory* 119(1): 104–127.

Calvo, G. A., and C. M. Reinhart. 2002. Fear Of Floating. *Quarterly Journal of Economics* 107 (2): 379–408.

Cheung Y. W., and X. Qian. 2009. Hoarding of International Reserves: Mrs Machlup's Wardrobe and the Joneses. *Review of International Economics* 17 (4): 777–801**.**

Diamond, D., and P. Dybvig. 1983. Bank Runs, Liquidity and Deposit Insurance. *Journal of Political Economy* 91 (3): 401–419.

Dooley, M. P., D. Folkerts-Landau, and P. Garber. 2009. Bretton Woods II Still Defines the International Monetary System. NBER Working Paper No. 14731. Cambridge, MA: NBER.

Eichengreen B., R. Hausmann, and U. Panizza. 2003. Currency Mismatches, Debt Intolerance and Original Sin: Why They Are Not the Same and Why it Matters. NBER Working Paper 10036. Cambridge, MA: NBER.

Flandreau M., and C. Jobst. 2009. The Empirics of International Currencies: Network Externalities, History and Persistence. *The Economic Journal* 119 (537): 643–664.

Jeanne, O., and R. Ranciere. 2006. The Optimal Level of international reserves for Emerging Market Economies: Formulas and Applications. IMF Working Paper 06/229. Washington, DC: IMF.

Krugman, P. 2000. Fire-Sale FDI. In *Flows and the Emerging Economies: Theory, Evidence, and Controversies*, edited by S. Edwards. Chicago, IL: University of Chicago Press.

Levy Yeyati, Eduardo. 2008. Liquidity Insurance in a Financially Dollarized Economy. In

Financial Markets Volatility and Performance in Emerging Markets, edited by S. Edwards and M.G. P. Garcia. Cambridge, MA: NBER.

McKinnon R. 2007. U.S. Current Account Deficits and the Dollar Standard's Sustainability: A Monetary Approach. *CESifo Forum* 8 (4):12–23.

Obstfeld, M., and K. Rogoff. 2005. The Unsustainable US Current Account Position Revisited., manuscript, UC Berkeley. Available: http://elsa.berkeley.edu/~obstfeld/NBER_final.pdf

Park, Y. C. 2009. Reform of the Global Regulatory System: Perspectives of East Asia's Emerging Economies. Presented at the ABCDE World Bank conference, Seoul, June.

Rajan R. S., R. Siregar, and G. Bird. 2005. The Precautionary Demand for Reserve Holdings in Asia: Examining the Case for a Regional Reserve Pool. *Asia-Pacific Journal of Economics and Business* 5 (12):21–39.

Rodrik, D. 2006. The Social Cost of Foreign Exchange Reserves. *International Economic Journal* 20 3): 253–266.