

**High-level Regional Policy Dialogue on
"Asia-Pacific economies after the global financial crisis: Lessons learnt,
challenges for building resilience, and issues for global reform"**

6-8 September 2011, Manila, Philippines

**Jointly organized by
UNESCAP and BANGKO SENTRAL NG PILIPINAS**

Current Regional Challenges 2: Managing Capital Flows

Managing Capital Flows in Asia and the Pacific: the case of Korea

by

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September 2011

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Abstract

Small emerging market countries with deep financial linkage like Korea were severely hit by the global financial crisis and there have been many debates on managing massive capital inflows in emerging market countries. Based on Korea's experience, this paper discusses issues and hopefully draws policy lessons for Asia and Pacific countries. Aperiodicity, procyclicality and risk of currency and maturity mismatches are main attributes of massive capital inflows, which make it onerous to build effective and efficient financial safety nets. Financial stability may come at the cost of financial repression. Global and regional financial arrangements can be a good substitute for foreign reserves but may not be a perfect one. It is because both type I and II errors exist in qualifying prearranged lending facility. Procyclicality arises through various channels. When massive capital inflows are intermediated into local currency denominated liabilities and credit cycle and real cycle do not coincide, the interest rate oriented monetary policy framework can accelerate financial procyclicality. Furthermore, when external debts are either denominated in international currency or hedged by foreign investors local FX market can be highly volatile to external shocks, which also contributes to procyclicality.

JEL Classification: F30, F32, F34, F55

Keywords: global financial crisis, capital inflows problem, pro-cyclicality, currency and maturity mismatch, foreign reserves, prudential regulation, financial safety net

*School of Economics, SKKU, Seoul 110-745 KOREA. This paper is prepared for High Level Regional Policy Dialogue, "Asia-Pacific economies after the global financial crisis: Lessons learnt, challenges for building resilience, and issues for global reform," organized by UN ESCAP and hosted by Bangko Sentral Ng Pilipinas, 6-8 September 2011, SOFITEL, Manila, Philippines.

I. Introduction

Financial globalization makes peripheral countries, especially small open economies with deep international financial linkages, vulnerable to credit shocks originating from the center countries. Regardless of their economic fundamentals many emerging market countries (EMCs) were severely hit by the global financial crisis (GFC). In fact, one may even say that financial globalization has led to collateral damage, instead of the collateral benefits promised earlier (Kose *et al.*, 2006). Korea is a good example.

The vulnerability has two specifics. One is so-called capital inflows problem, vulnerability of economy and financial system caused by massive capital inflows followed by sudden stop and reversal.¹ The other is highly volatile FX market. The latter is somewhat related to the former but needs to be explored further.

The capital inflows problem may be characterized by aperiodicity, procyclicality and risk of currency and maturity mismatch, which accompanies potential systemic risk. Since the Asian Financial Crisis foreign reserves have been given priority. However, simply relying on self-protection is either too costly or even impossible. During GFC as Aizenman and Sun (2009) accurately described many central banks, instead of releasing foreign reserves to stabilize FX market, were forced to balance fear of floating and fear of losing reserves. In times of crisis foreign reserves are useful buffer against practical hazard but not moral hazard. Indeed, empirical evidence suggests that the causality between foreign reserves and short term external debt can be two way. To mitigate moral hazard appropriate prudential measures are called on.

Procyclicality emerges through various channels such as asset price inflation, real exchange rate, lending boom etc. This paper emphasizes the role of central bank in injecting liquidity into the financial system. When surges in capital inflows are intermediated into local currency denominated liabilities, an active maturity transformation is expected: borrowing short and lending long. Unless credit cycle and real cycle coincided in order to maintain current monetary policy stance, the central bank tends to accommodate credit shock. The Korea's financial data strongly supports the financial procyclicality. (Kim *et al.*, 2010) International panel data can also confirm. (Kim *et al.*, 2011) In fact, it is the interest rate oriented monetary policy framework that fosters the financial procyclicality.

When foreign debts are either denominated in international currency or hedged by investors, local FX market becomes highly volatile to external shocks. Here, the valuation effect work in opposite direction to Blanchard *et al.* (2005) where debt is denominated in local currency. The logic behind is straightforward. An adverse shock makes the burden of foreign debt denominated in local currency heavier in the former (and lighter in the latter) and greater exchange rate adjustments are needed. Volatile exchange rates add procyclicality.

¹ Calvo *et al.* (1994) addressed this issue and coined the term 'capital inflows problem.'

Aperiodicity of massive capital inflows makes policy makers hard to deal with capital inflows problem. While capital inflows problem can be easily identified as *ex-post*, it is difficult to predict *ex-ante*. Accordingly prudential measures more broadly the financial safety net should aim at alleviating the cost of crisis rather than preventing the crisis, so that financial stability comes only with financial inefficiency. Prudential measures should be effective and the cost should be minimal.

However, such policy measures are much easier said than done. They may be easily evaded and yield unintended consequences. Identifying the systemically important financial institutions (SIFIs) is matters. For example, macro prudential levy on the banking sector's FX borrowing may create regulatory arbitrage to be exploited.

Global financial safety nets (FSNs) or collective FSNs can be a good substitute for foreign reserves but may not be a perfect one. It is essentially because as Jeanne (2010) pointed out in qualifying for prearranged loan facility type I and type II, the error problem of differentiating bad luck from bad policy may exist. This may limit the size of the collective FSNs less than optimal although there is plenty of room for improvement in regional financial arrangement, CMIM.

All the discussions considered building financial safety nets against massive capital inflows is far less than perfect, effective and efficient. When massive capital inflows are aperiodic, procyclical, and accompany risk of currency and maturity mismatches the financial stability may come only at the cost of the financial repression. Therefore, building financial safety nets should aim at mitigating the cost of the crises rather than preventing them. Many efforts should be directed to financial developments and internationalization of currency, which will alleviate capital inflows problem.

The paper is organized as follows: Section II draws issues and lessons related to massive capital inflows followed by sudden stop and reversal during GFC. Section III discusses policy challenges and Section IV closes with concluding remarks.

II. What have we learned from GFC?

1. The issue with capital inflows problem

Procyclicality

Procyclicality is the most notable feature of the capital inflows problem. Regardless of the level of income and the size of nations, net capital flows are strongly correlated with business cycle.² Of course, not all capital flows are procyclical. Portfolio investment and banking sector's external

² For example, Kaminsky et al. (2004) based on data for 104 countries including OECD and developing countries confirmed procyclicality of capital flows.

borrowing in particular tend to be most procyclical while foreign direct investment is least. (Contessi, et al., 2008)

Furthermore, capital inflow does not necessarily accompany the problem; massive inflows do. That is, procyclicality is aperiodic. (Kaminsky et al.) Aperiodicity has an important implication: it may be easy to identify the capital inflows problem *ex-post*, but hard to discern *ex-ante*. In reality how massive is massive is not easy to judge. Consequently, policy makers are subject to committing type I and type II errors.

Often a small open economy with deep international financial linkage suffers from severe procyclicality. Perhaps Korea is a good example. According to Schindler's *de jure* financial integration index of 91 countries from 1995 to 2005 Korea ranked 44th. In Asia Korea is the 3rd most widely open country next to Hong Kong and Japan; it overtakes the U.S. which is ranked 47th.³

The following tables are Korea's foreign currency flow of funds in 2007 and 2008. In 2007 USD103 billion's foreign liquidity flew in. (Table 1) In that year Korean economy bore USD108 billion's fresh liabilities equivalent to 103% of GDP of that year: USD33.8 billion in the form of portfolio investment, USD56.3 billion external borrowing by the banking sector, and USD18.2 billion non-banking sector. However, external assets were increased only by less than USD28 billion, of which the monetary authority absorbed USD15 billion as foreign reserves. The rest of them were recycled. Overseas equity investment by domestic residents set record, USD52.6 billion which was *effectively* leveraged.

[Table 1] FX Flow of Funds in 2007 (billion USD)

Uses of FOREX Liquidity		Sources of FOREX Liquidity	
External Assets	27.8	External Liabilities	108.2
General Government	3.0	General Government	21.5
MA	15.1	MA	12.3
Banks	13.2	Banks	56.3
(DB)	(10.3)	(DB)	(26.8)
(FBB)	(2.9)	(FBB)	(29.5)
Others	-3.5	Others	18.2
Overseas Direct Investment	19.7	Foreign Equity Investment	-28.9
Overseas Equity Investment	52.6	Foreign Direct Investment	1.8
Financial Derivatives	-5.4	Other	0.2
Other Capital Account	2.4	CA	21.8

³ In fact, capital inflows are more mobile (33rd) than outflows (48th). (Schindler, 2009)

Other Investment	8.2		
Errors and Omissions	-2.1		
Total	103.1	Total	103.1

Source: ECOS, BOK

In 2008 after Lehman collapsed, the Korean economy fell to a rapid downturn cycle generated by sudden stop and reversal preceded by massive capital inflows. During 2008 IV – 2009 II year to year GDP growth rate was in negative territory and when annualized it reached almost -13%. A massive deleverage over USD43 billion equivalent to over 46% of GDP in that year occurred and this deleverage was concentrated on the banking sector which wasn't able to roll over its debt and, instead, had to pay back USD23.5 billion. In spite of over USD56 billion sold by the monetary authority it appeared that such effort did not stabilize foreign exchange market. Rather it was BOK's swap arrangement with US Federal Reserve that was effective. (Baba and Shim, 2011) The loss of USD14.8 billion related to the financial derivative transaction is also notable. One may point out foreign investor's equity sell-off, USD 33.5 billion. But such sell-off already started during boom period.

[Table 2] FX Flow of Funds (2008, billion USD)

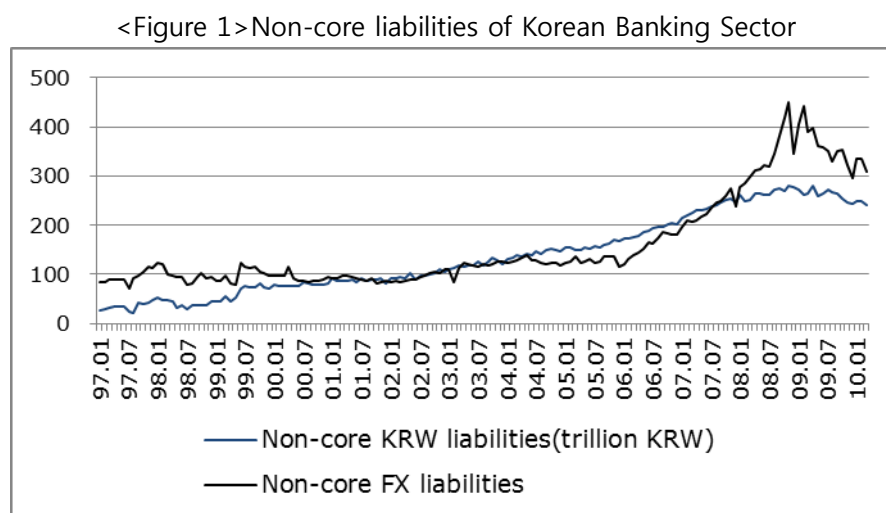
Uses of FOREX Liquidity		Sources of FOREX Liquidity	
External Assets	-69.7	External Liabilities	-16.1
General Government	-10.6	General Government	-10.6
MA	-56.4	MA	9.5
Banks	6.3	Banks	-23.5
(DB)	(7.4)	(DB)	(-12.0)
(FBB)	(-1.1)	(FBB)	(-11.5)
Others	-9.0	Others	8.5
Overseas Direct Investment	20.3	Foreign Equity Investment	-33.5
Overseas Equity Investment	-7.1	Foreign Direct Investment	3.3
Financial Derivatives	14.8	Other	-0.2
Other Capital Account	-0.1	CA	3.2
Other Investment	-3.3		
Errors and Omissions	2.0		
Total	-43.2	Total	-43.2

Source: ECOS, BOK

Looking into the two tables some important implications are obtained. First, capital inflows problem may emerge regardless of the exchange rate system. In 2007 of USD103 billion's FX liquidity inflow the monetary authority only absorbed USD15 billion. One could argue that the FX market intervention, although not in large scale, generated greater capital inflow. But Valgreen (2007) already noted based on the episode of Iceland, a country that ran pure floating rates and was exposed to huge foreign capital inflow. Flexible exchange rates do not guarantee financial stability.

Second, what matters is the size of the *gross* capital inflows. It is because when capital inflows once recycled a huge mismatch can be created between external assets and liabilities, as was seen in 2007. Risk of currency mismatch is particularly detrimental in EMCs where their currencies are inconvertible.

Typically capital flow is intermediated into local currency denominated liabilities. Figure 1 shows non-core (or non-deposit) FX and KRW liabilities of the Korean banking sector.⁴ As deleveraging started immediately after collapse of Lehman Brothers, non-core FX liabilities shrank drastically. In addition deleveraging had a spillover effect on the KRW credit market. This phenomenon, a so-called double drain, was unprecedented. Non-core KRW liability also dried up even though Bank of Korea aggressively reduced policy interest rate contrary to the Asian Financial crisis in 1997. Deep financial linkage is behind this observation.



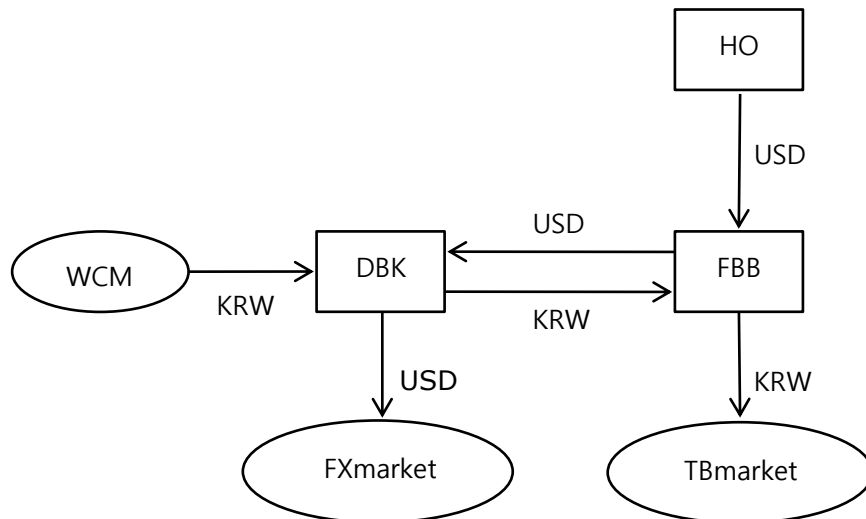
Source: Kim et al. (2010)

Figure 2 illustrates the way foreign capital inflow is intermediated through foreign exchange swap (FES) arrangement between a domestic bank (DBK) and a foreign bank branch (FBB), which is the most important channel for injecting FX liquidity in the Korean financial system. Borrowing from its head office, FBB supplies dollars to DBK through FES. Then DBK engages in FX lending. In return DBK funding from the wholesale credit market (WCM) supplies KRW to FBB and FBB invests

⁴ Domestic banks and foreign bank branches compose the banking sector.

in Treasury Bonds. Therefore, the inflow of foreign capital causes an increase in domestic credit. Through FES both parties effectively borrow short and invest in long term assets. Maturity transformation takes place.

<Figure 2> Foreign Exchange Swap and Maturity Transformation



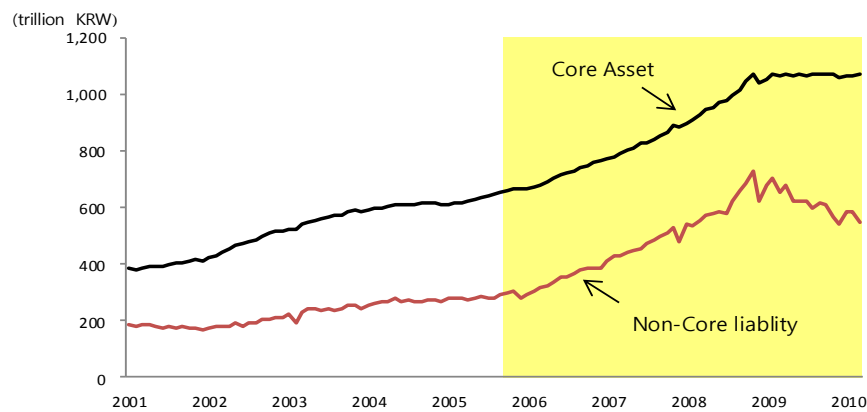
Source: Kim et al. (2011)

It is worth to note that during boom period the relationship among financial and macro variables are different from normal period. As may be recognized in Figure 3 from the fourth quarter of 2005 through the onset of the GFC, NCL increased rapidly and the growths of core assets and NCL show a strong linear relationship from October 2005 to March 2010.⁵ (Kim et al., 2010)

Furthermore, the term spread of the yield curve is usually regarded as the leading indicator of the business cycle. That is, the spread moves similarly together with core asset growth. However, during a boom when flattening yield curve is implied by active maturity transformation the spread is unlikely to reflect the real activities.

<Figure 3> Core Assets and Non-core Liabilities (Jan. 2001 – Mar. 2010)

⁵ This was mainly related to the faster growth of private credit, which was due to increases in both capital inflows through FX liabilities of the banking sector, especially FBBs and lending competition among domestic banks as well. The shortage of retail deposits also forces banks to rely on the credit market. Hence, core assets remained above the level of core liabilities, meaning that the loan-to-deposit ratio started to exceed one.



Source: Kim et al. (2010)

Here, the following questions are to be answered. If non-core liabilities (NCL) are the first order approximation of interbank liabilities, then an active maturity transformation, other things being constant, should simply raise short term interest rate (and lower long term one). Then how come liquidity erupts and supervene procyclicality? Again by DBKs borrowing short term and FBBs investing in longer term assets, maturity has been transformed. A massive maturity transformation other things being constant flattens the slope of the yield curve. *In order to maintain its current monetary policy stance*, the central bank should act to reduce the gap between the short term rates and the policy rate through open market operations. Liquidity is injected into the system, and as a result the monetary policy accommodates the credit shock. Credit causes liquidity.

Then, under what circumstances does the central bank maintain its policy stance and accommodate the credit shock? It happens when financial cycles do not match with business cycles⁶ and the central bank is given the mandate to react to the business cycle such as price stabilization. Inflation targeting monetary policy is a good example.⁷ Using Korea's financial data Kim et al. (2010) demonstrated financial procyclicality accelerated by monetary policy.

Indeed, it is the characteristics of interest rate oriented monetary policy framework. Kim et al. (2011) used panel data collected from 14 countries adopting floating exchange rate arrangements and inflation targeting under the interest rate-oriented monetary policy framework and

⁶ According to IMF (2011) there are strong linkages between business and financial cycles such that recessions associated with financial disruptions tend to be longer and deeper than others. However, financial cycles are often much longer and severe than business cycles. While a typical recession (recovery) lasts close to 4 (5) quarters a financial downturn (upturn) lasts between 6 to 8 (11 to 18) quarters.

⁷ They showed that the NCL growth causes the growth of monetary aggregates such as M2 and monetary base. This causality *only* appears during a boom-bust period of October 2005 through March 2010 when strong procyclicality was observed such that NCL growth significantly caused the growth of core liabilities of the Korean banking sector.

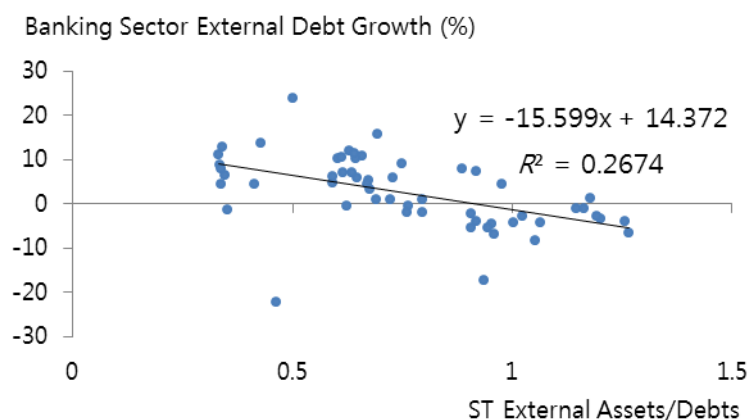
demonstrated the same properties.⁸

Risk of currency and maturity mismatches

In EMCs currency mismatch is often accompanied by maturity mismatch, ending up in a twin crises.⁹ <Figure 4> illustrates that external debt growth of the Korean banking sector is positively associated with the degree of maturity mismatch.¹⁰

There are several logical explanations for heavy reliance on short term indebtedness. One is lender's concern. Foreign lenders prefer short term contracts: either to monitor debtors' actions (Jeanne, 2009) or to charge a higher risk premium on long-term bonds than on short-term bonds, making it cheaper for emerging economies to borrow short term. (Broner, Lorenzoni and Schmukler, 2010). In borrower's point of view it could be waiting for better borrowing condition in the future (Mama, 2007). Or it could be moral hazard incurred by lenders and borrowers alike, which will be discussed.

<Figure 4> External Debt Growth and Maturity Mismatch (1994 IV-2008 IV)



Source: Kim and Chey (2010)

Ironically, currency mismatches are much more serious in developed countries (DC). Following Goldstein and Turner (2004), their aggregate effective currency mismatch (AECM) index is computed for various countries ([Table 4]). A negative (positive) number indicates a debtor (creditor) country, and numbers in absolute terms denote the degrees of mismatch. As of 2007, all EMCs in the table were creditors thanks to their massive FR accumulations since the Asian

⁸ They cover 14 countries for Jan. 2002- Dec. 2009: the UK, Sweden, Iceland, Australia, New Zealand, South Africa, Brazil, Chile, Colombia, Mexico, Peru, Indonesia, the Republic of Korea, and Thailand.

⁹ Kaminsky and Reinhart (1999).

¹⁰ The two outliers, 2008 IV and 1997 IV, contain most vulnerable periods, GFC and EA crisis.

Financial crisis. Based upon the international investment position, many EMCs had net liabilities as they cover broader types of assets and liabilities such as equities, direct investment, and derivatives.

[Table 3] Aggregate Effective Currency Mismatch Index

	90-99	2000	2001	2002	2003	2004	2005	2006	2007
Australia	-31.0	-48.7	-56.4	-64.4	-102.0	-117.9	-101.8	-120.6	-115.5
Britain	-23.6	-32.7	-44.3	-65.4	-88.0	-101.3	-90.2	-95.9	-124.3
Canada	-17.9	-12.3	-11.9	-14.3	-15.3	-13.6	-11.9	-9.1	-12.1
Germany	-2.0	-18.0	-7.8	-11.8	-14.3	-14.6	-6.5	-3.6	5.4
Japan	0.7	3.4	6.0	6.9	5.6	6.2	8.4	8.7	10.0
USA	-2.2	-12.6	-23.7	-31.1	-35.4	-33.8	-29.8	-30.9	-33.2
Brazil	-8.6	-18.0	-17.2	-30.0	-21.5	-11.5	-4.4	-0.7	3.3
China	0.9	0.8	0.8	0.6	0.5	0.5	0.6	0.5	0.6
Indonesia	0.9	1.0	0.9	0.8	1.0	1.0	1.3	1.7	2.1
Korea	0.3	0.9	1.0	0.9	1.0	0.9	4.0	3.9	3.8
Malaysia	-21.4	-14.7	-11.8	-10.0	-3.9	-0.6	-0.7	0.8	1.5
Mexico	-1.5	0.2	1.1	1.5	1.1	0.7	1.2	0.1	0.2
Taiwan	-0.2	2.0	2.2	2.2	2.1	2.5	5.4	8.4	13.0

Source: Suh and Kim (2010)

The Negative AECM indices also need explanation. First, in contrast to EMCs most DCs have net assets in terms of their international investment positions. Many positive numbers of EMCs reflect nothing but 'debt intolerance.' (Reinhart et al., 2003) Second, currency internationalization allows the hedging of currency mismatches. For example, with foreign liabilities largely in domestic currency and foreign assets denominated in foreign currencies, Australia has a net long position in foreign currencies (Battellino and Plumb, 2011). Here, the implication of exchange rate movement is different, in that depreciation of Australian dollar actually *reduces* the value of Australia's net foreign liabilities. This counter-cyclicality should be the stabilizing force of the Australian economy, which should be elaborated.

2. Volatile foreign exchange rates of EMCs: Liability contract denomination

After the Asian Financial Crisis, the world witnessed a sharp increase in international capital flows, which led to larger positions in terms of gross asset and liability, making it increasingly necessary to incorporate valuation adjustments when computing net foreign asset positions. This valuation effect is potentially very large and important.

For example, according to Gourinchas and Rey (2005) in 2004 a 10% depreciation of the dollar represents, *ceteris paribus*, a transfer of around 5.9% of US GDP from the rest of the world to the

US. This is based on the fact that by the end of 2004, US net foreign asset position was 22% of GDP with assets representing 85% of GDP and liabilities 107% of GDP. Almost all US foreign liabilities are in dollars whereas approximately 70% of U.S. foreign assets are in foreign currencies.

The valuation effect has theoretical foundation. Blanchard *et al.* (2005) has modeled so-called portfolio balance approach to international capital flow. They demonstrated that imperfect substitutability between assets makes the valuation effect bring into the center stage when US economy is subject to current account and portfolio shocks.

The valuation effect is very different for emerging market countries as liabilities are denominated in foreign currencies, mostly the US dollar. This section discusses a theoretical model proposed by Blanchard *et al.* (2005) considering that liabilities are denominated in U.S. dollars.

The world is composed by emerging market country (EMC) and rest of the world (ROW) and each country has its own financial wealth as well as goods both of which are tradable. EMC's financial wealth, W , is defined by the stock of its assets denominated by EMC's currency, X , minus net debt, F , which is not necessarily to be positive. A star (*) denotes ROW's variable. E is real exchange rate.

$$\begin{aligned} W &= X - F \\ \frac{W^*}{E} &= \frac{X^*}{E} + F \end{aligned}$$

R^e is the relative expected rate of return on EMC assets against ROW assets:

$$R^e \equiv \frac{1 + r + E_{+1}^e}{1 + r^* + E}$$

Variable r is EMC real interest rate and E_{+1}^e is the expected real exchange rate in the next period.

For asset market equilibrium the supply of EMC assets should be equal to EMC demand and ROW demand:

$$X = \alpha(R^e, s)W + (1 - \alpha^*(R^e, s))\frac{W^*}{E}$$

EMC investors allocate a share α of W to EMC assets and symmetrically ROW investors α^* of W^* to ROW assets

$$X = \alpha(R^e, s)(X - F) + (1 - \alpha^*(R^e, s))\left(\frac{X^*}{E} + F\right)$$

These shares are assumed to be functions of the relative rate of return, R^e , and asset preference shock, s which is exogenous.

$$\alpha = \alpha(R^e, s), \alpha_{R^e} > 0, \alpha_s > 0; \alpha^* = \alpha^*(R^e, s), \alpha_{R^e}^* < 0, \alpha_s^* < 0$$

Furthermore, home biasedness is assumed such that

$$\alpha(R^e, s) + \alpha^*(R^e, s) > 1$$

And trade deficit is an increasing function of the real exchange rate and terms of trade shock, z which is also exogenous.

$$D = D(E, z), D_E > 0, D_z > 0$$

It is assumed that when investors of ROW invest on EMC assets they may prefix the exchange rate in the next period at the rate of Δ , which means that they may either hedge their positions in

advance or denominate them in ROW currency at the very beginning. Specifically, their position may be hedged at $\Delta = E_{+1}^e$ or denominated in ROW currency so that $\Delta = E$.

Given this assumption, equations for portfolio balance, and trade deficit the net debt position in the next period is as follows

$$F_{+1} = (1 - \alpha^*(R^e, s)) \frac{W^*}{E} (1+r) \frac{\Delta}{E_{+1}} - (1 - \alpha(R^e, s)) W (1+r^*) \frac{E}{E_{+1}} + D(E_{+1}, z_{+1})$$

The equation can be rearranged as¹¹

$$F_{+1} = \{(1+r)F + (1 - \alpha(R^e, s))(1+r) \left(1 - \frac{1+r^*E}{1+r\Delta}\right) (X-F)\} \frac{\Delta}{E_{+1}} + D(E_{+1}, z_{+1})$$

Even though EMC assets held by ROW investors are either hedged or denominated in ROW currency the counter party credit risk still remains. It is assumed that the counter party credit risk is significant such that

$$\frac{1+r\Delta}{1+r^*E} > 1$$

The term $\{ \}$ in rhs of the equation is so called valuation effects. An unexpected depreciation of the real exchange rate or an unexpected decrease in E_{+1} will raise the burden of EMC's debt. The valuation effect depend on the size of the net debt, F , EMC investors' gross position on ROW assets, $(1-\alpha)(X-F)$, and the size of the counter party credit risk, $1 - \frac{1+r^*E}{1+r\Delta}$.

Again when liabilities are denominated in EMC currency that is, $\Delta = E_{+1}$, the net debt equation degenerate to Blanchard et al. (2005)

$$F_{+1} = (1+r)F + (1 - \alpha(R^e, s))(1+r) \left(1 - \frac{1+r^*E}{1+rE_{+1}}\right) (X-F) + D(E_{+1}, z_{+1})$$

Here, the implication is very different from Blanchard et al., where the valuation effect work favorably in the presence of unexpected exchange rate depreciation. If the debt were denominated in EMC currency, then the valuation effects should work favorably since the value of liabilities held by ROW investors also diminish. However, when the debt is either denominated in ROW currency or hedged the unexpected depreciation makes liabilities in terms of EMC currency increase. For example, terms of trade shock which has a depressing effect on exchange rate makes EMC's debt burden heavier than otherwise and, therefore, in order to balance the current account even greater depreciation is called for. As a result, terms of trade shock makes EMC exchange rate vulnerable.

In order to examine the dynamic path of the economy it is assumed that the stock of assets X, X^* and shock variables, s, z and real interest rates r, r^* are constant. Furthermore, EMC interest rate is greater than ROW rate even in steady state.

$$r > r^*, \quad \Delta = E = E_{+1} = E_{+1}^e$$

Then the steady state values of net debt F and exchange rate E are described by the portfolio balance equation and the net debt equation or current account balance equation.

$$X = \alpha(\bar{R}^e, s)(X-F) + (1 - \alpha^*(\bar{R}^e, s)) \left(\frac{X^*}{E} + F\right), \quad \bar{R}^e \equiv \frac{1+r}{1+r^*}$$

¹¹ Net debt position denominated in ROW currency can be obtained as

$$F_{+1}^* = (1+r^*)F^* + (1 - \alpha^*(R^e, s))(1+r^*) \left(\frac{1+r\Delta}{1+r^*E} - 1\right) (X^* + F) + D^*(E_{+1}, z_{+1})$$

$$0 = rF + (1 - \alpha(\bar{R}^E, s))(r - r^*)(X - F) + D(E, z)$$

In order to have stable system the slope of the portfolio balance equation should be greater than the current account balance equation in F and E space.

Terms of Trade Shock: permanent increase in z

Suppose that the economy is in a steady state A and terms of trade shock exist. That is, an unexpected and permanent increase in z occurs. Then CA schedule shifts down and the economy will move to new steady state C along the new saddle path.

In the presence of the trade shock the valuation effects may depress the economy even greater. Let dE be unexpected depreciation at the time of the shock. The valuation effects can be obtained from the debt dynamics equation

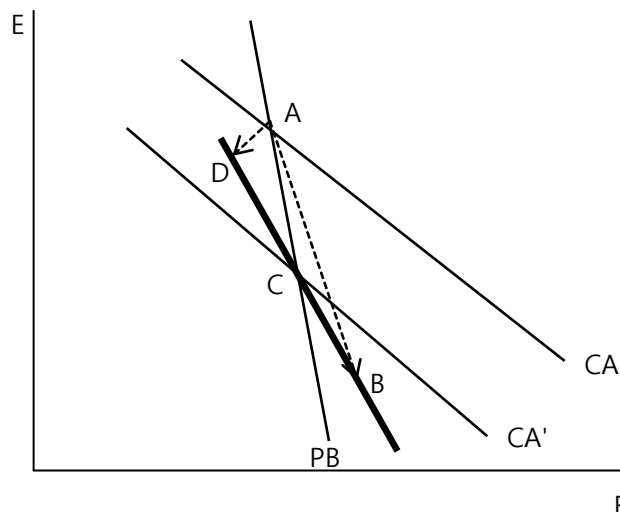
$$dF = -\{(1 + r)F + (1 - \alpha)(X - F)(r - r^*)\} \frac{dE}{E}$$

If the valuation effect is large enough then the economy can jump from its initial steady state equilibrium A to B on the new saddle path and eventually approach new steady state C. On the other hand, if liabilities were denominated in EMC currency, that is, $\Delta = E_{+1}$, then the following valuation effects partially offset the impact on the initial shock and the economy will jump to D as in Blanchard et al.

$$dF = (1 - \alpha)(1 + r^*)(X - F) \frac{dE}{E}$$

The size of the actual exchange rate depreciation rate, $\frac{dE}{E}$, depends on the asset preference function reflected in α_{R^E} and α_{R^*E} since the immediate impact on the exchange rate should be determined by the portfolio balance equation. Central banks are the most important investors originating from EMCs and unlike ROW investors as central banks do not seek profit and are very sensitive to the counter party credit risk the following inequality is expected to hold in steady state, $\alpha_{R^E} \ll |\alpha_{R^*E}|$. If this is the case ROW investors will swiftly collect EMC liabilities and therefore the size of initial exchange depreciation should be large.

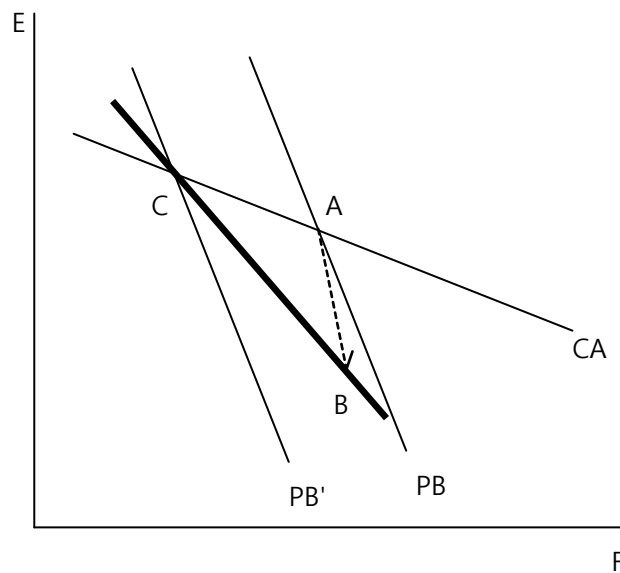
<Figure 5> Terms of Trade Shock



Portfolio Shock: permanent increase in s

In a way this is more like the case of flight to quality. Portfolio balance schedule shifts down. Again the dynamics are given by the path ABC. Portfolio shift toward ROW assets immediately depreciates EMC exchange rate and the depreciation of the real exchange rate triggers the valuation effects. The greater the valuation effect is (measured by $\frac{dF}{dE/E}$), the larger the exchange rate needs to depreciate. The initial pressure on the exchange rate will be partially offset by increase in ROW demand for EMC assets when one assumes the same portfolio preference.

<Figure 6> Portfolio Shock



Comments are in order. First, the valuation effect is important to explain vulnerability of exchange rates in EMCs exposed to current account and portfolio shocks. The larger the net debt position, the larger gross external assets position, the larger counterparty credit risk, and larger the valuation effect.

Second, the valuation effect is procyclical. In order to restore current account balance the valuation effects lead to depreciate exchange rate even further and, consequently, exacerbates capital inflows problem.

One may argue that the valuation effect should not be emphasized since many EMCs have net external assets. As a matter of fact, they do in terms of the external debt/asset position, but most EMCs have net liabilities in terms of the international investment position. Furthermore, most external assets are owned by the monetary authority and capital gains from positive valuation effect are transferred to the government. Therefore, the valuation effect should work differently. Last but not least, eventually, internationalization of currency is what matters. Currency internationalization allows the hedging of currency mismatches at the national level as in the case

of Australia.

III. Dealing with capital inflows problem

The GFC has fostered to build financial safety net; macroprudential policy has taken center stage. It has even changed the perception of capital controls in coping with surges in capital inflows although they should be the last resort in a pecking order of policy arrangements. (Ostry et al., 2010)

Foreign reserves

There have been many debates on the excessiveness of foreign reserves (FRs) accumulated by EMCs after the Asian Financial Crisis.¹² It is no doubt that FR is the first line of self-defense against deleveraging. The size of the FR matters, however, and the benefits do not come without costs.¹³ For example, Rodrik (2006) criticized that EMCs have over-invested in the costly strategy of reserve accumulation and under-invested in capital account management policies to reduce their short-term foreign liabilities.

His criticism may be best addressed by what Korea experienced on the onset of the GFC. Judging from its foreign debt and asset structure as a whole, the Korean economy should not have suffered a foreign liquidity shortage. However, the risk of currency and maturity mismatch were concentrated in the banking sector. As a result, even sitting on the world 6th largest volume of FR Korea awfully suffered from vulnerability of FX liquidity.

Here, the link between hoarding of FR and short term external borrowing needs to be elaborated. According to the Guidotti-Greenspan rule short term external borrowings should be absorbed as FR. But such a rule may encourage banks to rely on short term borrowing excessively. Indeed, empirical evidence suggests that FR and ST debt of the banking sector cause each other. Based on 46 EMCs (ST debt of the banking sector in 22 countries) and 2000-2007 annual data, Kim (2010) demonstrated that after controlling other macro variables FR accumulation does not necessarily mitigate the risk of MM while it may provoke pro-cyclicality of capital inflows.

¹² See Aizenman and Lee (2007), Jeanne (2007), Obstfeld et al. (2008), Blanchard et al. (2010) among others.

¹³ The social costs of hoarding FR, defined as the yield on FR subtracted from the cost of private external borrowing proposed by Rodrik reached to 1.5% of GDP at the peak.

Consequently, the Guidotti-Greenspan rule can provoke moral hazard. The risk associated with borrowing (or lending) is socialized while the return is privatized. In order for FR to be a useful buffer against practical hazard (not moral hazard) prudential regulation should be imposed.

Korea's foreign exchange system

After Asian Financial Crisis the Korean government aggressively liberalized capital account and foreign exchange transaction. In April 1999 the *bona fide* principle of foreign exchange transactions was abolished. Most regulations on capital account transactions by domestic firms were lifted. Corporations and financial institutions are able to borrow overseas and issue short-term foreign currency denominated bonds. Also non-residents are allowed to make deposits denominated in Korean won. In January 2001 OTC securities transactions between residents and non-residents were liberalized. (see Kim and Song(2010) in detail) All these measures effectively pursued internationalisation of Korean won summarized in the table.

However, this does not mean that Korea's foreign exchange system is fully decentralized. As shown in the table below, almost 2/3 of external assets are owned by monetary authority and over 75% of liabilities are held by the banking sector and firms. Furthermore, currency and maturity mismatches are concentrated in the banking sector while over 80% of assets are short term. This asymmetry implies that while banks and firms hedge, arbitrage and speculate; the monetary authority plays as the insurer of last resort associated with those activities.

External Assets and Liabilities (billion USD, end of 2010)

	Total	(ST)	(LT)	GOV	MA	Banks	(ST)	(LT)	Other
Debts	360.0	(135.0)	(225.0)	44.2	35.6	173.8	(101.3)	(72.4)	106.5
Assets	448.3	(369.1)	(79.2)	10.0	296.2	83.7	(50.2)	(33.5)	58.4

Source: ECOS, BOK

For example, a boom in the export sector increases demand for hedging export revenue against risk of dollar depreciation and the banking sector, the counter part of the exporters, squares its position via shorting the U.S. dollar which is funded by external short term debt. Consequently, the boom in the export sector causes currency and maturity mismatch and the risks of those mismatches are ultimately borne by the monetary authority.

Therefore, even though capital account and foreign exchange liberalization has led a drastic increase in foreign exchange transaction the risks associated are not effectively diversified away. It is essentially because Korean won is not fully internationalised. Unlike countries with more open financial systems such as Australia, Hong Kong and Singapore having substantial nonresident issuance of local currency Korea is unable to enjoy hedging risks via raising foreign currency funding offshore and swapping the proceeds into domestic currency promised by Munro and Wooldridge (2009).

Institutional Reform on Internationalisation of the won	
Definition	Degree of liberalisation
Unit of account	Won-denominated current transactions: liberalised (1988~91) Won-denominated capital transactions: liberalised (1992)
Medium of exchange	Current account transactions: liberalised via "free won account" (1996) Capital account transactions: partially allowed ¹
Store of value	Deposits: liberalised via "free won account" (1999~2001) Borrowing: allowed up to KRW 30 billion (2001~07) Issuance of won-denominated securities by non-residents: allowed (2001~06)

¹ Payment and settlement in respect of investments in domestic securities and forwards via "non-resident won account for investment use only"; settlement of the domestic transaction in

overseas trade office.

Source: Kim and Suh (2011)

Macroprudential policy

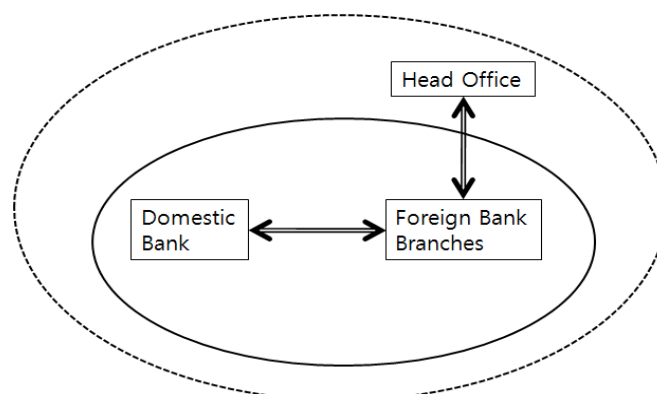
In EMCs the economies as a whole are unable to hedge the risk of currency and maturity mismatches, even though banks engage in hedging activities. Naturally, an insurer of last resort should serve as a stopgap to prevent banks from being illiquid in times of crisis. It is the central bank that plays the insurer of last resort. The banking sector, the insured, should pay an appropriate premium to the central bank, the insurer. Without the paying of such a premium, social and private optimality of external borrowing would not be the same.

Alternatively, one could argue that private external borrowing creates a negative externality on domestic asset prices, or more broadly real exchange rates (Jeanne and Korinek, 2010b; Aizenman, 2010). Instead of a risk premium, a Pigouvian tax that targets borrowing activities that cause spillover effects can cure the negative externality, and therefore mitigate the capital inflows problem.

However, application of either a risk premium or a Pigouvian tax is easier talked about than done. It may be easily evaded. Furthermore, it may yield unintended consequences. After the GFC Korean government has strengthened FX-related prudential measures including ceilings on FX derivatives positions of banks and levy on FX borrowing. (Appendix)

Here, identifying the systemically important financial institutions (SIFIs) matters. In Korea, FBBs are important agents supplying foreign liquidity and could be SIFIs. Such prudential measures imposed on FBBs will definitely discourage their short term external borrowings. But their head offices may directly engage in transactions with DBKs and exploit the regulatory arbitrage created by such levy and then it is their head offices that should have been identified as the SIFIs. (IMF, 2011a)

<Figure 7> Systemically Important Financial Institutions



Another issue related to prudential measures is capital controls. Prudential measures are intended to strengthen the resilience of the financial sector to prevent from taking excessive risk and to limit systemic risk while capital controls aim at affecting cross-border movements of capital. FX-related prudential measures discriminate according to the currency while capital controls the residency of the parties to the transaction. However, the classification is not always clear cut.¹⁴ Furthermore, the effectiveness of such capital flow measures does not draw definitive conclusions. (Habermeier et al., 2011)

During 2009-2010, the Korean economy ended up with a huge amount of current account surplus of USD 61billion, evidence of a typical post GFC macroeconomic adjustment. Furthermore, accumulation of external assets was much greater than external debts. Banking sector's external debts were significantly diminished. Instead, foreign investors' portfolio investment expanded a lot. Whether this shift is the result of prudential measures such as regulations on the banking sector's short term debts and forward contract position linked to banking sector's capital, etc., remains to be seen.

[Table 4] FX Flow of Funds (2009, billion USD)

Uses of FOREX Liquidity		Sources of FOREX Liquidity	
External Assets	67.9	External Liabilities	28.0
General Government	0.0	General Government	6.7
MA	68.7	MA	8.7
Banks	-5.1	Banks	10.8
(DB)	(-5.2)	(DB)	(6.0)
(FBB)	(0.2)	(FBB)	(4.8)
Others	4.3	Others	1.9
Overseas Direct Investment	17.2	Foreign Equity Investment	25.1
Overseas Equity Investment	2.1	Foreign Direct Investment	2.2
Financial Derivatives	3.1	Other	-0.2
Other Capital Account	-0.3	CA	32.8
Other Investment	-0.2		
Errors and Omissions	-1.9		
Total	87.9	Total	87.9

Source: ECOS, BOK

[Table 5] FX Flow of Funds (2010, billion USD)

¹⁴ Ostry et al. (2011) provide excellent discussion and documentation.

Uses of FOREX Liquidity		Sources of FOREX Liquidity	
External Assets	43.6	External Liabilities	14.6
General Government	0.8	General Government	16.4
MA	27.1	MA	-4.4
Banks	6.0	Banks	-6.5
(DB)	(4.2)	(DB)	(3.6)
(FBB)	(1.8)	(FBB)	(-10.1)
Others	9.7	Others	9.2
Overseas Direct Investment	19.2	Foreign Equity Investment	23.0
Overseas Equity Investment	4.9	Foreign Direct Investment	-0.2
Financial Derivatives	0.0	Other	0.1
Other Capital Account	0.2	CA	28.2
Other Investment	-5.1		
Errors and Omissions	2.9		
Total	65.7	Total	65.7

Source: ECOS, BOK

Collective FSN

Unlike the domestic financial market, the international financial market is less integrated– which can be described as a double-edged sword as there is a lack of supranational legal authority overlooking cross border contracts, but if there was one it would create sovereign risk. In general, the binding constraint of international debt repayment is *willingness* rather than ability to pay, which makes international debt contract incomplete (Eaton and Gersovitz, 1981). Relying on short term external borrowing, the debtors benefit by cheap funding costs (only at the risk of unwarranted crises). It may also be the case that excessive short term debt is the outcome of incomplete international debt contracts.

A more complete international debt contract is possible to arrange if *bad luck* is distinguishable from *bad policy*. In such a case, debt restructuring contingent on bad luck with good policy can make both creditors and debtors better off. Indeed, the following table, showing the years of default (or rescheduling) and of suffering from banking crises in six continents over the last two centuries demonstrates that sovereign risk differs from continent to continent, and from country to country. Asian countries are very different from other countries in Europe and Latin America: The average number of years in a banking crisis is much longer than average years in default or rescheduling. It seems that the degree of openness explains the difference: the more open a

country is, the willingness to pay matters less.

[Table 6] Debt and Banking Crises: 1800 or independence to 2008

Continent (countries)	Average years in default or rescheduling	Average years in banking crisis
Africa (13)	24.0	12.2
Asia (12)	6.4	11.2
Europe (19)	14.4	6.4
Latin America (18)	34.8	4.3
North America (2)	0.0	10.8
Oceania (2)	0.0	4.9

Sources: Authors' calculations from Table 10.1 and 10.2 (Kaminsky and Reinhart, 2010)

According to Jeanne (2009), the verifiability of policy quality should be enhanced by appropriate collective action at the international level, by the creation of a new legal regime or new specialized institutions mandated to accumulate the required expertise (such as the IMF). Going further, Jeanne et al. (2008) explored IMF conditionality to the country's crisis prevention efforts or *ex ante* conditionality, or prearranged lending. He concludes that considering that IMF lending to EMCs has been repaid in full, and that *ex ante* conditionality can mitigate systemic contagion, *ex ante* conditionality should be a useful policy tool. In March 2009 IMF introduce a pre-arranged lending program, the flexible credit line (FCL) to countries with strong track records but faced with balance of payments pressure. FCL aims at reducing stigma of borrowing from the fund since it doesn't accompany conditionality.¹⁵

As for regional financial arrangement (RFA) USD 120 billion's self-managed reserve pooling arrangement Chiang Mai Initiative Multilateralization (CMIM) has been established in 2010. As surveillance secretariat ASEAN+3 Macroeconomic Research Office (AMRO) is created. CMIM retains IMF link, but it is not clear whether other sorts of IMF credit arrangements than SBA could also meet that description. Besides, it is not equipped with credit line instrument which can be used for precautionary function. In order to facilitate the RFA CMIM needs to be improved.

Henning (2010) claimed that qualification for the FCL should be deemed to satisfy the ASEAN+3 requirements, so that disbursement under the CMIM can facilitate activation of the CMIM, soften the stigma of the Fund and make FCL more attractive to Asian members.

¹⁵ In fact, there are two other lending facilities on a precautionary basis. High-Access Precautionary Stand-By Arrangement (HAPA), with conditionality and Precautionary Credit Line (PCL), which bridges the gap between the FCL and the HAPA for those countries with sound fundamentals and policy track records, but facing moderate vulnerabilities that may not yet meet the high FCL qualification standards. PCL combines qualification process with ex-post conditionality.

Furthermore, an ASEAN+3 decision to allow PCL qualification to satisfy the 'link' would harness the expertise and analysis of the IMF to the resources of the CMIM in a precautionary framework. Such division of labor has important implications for the solidarity of ASEAN+3 and ASEAN.

Notwithstanding its usefulness the size of the collective FSN such as IMF funds, RFAs (Chiang Mai Initiative and European Financial Stability Fund) has remained constant as a share of GDP but has declined drastically compared to the size of the external shocks. (IMF, 2011b) Again it is national FSN that is the most important insurance against global liquidity shortage, foreign reserves. Consequently, as an international lender of last resort reform on GFSN is very much needed.

In spite of the usefulness of GFSN, however, at the individual country level, one dollar of FCL is worth less than one dollar of its own reserves (Jeanne, 2010a). This is because not to mention stigma sound fundamentals must be verified. That is, there is a potential risk of type II errors, denying lending to countries with good policies. If recipient countries risk type II errors it may be type I errors of providing lending to countries with bad policies that risk to countries those would contribute to fund.

Fundamentally, both EMCs and MMCs' common interest for GFSN as a reform on international financial architecture do not mesh. In EMC's point of view GFSN can manage 'the capital inflows problem' while for MMCs GFSN can help global rebalance. This asymmetry makes it hard to draw well-functioning GFSN.

For example, GFSN should reduce demand for foreign reserve as self-protection and therefore, contribute to global rebalancing. Limiting moral hazard is precondition for efficient and effective GFSN and IMF should be given a clear mandate to further reform on GFSN. However, imposing verifiable guideline for sound policy and warranted level of foreign reserves would be much easier said than done. As a result, instead of GFSN the accumulation of foreign reserves may be more viable option to EMCs and to MMCs exchange rate adjustments would do better job for global rebalancing.

Macroprudential regulations can be very effective policy instruments, which enable to defend much less on foreign reserves as precautionary reason. But in order for those regulations to work well, regulatory arbitrage among countries should not be excessive. The regulatory framework must be consistent as the coordination of those regulations is essential. Furthermore, the international code of conduct should be established since it is not easy to draw the line between FX related prudential measures and capital controls, where there is consistent disputes over such

IV. Concluding remarks

Foreign reserves, prudential measures, collective financial safety nets are key words in managing large capital inflows. They are inter-related. Accumulation of foreign reserves is

important self-protection against deleveraging. But it causes significant costs and without accompanying prudential measures it may risk provoking even larger capital inflows. Collective financial safety nets can be useful substitutes for foreign reserves, even though they may be less than perfect.

Properly designed and implemented prudential policies should alleviate the risk of short term external borrowing. To that extent, the economy can be less dependent upon an insurer of last resort role of the monetary authority in providing FX liquidity in times of crisis. However, such prudential measures should be well designed, correctly implemented and minimal in distortion. Otherwise, it could prevent domestic financial market system from functioning properly and bring about only short term relief at the cost of the longer term benefits of the efficient financial system.

Inconvertibility of EMC currency lies at the root of the capital inflows problem. It makes unable to hedge exchange risk at the national level and a country with deep international financial linkages should accumulate exorbitant amount of foreign reserves. Besides, the country is exposed to an exorbitant volatility of exchange rates in the presence of various shocks when its debt is unable to hedge. Naturally, currency internationalization should be the final destination of capital inflows management.

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Appendix

Date	Measures for Stabilizations of FOREX Liquidity and FOREX Market
2007.7.12	Reduction in thin capitalisation - The MoSF announces a plan to regulate short-term foreign currency borrowing by lowering the ceiling for tax deductibility of interest expenditure resulting from foreign bank branches' borrowing from their headquarters, from six times their capital to three times, starting 1 January 2008.
2007.8.10	Banks FX lending restrictions - The BoK limits foreign currency lending to actual uses overseas by end users and domestic facilities investment funds for manufacturers.
2007.9.11	Intervention in FX swap market - The BoK intervenes in the FX swap market for the first time to provide dollars.
2008.7.14	Restoration of thin capitalisation - The MoSF announces that the tax deductibility ceiling for foreign bank branches will be raised back to the previous level, effective the 2008 business year.
2008.10.19	The MoSF announces a plan to provide a foreign currency debt issuance guarantee, and an additional \$20 billion using the official foreign reserves.
2008.10.30	Competitive Auction Swap Facility - The Bank of Korea has provided a total of 26.6 billion US dollars in foreign currency liquidity to financial institutions experiencing difficulties in overseas fund-raising, by way of its Competitive Auction Swap Facility using the official foreign reserves
2008.10.30	Currency swap arrangements - The BoK and MoSF announce the opening of swap lines with the Fed.
2008.11.13	Foreign Currency Loans Secured by Export Bills Purchased - The BoK announces a plan to introduce foreign currency loans secured by export bills purchased.
2008.11.27	Competitive Auction Loan Facility - The BoK announces a plan to conduct competitive US dollar loan facility auctions using the proceeds of swap transactions with the Fed.
2008.12.12	Currency swap arrangements - The BoK announces the opening of swap lines with the People's Bank of China and expansion of the current bilateral swap lines with the Bank of Japan
2009.2.26	Exemption of withholding tax and capital gain tax for promoting foreign capital inflows - It would abolish the 14% withholding tax that foreign investors pay on government bonds, including Korean Treasury Bonds and Monetary Stabilization Bonds. - The government will also exempt non-domestic investors on the 20% capital gains tax that trading KTBs and MSBs incurs.
2009.11.19	Fine-tuning the Regulation on FX Liquidity Ratio

	<ul style="list-style-type: none"> - Liquidity ratio will calculate reflecting the weightings into the recoverability of foreign-currency assets. - The 7-day gap ratio is to be changed from the current 0% to above -3%.
2009.11.19	<p>Mandatory Minimum Holdings of Safe FX Assets</p> <ul style="list-style-type: none"> - Financial institutions will retain the option to adopt one of the following <ul style="list-style-type: none"> i) Borrowings maturing in less than 1-year \times 2/12 \times (1-lowest refinancing rate), where the lowest refinancing rate is defined as the lowest weighted 3-month average refinancing rate exercised during the recent crisis. ii) More than the fixed ratio in relation to total FX assets, where the fixed ratio is initially set at 2%, but subject to review for adjustment according to prevailing conditions.
2009.11.19	<p>New Standards for FX Derivatives Trading Risk Management</p> <ul style="list-style-type: none"> - FX forward transactions of corporations will thus be limited to a fixed ratio of a maximum of 125% vis-à-vis physical trade to prevent excessive FX hedging
2009.11.19	<p>Tightened Regulations to Increase Mid- to long-term Financing in Foreign Loan Portfolios</p> <ul style="list-style-type: none"> - It was decided to change the criteria for mid- to long-term foreign loan financing from '1 year or more' to 'more than 1 year' while the calculation standard and classification will be the same with short-term foreign loans. - The ratio regulation will be tightened from the current 80% or more to 100% or more. Based on results next year, the ratio will gradually be revised upwards.
2010.6.14	<p>'New macro prudential measures to mitigate volatility of capital flows'</p> <p>Introducing New Ceilings on FX Derivatives Positions</p> <ul style="list-style-type: none"> - The ceilings on domestic banks' FX derivatives contracts will be no more than 50% of their capital in the previous month. In case of foreign bank branches, the ceilings will be set at 250%. - Stricter liquidity ratios require domestic banks to raise the LT financing for FX loans to 100%.
2010.6.14	<p>Reinforcing the Regulations on the Use of Foreign Currency Bank Loans</p> <ul style="list-style-type: none"> - Foreign currency financing should be operated for overseas use only. - Small and medium-sized manufacturers will be exceptionally allowed to operate it for the purpose of purchasing domestic facilities.
2010.6.14	<p>Improving FX soundness of financial institutions</p> <ul style="list-style-type: none"> - The limit on currency forward transactions of corporations will be lowered from 125% to 100% of the real transactions being hedged.
2010.12.19	<p>Imposing Macro-prudential Stability Levy</p> <ul style="list-style-type: none"> - It would charge on non-deposit foreign currency liabilities or total foreign currency-denominated debt exclusive of foreign currency-denominated deposits.
2010.12.19	<p>Restorations of withholding tax and Capital gains tax</p> <ul style="list-style-type: none"> - It would restore a 14% withholding tax on interest income and 20% tax on capital gains earned by foreign investors on Korean Treasury Bonds(KTBs) and Monetary Stabilization Bonds(MSBs).

Sources: Bank of Korea (BoK); Ministry of Strategy and Finance (MoSF); Financial Supervisory Service