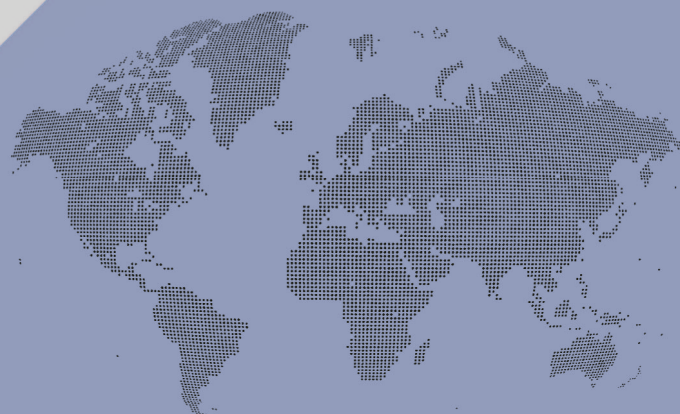


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# Exchange Rate Flexibility, Financial Market Openness and Economic Growth

**Il Houg LEE**

Korea Institute for International  
Economic Policy

**Kyunghun KIM**

Korea Institute for International  
Economic Policy

**Eunjung KANG**

Korea Institute for International  
Economic Policy

June, 2016

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Il Houngh LEE<sup>†</sup>Kyunghun KIM<sup>‡</sup>

Eunjung KANG\*

*Korea Institute for International Economic Policy (KIEP)**This version: June 27, 2016*

## Abstract

With global recovery not in sight, along with calls for stronger structural reform, international policy coordination is again under spotlight. Correcting global imbalance would contribute towards closing the demand gap. Emerging economies in particular should allow greater exchange rate flexibility and not intervene in the foreign exchange market to reflect fundamentals. Yet, the impact of greater exchange rate flexibility is unclear as they also struggle to keep their growth momentum alive and hedge against greater exposure to potential capital reversal than ever before. With the loss of monetary policy independence, emerging markets (EMs) are running out of policy options. Against this background, unless international policy coordination is fundamentally recast, a comprehensive review of all emerging market economies' policy options are in order, including both macro policy instruments, micro measures, and global safety net aimed at attaining the best possible solution to escaping global recession.

*JEL Classification: F31, F33, F43, G15*

*Keywords: exchange rate flexibility; financial market; economic growth; emerging economies; monetary policy independence*

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<sup>†</sup> President of Korea Institute for International Economic Policy (KIEP), Building C, Sejong National Research Complex, 370 Sicheongdaero, Sejong-si 30147, Korea

<sup>‡</sup> Research Fellow of KIEP

\* Senior Researcher of KIEP

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## I. Introduction

Recent discussions on macroeconomic policy coordination have focused on ways to lift global recovery and place it onto a higher and sustainable growth path. Along with structural reform efforts, closing demand deficiency through correcting global imbalance was part of the focus of the discussions. Expansionary fiscal policy was called for from surplus countries seen as still having adequate fiscal space. Regarding the different monetary policy stance across countries, advanced economies (AEs) should continue to aim at attaining domestic policy objectives while clearly communicating their intentions to the rest of the world. EMs were expected to allow greater exchange rate flexibility, which would also help dampen the degree of spillover. In this regard, the G20 communique notes: "consistent with central banks' mandates, current economic conditions require accommodative monetary policies in some [advanced] economies" and "stick to our previous exchange rate commitments"<sup>2</sup> the commitment being "more market-determined exchange rate systems and exchange rate flexibility to reflect underlying fundamentals, and avoid persistent exchange rate misalignments."<sup>3</sup>

To the extent that the exchange rate has been repeatedly used as a means to gain competitive advantage in trade, it should rightly receive full attention. Yet, attempt to curtail competitive devaluation may inadvertently bias policies against EMs under the current changing environment. First, monetary policy in advanced economies is equivalent to exchange rate policy in emerging economies—to be defined later—without currency convertibility and low financial openness. Second, the extensive global value chain has made the impact of competitive devaluation questionable and thus it is no longer common to use the exchange rate for the purpose noted here. Third, the underlying structural impediments as reflected in the sluggish recovery and large terms of trade shocks have contribute significantly to the imbalance.

These developments beg the question as to whether such a policy agreement is indeed an optimal package of policy coordination. As noted, capital flows into emerging economies and further downwards pressure on interest rates along with appreciation of the exchange

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<sup>2</sup> G20 (2015a), "Communiqué of G20 Finance Ministers and Central Bank Governors." (Istanbul, February 10, 2015)

<sup>3</sup> G20 (2015c), "Communiqué of G20 Finance Ministers and Central Bank Governors." (Ankara, September 5, 2015)

rate—all part of the likely spillover—will not necessarily be consistent with economic challenges faced by individual emerging markets. Moreover, to the extent that the main reason for the slow global recovery rests on structural impediments, placing too much expectations on EMs' demand response from exchange rate appreciation could be misplaced, and result in delaying implementing the needed policies for the recovery. Current account imbalances may be the result of structural impediments, demography, and excessive capital inflows in the first place, rather than exchange rate gaps (or misalignments).

Emerging economies have not only largely lost monetary policy independence, but are now also more exposed to foreign exchange market risks than a decade ago. More importantly, their lack of financial openness does not necessarily argue for greater exchange rate flexibility as its impact is at best ambiguous. Moreover, given the extensive network of global value chain, many EMs no longer find devaluation a solution to maintaining their relative competitiveness. Also, their attempt to raise international reserves to cover greater exposure to foreign exchange risks is wrongly perceived as policies to retain the current account gap. As a result, they are heavily constrained in policy options to close domestic demand gaps and to meet their desired current account balance targets.

On the positive side, there is consensus that large capital inflows to emerging markets have complicated macroeconomic management, and run the danger of transmitting liquidity overhang in advanced economies to emerging markets. As such, the G20 reiterated the common objective of what policy coordination should achieve, namely to attain "sustained internal and external imbalances"<sup>4</sup> in all member countries. In that context, they saw the need to contain large volatile capital flows from macro and financial stability perspectives and thought appropriate to support macroeconomic adjustments by "macro-prudential measures and, as appropriate, capital flow management measures."

Many of these points are empirical questions that will need to be assessed more rigorously. In this paper, we shed light on some of the issues noted above and question whether the conventional wisdom that forms the basis of the agreed policy package still remain valid in a rapidly changing global environment. In particular, we first define which country should be classified as an emerging market economy for the purpose of international macroeconomic policy discussions, and assess the usefulness of greater exchange rate

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<sup>4</sup> G20 (2015b), "Communiqué of G20 Finance Ministers and Central Bank Governors." (Washington DC, April 17, 2015)

flexibility as a policy instrument to reduce the probability of an exchange market crisis and supporting growth more broadly. In light of these findings, we conclude with policy options on how best EMs can manage their macroeconomic policies to attain internal and external balances.

The rest of the paper is organized as follows. The related literature on the transmission of US monetary policy to EMs and the impact of exchange rate flexibility on growth and productivity are discussed in Section II. Section III identifies financial market openness<sup>5</sup> as a key criterion that should be used for classifying a country as an emerging market economy for the purpose of this paper. In addition, we show that EMs' foreign exchange market exposure has risen sharply over the last two decades and that their domestic liquidity conditions were predominantly influenced by the monetary policy stance of the advanced economies. In Section IV, we supplement the arguments in earlier section with an empirical test showing that financial market openness for EMs is critical in determining the effect of exchange rate flexibility on economic growth. Section V challenges the conventional wisdom that closing the exchange rate gap (or misalignment) is the solution to most evils, but rather that emerging economies should apply a combination of all possible policy tools, including intervention in the foreign exchange market, to gain internal and external balances. We conclude in Section VI with a summary of policy implications.

## II. Literature Review

The loss of monetary policy independence by major emerging economies took place gradually over the last decade due to financial integration which in turn can be attributed to the opening of capital account and the sharp increase in global liquidity. Synchronization of monetary policy has not only limited policy options in emerging markets but also accompanied various side effects.

Cho and Rhee (2013), for example, investigate the effect of quantitative easing on Asian countries and found that countries with more open and developed financial markets experienced greater swings in capital inflows. Choi and Lee (2010) show that monetary policy synchronization between advanced and EMs has substantially strengthened, and the

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<sup>5</sup> "Capital market and financial market" openness are used interchangeably in this paper as the subtle difference are not of consequential importance.

corresponding transmission of policy stance from the former to the latter has contributed to global imbalances. While accommodation of advanced economies' monetary policy by EMs in excess of what is consistent with their natural rate has helped spur growth in EMs, it has widened saving-investment gap in Asia. Expansionary monetary policy reduces investment/GDP because output increase proportionately more than investment. The negative effect of expansionary monetary policy on investment/GDP dominates the effect on savings/GDP such that net savings/GDP increases in tandem with expansionary monetary policy in Asia.

Other studies on the consequence of monetary policy synchronization include Georgiadis (2015) who argues that US monetary policy generates sizable output spillovers to the rest of the world, and that the impact is larger for many economies than the domestic effect in the US itself. This is similar to Chen et al. (2015), who found the effects of US quantitative easing (QE) on the emerging economies to be diverse but generally larger than those in the United States and other advanced economies. Neely (2015) focuses on US unconventional monetary policy in 2008-2009 and finds that it reduced international long-term bond yields and the spot value of the dollar. Escolano et al. (2014) study the relationship between US contractionary monetary policies and EMs' sovereign debt crises while Mishra et al. (2014), Ahmed et al. (2015), and Bouraoui (2015) analyze the responses of EMs with respect to the taper-tantrum episode.

Regarding the transmission channels, Bernanke et al. (1999)<sup>6</sup> highlight the credit channel as the main modality of passing monetary policy shocks from the financial center such as the US, Euro, and Japan to other countries. More recently, Bruno and Shin (2015)<sup>7</sup> identify the risk-taking channel, while Rey (2015, 2016) notes the dominance of US dollar liquidity in the global market as the main channels of financial transmission from AEs to EMs.

Monetary policy synchronization also has a notable impact on the exchange rate in EMs, including rendering the latter redundant in terms of its role as a macroeconomic instrument. Rey (2015) highlights the dominance of the global financial cycle that is heavily affected by the monetary policy in the center country, and on EMs' national monetary policies

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<sup>6</sup> The external finance premium rises when the asymmetric information problem between lenders and borrowers worsens. Borrower's net worth determines the agency cost (monitoring cost), and net worth is affected by the boom-bust cycle. In the recession, the cost of fund increases due to the decreased net worth which raises the agency cost.

<sup>7</sup> A favorable shock increases demand for assets and this in turn decrease risk premia. The lower risk premia relaxes the value-at-risk constraint of financial intermediaries, which can provide more credit.

regardless of the exchange rate regime. This is supported by the empirical evidence provided by Rose (2014) who finds that there are no significant differences in economic outcomes between a hard exchange rate fixers and float with an inflation targeter for small open economies.

More broadly, empirical evidences do not back the argument that exchange rate flexibility supports growth. Rather, studies show that the effect of exchange rate flexibility on economic growth to be positive only under certain circumstances and generally insignificant otherwise. Aghion et al. (2009), for instance, offer empirical evidence that real exchange rate flexibility can have a significant impact on economic growth, but that the effect varies with a country's level of financial development. Less financially developed economies may derive growth benefits from maintaining a rigid exchange rate regime.

The effect of financial market openness on economic growth is elusive (Kose et al., 2009; Obstfeld, 2009). Bussière and Fratzscher (2007) argue that countries with open financial market tend to gain in the short-run, but that is not necessarily the case in the medium and long-term. Against this background, in this paper we estimate the long-run effect of financial openness on growth and how financial openness affects the effect of exchange rate flexibility on economic growth. Given the diverse empirical observations, we use the financial openness index to assess the impact of exchange rate flexibility on growth as financial openness, it turns out below, is critical in determining whether a country should be classified as an emerging market economy or not. In addition, we also review 10 EMs in some detail to gain insight of the current status quo of their economic situation.

### **III. EMs in the Integrated Financial Market**

#### **A. Financial Market Openness and Currency Convertibility**

Classifying countries into different groups is useful when reviewing the performance of a country with its peers. Countries are classified into different groups by international organizations (Table 1) depending on the purpose. The IMF, for example, divides the world into two major groups: advanced economies and emerging market and developing economies. The main criteria are per capita income, the degree of export diversification<sup>8</sup> and integration into the global financial system (IMF, 2015). The UNDP's country classification system is

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<sup>8</sup> The classification is not based on strict criteria, and it has evolved over time (IMF, 2015).



based on Human Development Index (HDI)<sup>9</sup>, and the World Bank on gross national income (GNI) per capita.

**Table 1. Country Classification Systems in Selected International Organizations**

	IMF	UNDP	World Bank
High income group	Advanced countries	Developed countries	High-income countries
Other countries	Emerging and developing countries	Developing countries	Low- and middle-income countries
Development threshold	Not explicit	75 percentile in the HDI distribution	US\$6,000 GNI per capita in 1987-prices
Share of high income group in 2010	17 percent	25 percent	26 percent

Source: Nielsen(2011), p. 19, Table 3.

FTSE and MSCI, the most widely used benchmarks in the global financial market, understandably use financial market-based measures. The FTSE uses a formal classification process founded on a set of principles: quality of market, materiality, liquidity, consistency and predictability, and market access (FTSE, 2013). The MSCI's classification system is based on: economic development, size and liquidity, and market accessibility (MSCI, 2014).<sup>10</sup> These measures are weighted to construct a single index, which in turn provides the basis of classifying countries into either an advanced economy or an emerging market economy.

For our purpose, we classify countries into advanced and emerging markets based on financial market openness and convertibility. But first, financial development refers to the degree to which the financial system eases market imperfections (Čihák et al., 2013). Empirical literature measures financial depth by private credit and stock market capitalization to GDP. However, these indicators do not take into account the complex multi-dimensional nature of financial development (Svirydzhenka, 2016). To overcome the shortcomings of these indicators, IMF compiled a new comprehensive indicator, capturing both financial institutions and financial markets in terms of their depth, access, and efficiency (Sahay et al., 2015). Even then, financial market development measure is less relevant for cross border activities since it tends to measure market size, rather than their underlying drivers (such as the institution, regulatory environment, and legal framework) or outcomes (financial stability measures). Financial openness, on the other hand, refers to the integration of financial markets of among

<sup>9</sup> The HDI is a summary measure of average achievement in key dimensions of human development: a long healthy life, being knowledgeable and have a decent standard of living (GNI per capita).

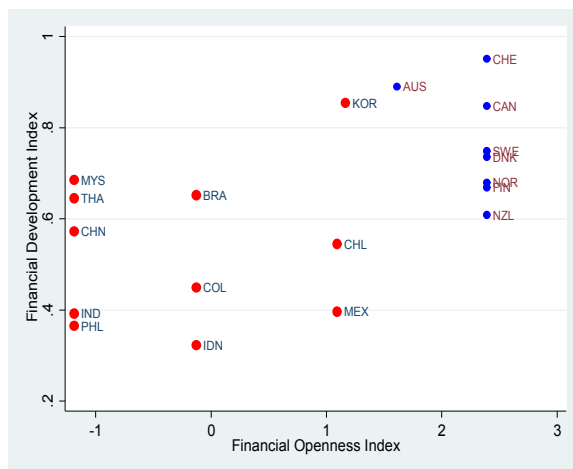
<sup>10</sup> See Table A. 1. in Appendix A.

countries, allowing residents and domestic institutions to participate in the transactions of international financial markets (Yu, 2014).

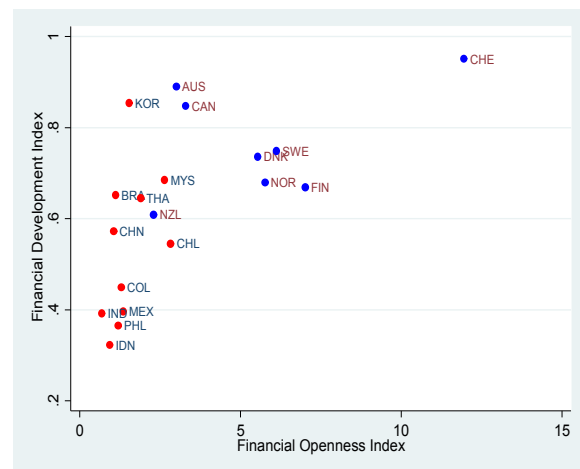
In fact, when placing countries in the financial development index and financial openness index space (see Figure 1 (a) and (b)), the reason for such grouping becomes clear.<sup>11</sup> The difference between EMs and ADs are much more distinct when comparing against financial openness index than using financial development index.<sup>12</sup> The differentiation becomes even clearer when using de facto (Lane & Milesi-Ferretti index) rather than de jure measures (Chinn-Ito index).<sup>13</sup>

**Figure 1. Financial Development and Financial Openness (2013)**

(a) Chinn-Ito index



(b) Lane & Milesi-Ferretti



Note: Blue points denote countries that use a freely convertible currency, and red points denote countries that do not use a freely convertible currency. Data on the currency convertibility is available at <http://www.financialfreedomindex.com/currency-convertibility.html>

Main sources for de jure indicators are (1) the IMF's Annual Report on Exchange Rate Arrangements and Exchange Restrictions, (2) Quinn et al. (2011), (3) KAOPEN index by Chinn and Ito (2008), (4) Financial Openness Index (FOI) by Johnston and Tamirisa (1998) and Brune and Guisinger (2006). De jure indices of financial openness provide information on regulations that restrict capital, but do not always reflect the actual degree of financial

<sup>11</sup> The idea of using financial openness index was suggested by Tamim Bayoumi, IMF, at the PIIE workshop.

<sup>12</sup> The level of financial openness is measured by Chinn and Ito Index (upper graph) and Lane and Milesi-Ferretti's indicator (lower graph). Blue points denote countries that use a freely convertible currency, and red points denote countries that do not use a freely convertible currency.

<sup>13</sup> The level of financial development in Korea, one of the countries using a non-convertible currency, is comparable with that in advanced countries like Australia and Canada, but the degree of financial openness is similar to that in EMs. As such, according to our classification, Korea is part of EMs.

integration (Quinn and Toyoda, 2008; Quinn et al., 2011; Kose et al., 2009; Estrada et al., 2015). The most widely used de facto measures are as follows: (1) Lane and Milesi-Ferretti (2007) which is calculated as a country's aggregate foreign assets plus liabilities as a share of GDP, (2) Kose et al. (2009) measure is total capital flows as a share of GDP.

Our classification appears to be more relevant when considering monetary policy coordination in the sense that EMs have much less policy options (i.e., monetary policy independence) to respond to a monetary shock from advanced economies because they face constraints on foreign exchange market liquidity front. Countries with a relatively low level of financial openness and non-convertibility of currency are easily exposed to macroeconomic and financial stability risks driven by capital inflow surges or sudden stops from abroad. These countries have more often experienced sharp drops in asset prices, contraction in output and financial crises since they are highly vulnerable to the impact of external shocks.

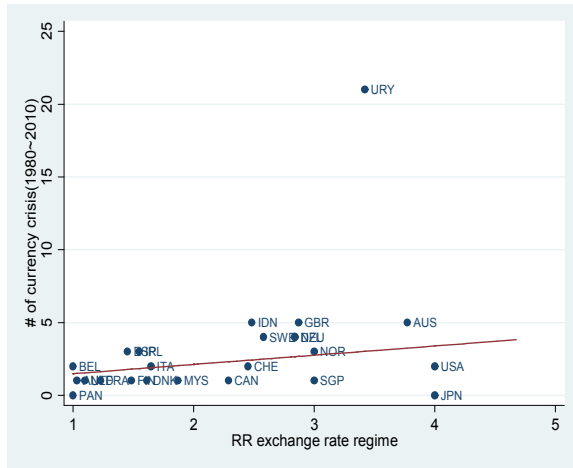
It is often argued that greater exchange rate flexibility would ensure EMs' monetary policy independence (or at least greater space). However, actual experiences indicate that this is not the case. When counting the number of currency crisis for each country over the last 30 years, greater exchange rate flexibility appears to have not played any role (see Figure 3 (a) and (b)).<sup>14</sup> Rather, there is weak evidence that greater flexibility of exchange rate is associated with more currency crisis than less. This is the case even when comparing financial openness with flexibility on "de jure" basis. In the following section, we provide empirical evidence based on panel data covering 87 countries from 1966 to 2010.

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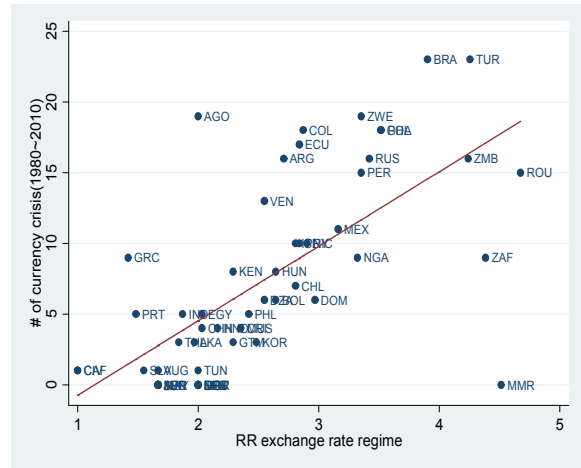
<sup>14</sup> Data (currency crisis, external debt crisis and exchange rate regimes) are from Reinhart and Rogoff (2004) and financial openness is using Chinn-Ito index.

Figure 2. Currency Crisis and Exchange Rate Flexibility (1980~2010)

(a) Chinn-Ito index  $\geq 1$



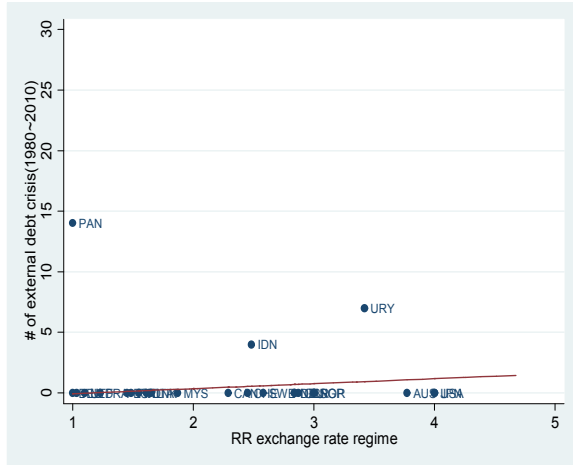
(b) Chinn-Ito index  $< 1$



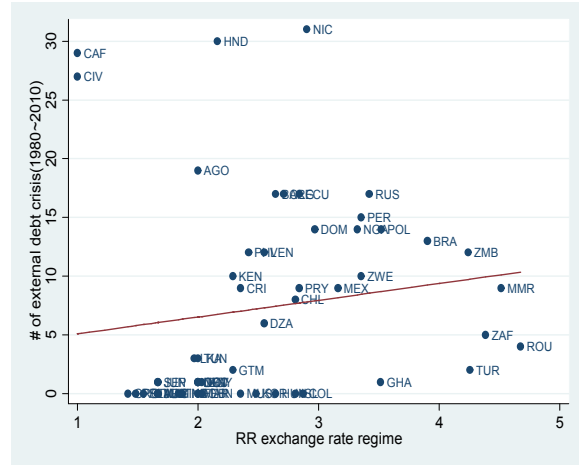
Note: Linear lines are regressed without outliers (URY, AGO, MMR)  
 Source: Reinhart and Rogoff (2004, 2011) and Chinn and Ito (2006)

Figure 3. External Debt Crisis and Exchange Rate Flexibility (1980~2010)

(a) Chinn-Ito index  $\geq 1$



(b) Chinn-Ito index  $< 1$

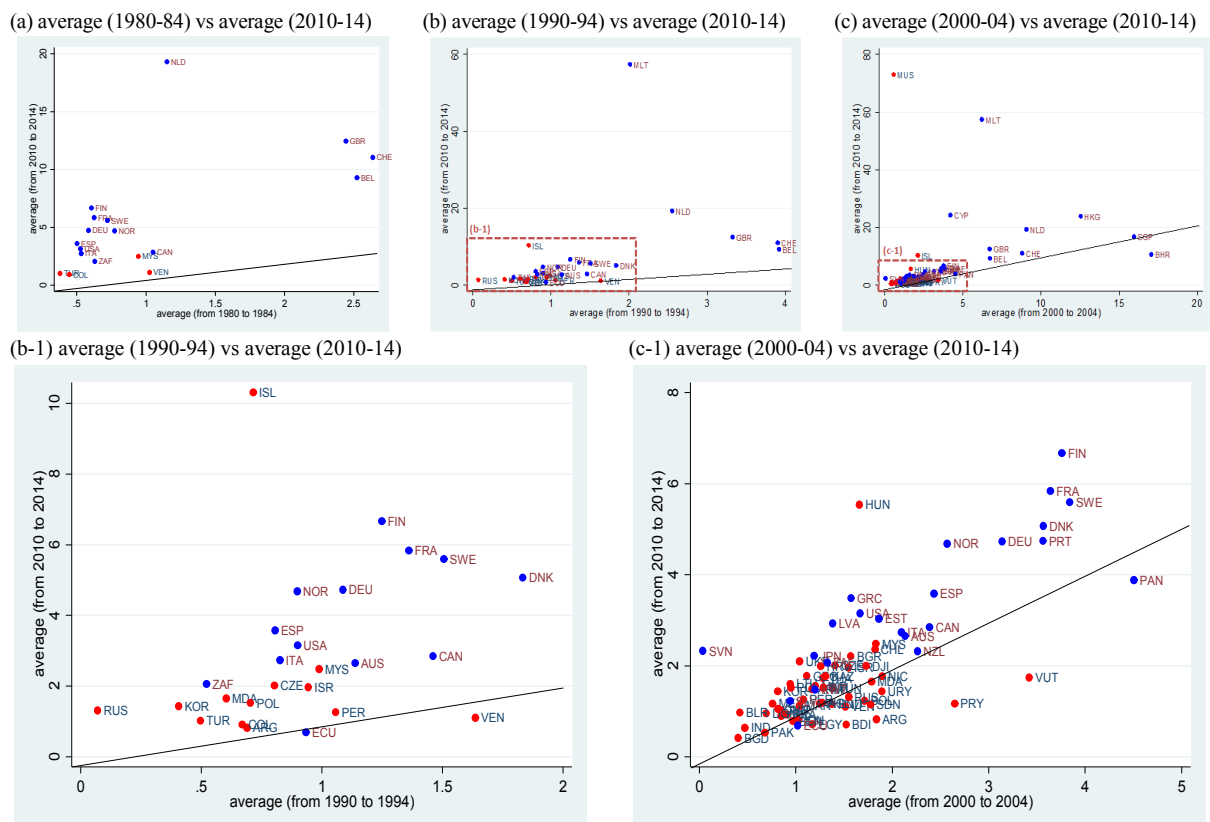


Note: Linear lines are regressed without outlier (PAN)  
 Source: Reinhart and Rogoff (2004, 2011) and Chinn and Ito (2006)

## B. EMs' Position in Global Financial Market

It is interesting to note that most of ADs' financial openness indices have increased by a large amount during the 1980s. Except for a small number of emerging market countries, it was during the 2000—characterized as a period of large expansion of global liquidity, that ADs' financial openness indices diverged substantially from those of the EMs. For most EMs, their financial openness remained stuck, perhaps indicative of the comparative advantage EMs have on manufacturing and merchandize trade, relative to financial market activities that require a completely different set of skills. On de jure basis, Kose et al. (2009) found even less change over the last 2 decades. Perhaps emerging markets found it more difficult to open their capital account in the face of rapid expansion of global liquidity and thus tended to slow the pace of capital account liberalization. How best to transit from a low to a high financial openness economy is a different subject altogether that is not covered in this paper.

**Figure 4. Comparison of Financial Openness Index (Lane and Milesi-Ferretti)**

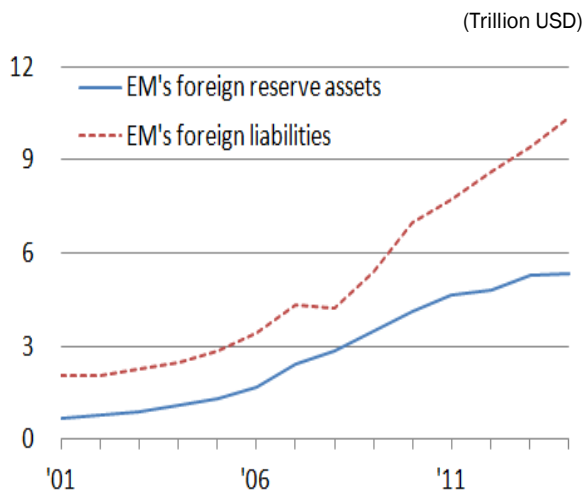


Note: Black line is 45 degree line. Blue points denote countries that use a freely convertible currency, and red points denote countries that do not use a freely convertible currency. Data on the currency convertibility is available at <http://www.financialfreedomindex.com/currency-convertibility.html>

Source: Chinn and Ito (2006)

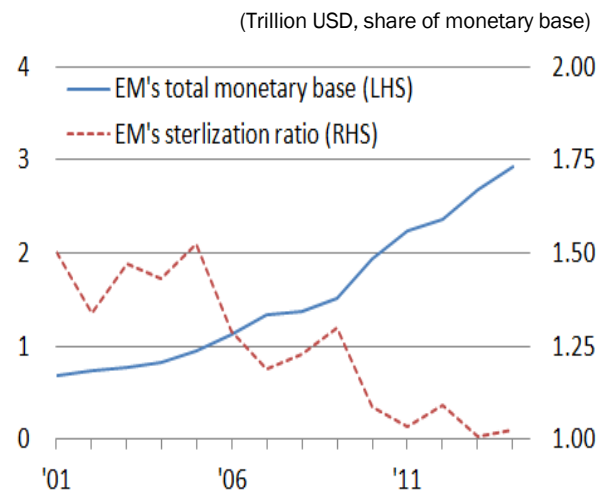
In fact, during the last 15 years in particular, foreign liabilities of key EMs<sup>15</sup> (2/3 of non-advanced economies' GDP) have increased from US\$2.1 trillion to US\$10.4 trillion. Foreign reserve assets rose from US\$0.7 trillion to US\$5.3 trillion contributing to more than 100% of their base money growth—which in turn rose from 20 percent of GDP to 31 percent of GDP. Sterilization (measured using central bank bills and government bonds only) as share of base money declined, which together with the increase in foreign liabilities, have increased exposure to foreign exchange shocks and rapid capital outflows.

**Figure 5. EM's total foreign reserve assets and foreign liabilities**



Source: CEIC.

**Figure 6. EM's total monetary base and sterilization ratio**



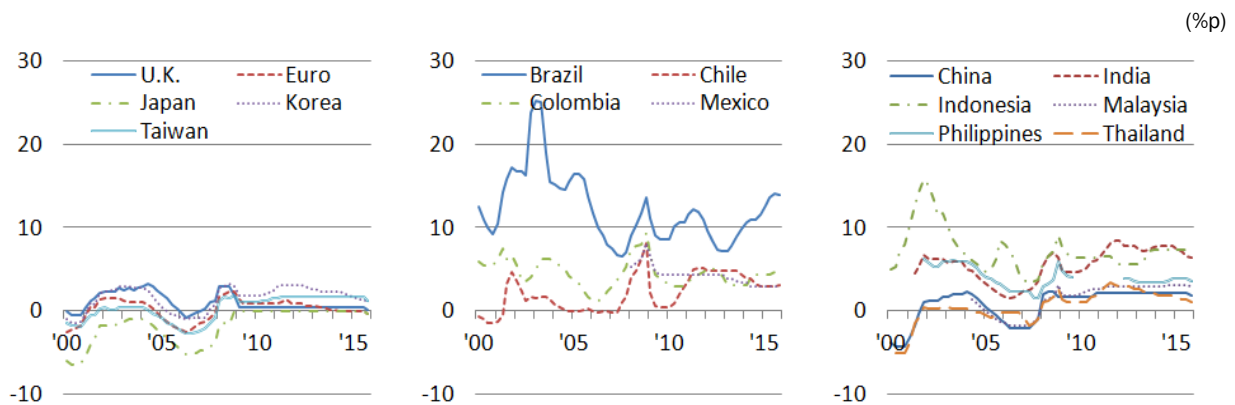
Source: CEIC and author's calculation.

EMs have largely lost monetary policy independence. Irrespective of the policy regime, i.e., fixed exchange rate or inflation/monetary aggregate targeting, their interest rates are increasingly being influenced by those in advanced economies (plus individual country risk spread).<sup>16</sup> Moreover, due to the increasing amount of foreign share in financial assets, long-term rate in the US also raises long-term rates in many emerging economies, not necessarily because the former granger causes the latter, but because they are becoming integrated.

<sup>15</sup> Brazil, Chile, China, Colombia, India, Indonesia, Malaysia, Mexico, Philippines and Thailand.

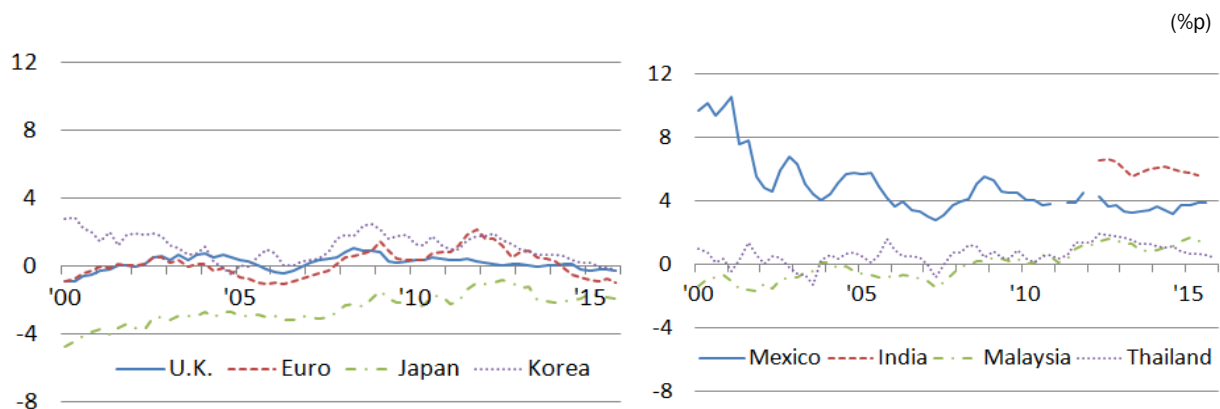
<sup>16</sup> Rose, A.K. (2014), "Surprising Similarities: Recent Monetary Regimes of Small Economies," *Journal of International Money and Finance*, 49, 5-27 and Rey, H. (2015), "Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence," NBER Working Paper.

Figure 7. Policy rate gap



Note: the difference between each country's policy rate and federal funds rate.  
Source: IMF IFS and author's calculation.

Figure 8. Long term interest rate gap



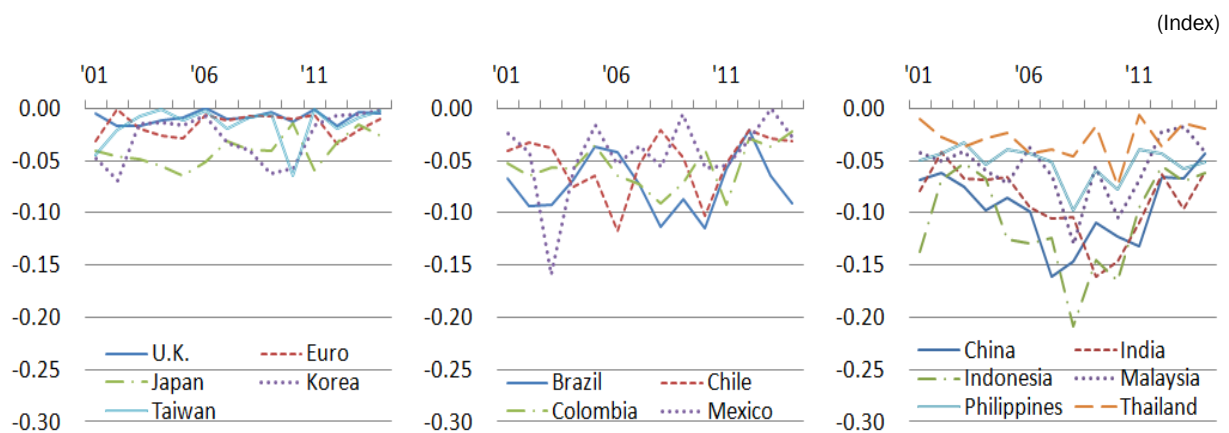
Note: Difference between US and respective country's long term government bond yields  
Source: IMF IFS and author's calculation.

In a similar vein, the level of the exchange rate in EMs is now determined more by market expectations on the dollar, rather than through intervention or the interest rate parity condition. For example, intervention in the foreign exchange market had less of an impact (i.e., statistically insignificant and also often with opposite sign) on the won/dollar rate than the US dollar index (e.g., US nominal effective exchange rate). That said, interest rate differential granger caused the won/dollar rate over the medium term, with a rise in the Korean interest rate relative to that of the US leading to an appreciation with a lag of about 7-8 quarters.<sup>17</sup>

<sup>17</sup> This reflects continuous appreciation of the won over the last two decades (except for the two period—once after the dotcom bubble and the global financial crisis—whence it depreciated sharply) as its growth hovered above that of the US.

Monetary dependence is problematic as their business cycles are not necessarily synchronized with that of the United States. Against increasingly synchronizing interest rates, business cycles are not showing similar convergence except among the US, the euro area, and the UK. Another group of countries that diverged moderately from the US growth cycle are Japan, Taiwan POC, and Korea, in that order.<sup>18</sup> Among emerging economies, none of the EMs tested<sup>19</sup> show convergence of their GDP cycle with that of the US. Moreover, business cycles in the BRICs are not only dis-synchronized, but also diverged substantially in level terms especially during the mid-2000s from the US growth cycle.

Figure 9. Synchronization of business cycle



Note: Synchronization of business cycle is measured by the negative of divergence in growth rate, defined as the absolute value of GDP growth differences between each countries and U.S.

Source: author's calculation using the Kalemli-Ozcan et al. (2013)'s methodology.

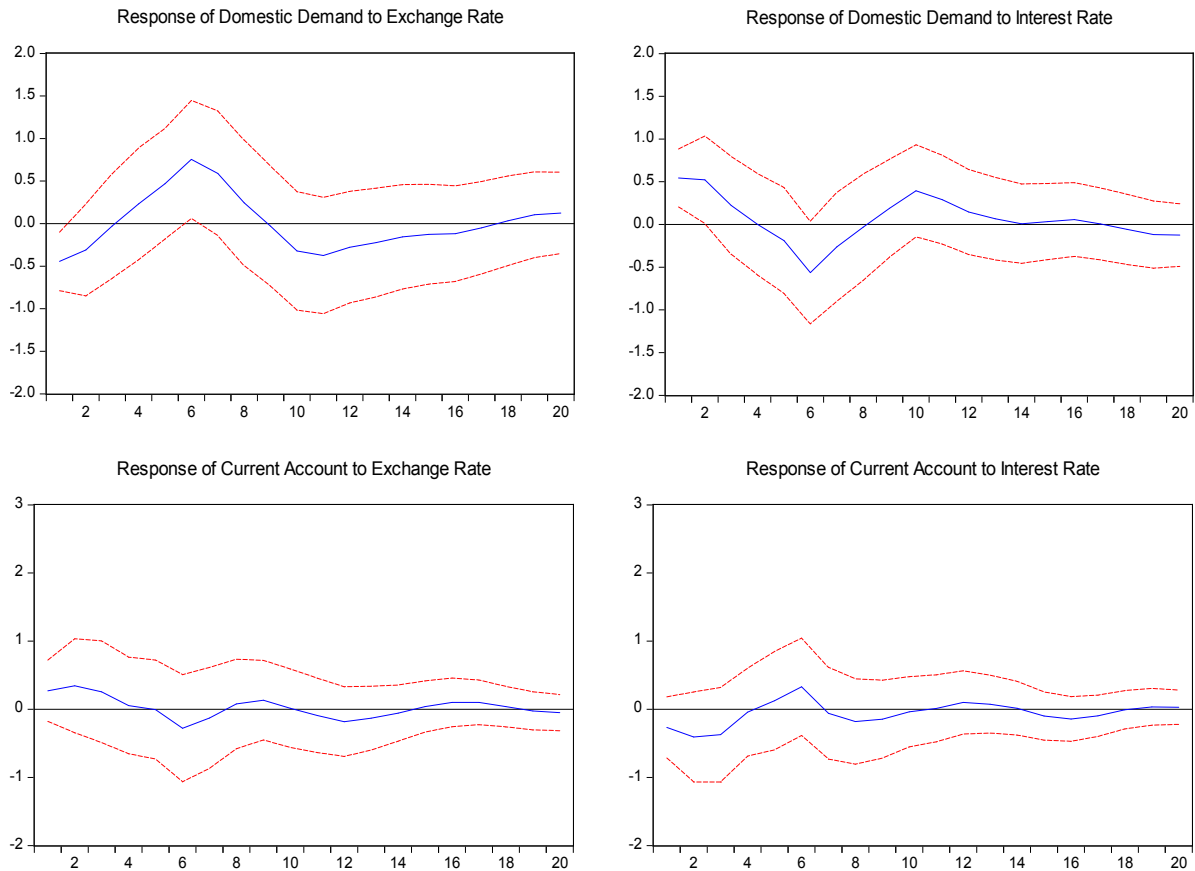
Lack of monetary independence should not be blamed, however, for the weakening economic activities in EMs. Although it is only a counterfactual conjecture, even if independence were to be gained, it is not clear to what extent it would be effective as a policy tool. This pessimism rests on the reality that the global economy is in the middle of a structural recession and not so much in a downturn of a transitory business cycle.

<sup>18</sup>Tested using simple correlation, Kalemli-Ozcan et al. (2013), "Global Banks and Crisis Transmission", *Journal of International Economics*, 89(2), and Morgan et al. (2004), "Bank Integration and State Business Cycles," *The Quarterly Journal of Economics*, 119(4).

<sup>19</sup> Brazil, Chile, Columbia, Mexico, China, India, Indonesia, Malaysia, the Philippines, and Thailand.



**Figure 10. Impulse responses of current account and domestic demand to exchange rate and interest rate**



Note: The VAR uses data from 2000Q3 to 2015Q3. The generalized impulse functions are calculated using the method described by Peasaran and Shin (1998). The dashed lines indicate 95-percent confidence bands. Exchange rate, domestic demand and current account (normalized by GDP) are growth rates (year-on-year). The exchange rate is defined as Korean won/US dollar. The first difference of interest rates is used. Global GDP and terms-of-trade are included in the VAR but, not reported here.

Source: author's calculation using the structural VAR.

Capital flows have played an important role in supporting growth in developing economies. However, excessive global liquidity has also destabilized or replaced local capital. For example, capital inflows to a small open economy currently at internal and external balances may experience asset price bubble, bond price hike, or credit expansion requiring adjustments by domestic agents. In particular, inflows to a small open economy due to liquidity expansion in originating economy without underlying productivity differences (i.e., net savings) could induce a current account deficit in the recipient country inducing the capital to return to the originating country through a current account surplus. In this case, capital inflows will replace investment in the recipient country with corresponding increase in

its foreign liability, undergoing potentially a costly adjustment, only to return to the original steady state. Potential 3 policy options are shown below as illustrative scenarios.

Illustrative Scenario: Inflows to a country in Equilibrium			Balance Sheets of 10 Emerging Economies, 2001-2014 (in USD bn)		
<b>Balance of payments</b>			<b>Balance of payments</b>		
Current account	-100 <sup>①</sup>	Current account	Current account	1,836	Current account
Capital account			Capital account		
Non reserves		Foreign liabilities less FDI	Non reserves	-3,816	8,294 4,012 less FDI
Reserve assets		100	Reserve assets	-4,675	
<b>Banking system</b>			<b>Banking system</b>		
NFA	100 <sup>② ③</sup>	NFA	NFA (Central B)	4,675	NFA
	-100 <sup>①</sup>		NFA (Deposit B)		
NDA			NDA	4,871	
NDC	100 <sup>②</sup>		NDC (Non-steril)	3,253	
		100 Deposits	Credit	196	4,012 Deposits
Central bank	100	-100 <sup>①</sup>	Central bank	1,421	
<b>Financial system</b>			<b>Financial system</b>		
Nonresident		100 Nonresident	Nonresident		4,012 Nonresident
Resident	<sup>①</sup>	-100 Resident	Resident		3,449 Resident
	<sup>②</sup>	100			
① Exchange rate appreciation; current account deficit			Total inflows of \$10.1 tr, of which \$1.6 tr outflows via current account		
② Non-sterilized intervention; credit expansion; asset price increase			Intervention \$4.7 tr of which \$1.4 sterilized; \$3.8 tr investment abroad		
③ Sterilized intervention; 1/2 asset price increase			Total additional funding of \$7.5 tr due to balance of payments inflows		

Aggregated data of the 10 emerging economies during 2001-2014 record total inflows of US\$10.1 trillion, of which about half were in the form of FDI. Total current account surplus amounted to US\$1.8 trillion. Of the total inflows, US\$4.7 trillion was absorbed as intervention by central banks and US\$1.4 trillion sterilized, allowing the rest to be added to domestic credit (assuming multiplier of 1 for sake of simplicity). The non-FDI components of foreign liabilities which would be tied to some type of local assets (i.e., the domestic currency counterpart of inflows) amounted to US\$4.0 trillion. Thus, a total US\$7.5 trillion increase in these 10 EMs' local assets were due to inflows from abroad. How much of this was excessive, i.e., beyond the amount needed to retain external and internal balance while attaining robust growth, is a difficult question to answer. However, US\$7.5 trillion is about 150 percent of base money growth or 50 percent of GDP growth of these 10 emerging economies, which appears to be on the excessive side.

## IV. Empirical Analysis

We investigate how financial market openness affects the effect of exchange rate flexibility or exchange rate regime on economic growth. We find that exchange rate flexibility has a negative effect on economic growth, but this effect varies with the degree of financial market openness. Our hypothesis is that flexible exchange rate has a negative impact on economic growth when the financial market openness is low. The measure of exchange rate flexibility is the exchange rate regime classified by Reinhart and Rogoff (2004, henceforth RR)<sup>20</sup>. For the robustness check, the standard deviation of the real effective exchange rate is considered. We present the empirical model and variables used in the analysis and then show the main results based on a dynamic panel of 87 countries from 1966 to 2010.

### A. Empirical Model and Data

We use the dynamic panel model developed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). For addressing the endogeneity issues, we compute robust two-step standard errors by following methodology proposed by Windmeijer (2005). We use the unbalanced panel data constructed by non-overlapping 5-year averages to focus on long-run growth effects. The list of countries is presented in Table A.2 in Appendix A.

As noted, our baseline empirical model is similar to Aghion et al. (2009), which provides empirical evidence that real exchange rate flexibility can have a significant impact on productivity growth, and the effect depends on a country's level of financial development. Instead of financial development measure, we use financial market openness to see whether the effect of exchange rate flexibility on economic growth varies over the degree of financial market openness. Equation (1) is our baseline empirical model specification.

(1)

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)y_{i,t-1} + \beta_1 ER_{i,t} + \beta_2 ER_{i,t} \cdot KA_{i,t} + \beta_3 KA_{i,t} + \delta' Z_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}$$

where  $y_{i,t}$  is the log of output per capita;  $ER_{i,t}$  is a measure of exchange rate flexibility;

<sup>20</sup> Updated dataset is available at <http://www.carmenreinhardt.com/data/browse-by-topic/topics/11/> by Ilzetzki et al. (2008)

$KA_{i,t}$  is a measure of financial market openness;  $Z_{i,t}$  is a set of control variables;  $\mu_t$  is the time-fixed effect;  $\eta_i$  is the country-fixed effect; and  $\varepsilon_{i,t}$  is the error term.

We begin by the benchmark specification, Equation (1), and then extend model specification by adding financial development measure and financial crisis indicators from Reinhart and Rogoff (2011). The measure of exchange rate flexibility( $ER_{i,t}$ ) in our benchmark specification is 5-year average of RR exchange rate classification following the methodology used by Aghion et al. (2009). The RR coarse classification of exchange rate regime orders regimes from the most rigid to the most volatile:  $ERR_{i,t} \in \{1,2,3,4\} = \{\text{fix, peg, managed float, float}\}$ . The measure of exchange rate regime is computed as

$$(2) \quad ER_{i,t,t+5} = \frac{1}{5} \sum_{l=1}^5 ERR_{i,t+l}$$

The financial market openness( $KA_{i,t}$ ) is the Chinn-Ito index<sup>21</sup>. The interaction term of exchange rate flexibility( $ER_{i,t}$ ) and financial market openness( $KA_{i,t}$ ) is the key variable that shows how financial market openness affects the effect of exchange rate flexibility on the GDP per capita, which is the dependent variable indicating the economic growth.

The set of control variables includes average years of secondary schooling, lack of price stability (inflation), government burden (government spending as proportion of GDP), trade openness (import and export as proportion of GDP) etc. Crisis dummies from Reinhart and Rogoff (2011) indicate the frequency of a currency crisis and external debt crisis within each 5-year interval. The sources and definitions of variables used in the empirical analysis are presented in Table A.3 in Appendix A.

## B. Exchange Rate Flexibility and Financial Market Openness

Table 3 reports estimated coefficients of the effect of the exchange rate flexibility on GDP per capita. The first regression in Table 3. (1) estimates the effects of the exchange rate flexibility, financial market openness, interaction term of exchange rate flexibility and financial market openness, and a set of control variables.

<sup>21</sup> This index is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). See [http://web.pdx.edu/~ito/Chinn-Ito\\_website.htm](http://web.pdx.edu/~ito/Chinn-Ito_website.htm)

Table 3. Main Result

	RR Coarse Classification			
	(1)	(2)	(3)	(4)
Exchange Rate Flexibility (ER)	-1.920** (0.752)	-1.669** (0.680)	-1.419** (0.638)	-0.793 (2.463)
Financial Market Openness (KA)	-7.424*** (2.803)	-6.637** (2.544)	-5.210** (2.014)	-6.005* (3.296)
Financial Development (FD)			0.398 (0.410)	0.828 (1.652)
Initial GDP per capita	-0.377 (0.634)	-0.482 (0.625)	-1.308** (0.583)	-1.265** (0.589)
Flexibility × Financial Market Openness (ER × KA)	3.731*** (1.257)	3.407*** (1.135)	3.021*** (1.076)	3.435** (1.616)
Flexibility × Financial Development (ER × FD)				-0.224 (0.815)
Education	1.551 (1.081)	1.748* (1.024)	2.647*** (0.772)	2.559*** (0.797)
Trade Openness	1.767*** (0.593)	1.761*** (0.560)	1.507*** (0.499)	1.485*** (0.566)
Government Burden	-1.506 (1.018)	-1.549 (1.049)	-0.866 (0.903)	-0.868 (0.952)
Lack of Price Stability	1.608 (2.581)	3.647 (2.796)	3.233 (4.478)	2.982 (4.735)
Currency Crisis		-0.265 (0.186)	-0.254 (0.193)	-0.223 (0.215)
External Debt Crisis		-0.375*** (0.132)	-0.444*** (0.133)	-0.448*** (0.137)
No.countries/observations	87/536	87/536	87/534	87/534
Specification tests(p-values)				
Hansen test	0.218	0.218	0.250	0.270
Serial Correlation				
First-order	0.000	0.001	0.001	0.001
Second-order	0.811	0.770	0.796	0.796
Wald tests(p-values)				
$H_0$ : total effect of ER = 0	0.011	0.008	0.012	0.027
$H_0$ : total effect of KA = 0	0.014	0.012	0.023	0.071

Note: The estimation methodology is two-step system GMM with small sample robust correction. Time-fixed effects are included in all regressions. Standard errors are in the parentheses. \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1-percent levels, respectively. Dependent variable is growth rate of GDP per capita. A constant term is included, but not reported.

The exchange rate flexibility is negative and significant, which is consistent with the previous studies. The interaction term of exchange rate flexibility and financial market openness is positive and significant, which means that the more open the financial market is, the more positive impact of exchange rate flexibility on economic growth is. The total effect of exchange rate flexibility on economic growth (Wald test) is statistically significant at the 5% confidence level.

The second regression in Table 3. (2) adds crisis dummy variables. External debt crisis becomes significant at the 1% level, and exchange rate flexibility and interaction of exchange rate flexibility and financial market openness is still significant and consistent with the first regression. The third regression in Table 3. (3) includes financial development additionally. Exchange rate flexibility and interaction term stay significant and consistent with the first two regressions. In the fourth regression, financial development and crisis dummy variables are all included. The exchange rate flexibility becomes insignificant but, the interaction of exchange rate flexibility and financial market openness is positive and significant, and the Wald test of total effect of exchange rate flexibility is significant at the 5% level.

The interesting finding of Table 3 is that the effect of exchange rate flexibility on economic growth varies with the degree of financial market openness. This implies that the volatile exchange rate hampers economic growth when the financial market openness is low. Thus, countries whose financial market is less integrated to the world relative to their GDP, it may derive economic growth from maintaining a rigid exchange rate regime. Education and trade openness in other control variables are consistent with the previous literature. Government burden and lack of price stability become insignificant in Table 3.

### C. Alternative Exchange Rate Flexibility

We conduct the robustness test to alternative measures of exchange rate flexibility. One is the exchange rate flexibility calculated based on the fine classification of exchange rate regime defined by Reinhart and Rogoff (2004). It is finer classification that ranges from 1 to 13 than that is used in the benchmark specification<sup>22</sup>. Another measure of exchange rate flexibility is computed by following the methodology used by Aghion et al. (2009).  $RER_{i,t}$  is the real effective exchange rate and the standard deviation of the growth rate of the real

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<sup>22</sup> See Table A. 4. in Appendix A.

effective exchange rate is calculated in each 5-year interval.

$$(3) \quad \sigma_{i,t,t+5} = \text{stdev} [\ln(RER_{i,t}) - \ln(RER_{i,t-1})]$$

Table 4 shows that our main result of Table 3 is robust to alternative measures of exchange rate flexibility. Table 4. (1) and (3) are the result based on RR fine classification of exchange rate regime and exchange rate volatility calculated by Equation (3), respectively. The estimated coefficient of exchange rate flexibility is negative and significant in all alternative exchange rate flexibility specifications and the interaction of exchange rate regime and financial market openness is positive and significant as well. Table 4. (2) and (4) adds the crisis dummy variables, the results are robust to the benchmark specification. The set of control variables, education, trade openness, government burden, and lack of price stability are all consistent with the main result.

Table 4. Robustness Test

	RR Fine Classification		Exchange Rate Volatility	
	(1)	(2)	(3)	(4)
Exchange Rate Flexibility (ER)	-0.561*** (0.202)	-0.499** (0.192)	-14.95** (5.699)	-11.73* (6.148)
Financial Market Openness (KA)	-7.509*** (2.773)	-6.716** (2.645)	-1.216* (0.722)	-1.003 (0.792)
Initial GDP per capita	-0.112 (0.625)	-0.203 (0.608)	-1.246** (0.524)	-0.877 (0.531)
Flexibility × Financial Market Openness (ER × KA)	1.069*** (0.341)	0.984*** (0.314)	33.10** (14.58)	30.62* (16.77)
Education	1.316 (1.124)	1.482 (1.046)	2.885** (1.206)	2.114* (1.159)
Trade Openness	1.838*** (0.571)	1.824*** (0.538)	0.815** (0.377)	0.999** (0.381)
Government Burden	-2.011* (1.015)	-2.029** (1.017)	-1.371 (1.191)	-1.706** (0.825)
Lack of Price Stability	1.555 (2.320)	3.712 (2.585)	-5.460 (4.683)	0.276 (4.734)
Currency Crisis		-0.272 (0.168)		-0.612*** (0.209)
External Debt Crisis		-0.325** (0.141)		-0.181 (0.165)
No.countries/observations	87/536	87/536	48/294	48/294
Specification tests(p-values)				
Hansen test	0.344	0.372	0.967	0.990
Serial Correlation				
First-order	0.001	0.001	0.004	0.003
Second-order	0.714	0.685	0.679	0.502
Wald tests(p-values)				
$H_0$ : total effect of ER = 0	0.007	0.005	0.039	0.173
$H_0$ : total effect of KA = 0	0.008	0.006	0.050	0.178

Note: The estimation methodology is two-step system GMM with small sample robust correction. Time-fixed effects are included in all regressions. Standard errors are in the parentheses. \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1-percent levels, respectively. Dependent variable is growth rate of GDP per capita. A constant term is included, but not reported.



## V. Addressing the Limitations of Monetary Policy

### A. Internal and External Balance

A core objective of international economic policy coordination is to agree on policy combinations that would achieve pareto improvement to support global economic growth. To avoid a country benefit at the expense on another, individual country's policies should be limited to ensuring the attainment of internal and external balance. Internal balance is attained when an economy is at full employment with price stability while external balance is attained when a country's financial position, both in flow and stock terms, is sustainable vis-a-vis the rest of the world. It was in this spirit that the G20, following the global financial crisis, agreed on a multilateral policy coordination using "Mutual Assessment Process"<sup>23</sup> as a basis for achieving a lasting recovery and strong and sustainable growth over the medium term.

The IMF was asked to provide "analysis of how the G20's respective national and regional policy frameworks fit together" such that countries' policies are "collectively consistent with more sustainable and balanced trajectories for the global economy."<sup>24</sup> Indicators that countries were expected to adhere to were public debt and fiscal deficits; private saving and private debt; and the external position, comprising trade balance, net investment income flows, and transfers. As economies struggled to recover from the crisis, adhering to these indicators would broadly ensure policies would not nurture, but reduce, external imbalance (or restore balance) without placing undue policy burden on each other.

The IMF developed External Balance Assessment (EBA) methodology, an extension of its traditional methodology dating back to the mid-1990s, to assess external imbalance. The assessment centers on identifying gaps in the current account and the real exchange rate.<sup>25</sup> Other policies, i.e., structural fiscal balance, health care spending, capital controls, and the level of international reserves, were also factored in to explain part of the gaps first. The remaining gap was then attributed to misalignment of the real exchange rate—implicitly assuming that the exchange rate is rigid or temporarily off its equilibrium path.

Although this approach is very comprehensive and captures most policy aspects relating to imbalance, it still falls short in some respect. First, it only captures part of

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<sup>23</sup> IMF (2009), "The G-20 Mutual Assessment Process and the Role of the Fund." (December)

<sup>24</sup> G20 (2009), "G20 Leaders' Statement: The Pittsburgh Summit." (Pittsburgh, September 24-25, 2009)

<sup>25</sup> See Appendix B for a summary of EBA's conceptual framework.

structural problems which is a critical handicap at this juncture when the global economy suffers demand deficiency due in large part to structural impediments.<sup>26</sup> Second, fiscal and health spending gaps of individual countries are skewed towards the advanced economies. Since the average, against which individual gaps are measured, is weighted by GDP, policy stance by few key advanced economies becomes the norm and all other smaller countries will have to follow suit without due regards to specific country circumstances. So, if the US, for example, runs a deficit, EMs by default are running a fiscal surplus by this measure.

Another shortfall most relevant to this paper is the omission of monetary policy from the analysis. Interest rate enters the equation only through the output gap via the Taylor's rule. However, to the extent that output no longer responds systemically to changes in interest rates (i.e., liquidity trap with interest rates at close to zero or negative), and emerging economies no longer have monetary policy independence, it is not clear what Taylor's rule means in EMs, and even less whether monetary policy can simply be omitted from this assessment. In Section 2, we have noted various studies that show the impact of AD's monetary policy transmission to EMs taking various forms and shapes.

As a matter of fact, under the EBA, structural impediments, policy bias towards the average of advanced economies' stance (e.g., structural fiscal position and health spending), and monetary policy changes by advanced economies are all picked up by emerging economies as exchange rate misalignment. What is perhaps more disconcerting at a time when the role of the exchange rate is overstated, is the fact that the impact of exchange rate on EMs' current account have declined due to extensive global value chain. As such, closing the exchange rate gap as identified under the EBA would call for a much larger adjustment in the exchange rate than what would be consistent with EMs' fundamentals. Over-adjustment will have unintended consequences on domestic demand. Such a case would be more likely in a highly open economy dependent on imported inputs.

Discussions at the G20 were broadly consistent with the way EBA was set up. It argued for greater flexibility of the exchange rate and endorsed any monetary policy stance by advanced economies as long as it was targeted towards domestic objectives. Given the current underlying analytical approach, this means that emerging economies will be required to appreciate their currency (close the exchange rate gap) in response to an expansionary

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<sup>26</sup> This shortfall is partly addressed in the comprehensive External Sector Report where qualitative assessment accompanies the results, but still not enter in the quantitative analysis itself.

monetary policy in advanced economies. Expansionary monetary policy will result in capital inflows to emerging economies irrespective of whether the latter is at equilibrium (internal and external balance). If so, it is de facto equivalent to beggar-thy-neighbor policy even though unintended. In this case, an optimal policy response by capital recipient emerging market economy would be sterilized intervention. However, such a response under the current approach would be against the G20 agreement, accused of intervention in the foreign exchange rate market.

On the positive side, however, G20 called for “macro-prudential measures and, as appropriate, capital flow management measures” in support of the necessary macroeconomic adjustment when “dealing with macroeconomic and financial stability risks arising from large and volatile capital flows.” This goes a long way towards establishing the right balance to an unbiased policy coordination in favor of advanced economies. What still remains as a problem is the fact that the exchange rate gap is de facto the residual of all unidentified policy gaps, including structural impediments.

## **B. Policy Independence for Emerging Economies**

In emerging economies with open capital account, following the Taylor’s rule is not possible as interest rate differential could lead to large volatile capital flows. At the same time, the exchange rate does not necessarily adjust to domestic market conditions but, instead is more often influenced by global market sentiment on the US dollar value. Moreover, structural impediments holding global recovery hostage are also often found to be in place in EMs, heavily pulling current account balances into certain directions such that the exchange rate alone cannot close the gap.

Thus, to reduce imbalance, policy coordination calls for a different approach altogether that should perhaps rely only on estimating the current account norms, and letting individual countries determine how best to close their respective gaps. Since advanced economies will not likely include EMs’ concerns in their monetary policy objective function, EMs should respond optimally, taking AEs’ policies as given, and use whatever policy instruments that work for them. More specifically for EMs;

- (i) Choose interest rate or exchange rate or both as policy instruments (each time taking into account exogenous factors such as expectations on the US\$ movements, terms of trade shocks, and financial uncertainties) with supporting quantity

adjustment operations in liquidity, e.g., sterilization, that would work best in each situation;

- (ii) Introduce capital flow measures and/or macro-prudential measures with a view to contain build-up of risks and bubbles in specific markets and asset types and to ensure external and internal balances are maintained;
- (iii) Maintain adequate level of international reserves as insurance, taking into account global and regional safety nets, recognizing that the threshold of reserves that would provide market confidence is asymmetric between times of stress and stability.

In determining the right external balance target, i.e., the current account norm, one needs to be mindful of aging, global value chains, and financial market conditions. Aging would likely call for different mix of current account norms across countries than would otherwise be called for and the extensive global value chain will complicate attaining external balance as simply through changes in the exchange rate.<sup>27</sup>

A review of capital control measures that would discourage destabilizing short-term flows would be useful. Capital control measures have shown to be useful in changing the type of inflows ex ante. For example, the Korean authorities introduced a series of macro-prudential measures in 2010, e.g., a withholding tax on foreign investors' earnings on government bonds (with differentiated rates depending on maturity) and saw short-term foreign liabilities falling from 49 percent of international reserves in 2007 to 29 percent by 2015 even though total foreign liabilities rose by 20 percent.

Having an adequate global or regional financial safety net would reduce the need to hold large level of international reserves. This can partly be done through knitting fragmented regional financial safety nets with the global one and, given the limited size relative to global liquidity, supplemented by currency swap with the Fed or the ECB, the main reserve currency issuers as well as among EMs.

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<sup>27</sup> For example, various tests show the exchange rate (both nominal and real) has little impact on the current account in Korea.

## VI. Conclusion

We started this paper by showing G20 finance ministers and governors statement: “accommodative monetary policies are needed to anchor inflation expectations and support recovery” in many advanced economies.<sup>28</sup> At the same time, they emphasized “monetary policies will continue to support economic activity consistent with central banks’ mandates” and reiterated their commitment “to move toward more market-determined exchange rate systems and exchange rate flexibility” to reflect “underlying fundamentals and avoid persistent exchange rate misalignments.”<sup>29</sup>

Against this background, we reviewed empirical evidences, and data on 10 EMs in detail and found the following points. First, monetary policy synchronization between advanced and EMs has meant the former setting the tone for everyone, which in turn has accompanied unintended and not always welcome consequences. Second, under such circumstances, the type of exchange rate regime has become irrelevant. In fact, for economies with low financial openness—key characteristics of emerging market economy, exchange rate flexibility will dampen growth and raise the probability of a foreign exchange market crisis. Third, for most EMs, their financial openness has not changed much over the last decades while the opposite is true for most advanced economies, indicating that financial openness is something peculiar to advanced economies with currency convertibility. Emerging economies, on the other hand, are now much more exposed to foreign exchange market risks and their base money expansion was heavily influenced by capital inflows from advanced economies.

Accordingly, while competitive devaluation in all forms and methods should be strongly discouraged, we proposed that emerging markets be given greater autonomy in how they should manage their macroeconomic situation using the full set of policy tools as long as they aim to attain mutually agreed external current account norms. Their exchange rate flexibility or inflexibility, foreign market intervention, sterilized or unsterilized, and macro prudential and capital flow measures, should all be part of their arsenal in gaining more independence in monetary policy to cater for establishing domestic balance. Even then, this

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<sup>28</sup> G20 (2015b), “Communiqué of G20 Finance Ministers and Central Bank Governors.” (Washington DC, April 17, 2015)

<sup>29</sup> G20 (2015c), “Communiqué of G20 Finance Ministers and Central Bank Governors.” (Ankara, September 5, 2015)

approach would be a second best solution since it would not be realistic to expect advanced economies include emerging market concerns in their monetary policy objective functions.

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## Appendix A

**Table A. 1: The MSCI Market Classification framework**

Criteria	Developed	Emerging	Frontier
<b>A Economic Development</b>			
A.1 Sustainability of economic development	Country GNI per capita 25% above the World Bank high income threshold* for 3 consecutive years	No requirement	No requirement
<b>B Size and Liquidity Requirements</b>			
B.1 Number of companies meeting the following standard Index criteria	5	3	2
Company size (full market cap)	USD 2519 mm	USD 1260 mm	USD 630 mm
Security size (float market cap)	USD 1260 mm	USD 630 mm	USD 49 mm
Security liquidity**	20% ATVR	15% ATVR	2.5% ATVR
<b>C Market Accessibility Criteria</b>			
C.1 Openness to foreign ownership	Very high	Significant	At least some
C.2 Ease of capital inflows / outflows	Very high	Significant	At least partial
C.3 Efficiency of the operational framework	Very high	Good and tested	Modest
C.4 Stability of the institutional framework	Very high	Modest	Modest

Note: \* High income threshold is GNI per capita of USD 12,615 for 2011.

\*\*Liquidity is measured using Annualized Traded Value Ratio (ATVR). ATVR is calculated as the median of shares traded everyday in relation to the market capitalization of the stock.

Source: MSCI(2014), p. 76.

Table A. 2: Country List

Algeria	Guatemala	Nigeria
Australia*	Honduras	Norway*
Austria*	Hungary	Pakistan
Bangladesh	Iceland*	Panama
Belgium*	India	Papua New Guinea
Bolivia	Indonesia	Paraguay
Botswana	Iran, Islamic Rep.	Peru
Bulgaria	Ireland*	Philippines
Burkina Faso	Israel*	Poland
Canada*	Italy*	Portugal*
Chile	Jamaica	Senegal
Colombia	Japan*	Slovak Republic*
Congo, Rep.	Jordan	Slovenia*
Costa Rica	Kenya	South Africa
Cote d'Ivoire	Korea, Rep.*	Spain*
Cyprus*	Latvia*	Sri Lanka
Czech Republic*	Lithuania*	Sweden*
Denmark*	Madagascar	Switzerland*
Dominica	Malawi	Syrian Arab Republic
Dominican Republic	Malaysia	Thailand
Ecuador	Malta*	Togo
Egypt, Arab Rep.	Mexico	Trinidad and Tobago
El Salvador	Mongolia	Tunisia
Finland*	Morocco	Turkey
France*	Nepal	Uganda
Gambia, The	Netherlands*	United Kingdom*
Germany*	New Zealand*	United States*
Ghana	Nicaragua	Uruguay
Greece*	Niger	Venezuela, RB

Note: \* denotes advanced economy defined by World Economic Outlook (IMF, 2015)

Table A. 3: Data Source

Variable	Definition	Source
<b>Dependent Variable</b>		
GDP per capita ( $y_{i,t}$ )	gross domestic product divided by midyear population	World Bank
<b>Explanatory Variables</b>		
Exchange Rate Flexibility ( $ER_{i,t}$ )	de facto exchange rate regime classification(coarse and fine)	Reinhart and Rogoff (2004)
	real effective exchange rate	IMF IFS
Financial market openness ( $KA_{i,t}$ )	de jure financial market openness	Chinn and Ito (2006)
<b>Other Control Variables</b>		
Education	secondary school enrollment	World Bank
Trade Openness	(import + export)/GDP	World Bank
Government Burden	(Government final consumption expenditure)/GDP	World Bank
Lack of Price Stability	log(100+inflation)	IMF IFS
Financial Development	(private credit)/GDP	World Bank
Currency Crisis	an annual depreciation versus the US dollar of 15 percent or more.	Reinhart and Rogoff (2011)
External Debt Crisis	failure to meet a principal or interest payment on the due date.	Reinhart and Rogoff (2011)

Table A. 4: Exchange Rate Regime

Coarse Classification		Fine Classification	
1	No separate legal tender	1	No separate legal tender
1	Pre announced peg or currency board arrangement	2	Pre announced peg or currency board arrangement
1	Pre announced horizontal band that is narrower than or equal to +/-2%	3	Pre announced horizontal band that is narrower than or equal to +/-2%
1	De facto peg	4	De facto peg
2	Pre announced crawling peg	5	Pre announced crawling peg
2	Pre announced crawling band that is narrower than or equal to +/-2%	6	Pre announced crawling band that is narrower than or equal to +/-2%
2	De factor crawling peg	7	De factor crawling peg
2	De facto crawling band that is narrower than or equal to +/-2%	8	De facto crawling band that is narrower than or equal to +/-2%
3	Pre announced crawling band that is wider than or equal to +/-2%	9	Pre announced crawling band that is wider than or equal to +/-2%
3	De facto crawling band that is narrower than or equal to +/-5%	10	De facto crawling band that is narrower than or equal to +/-5%
3	Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)	11	Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)
3	Managed floating	12	Managed floating
4	Freely floating	13	Freely floating

Source: Ilzetki et al. (2008) The data is available at <http://www.carmenreinhardt.com/data/browse-by-topic/topics/11/>

## Appendix B

Conceptual framework<sup>30</sup>

**External (current account) balance:**

$$\begin{aligned} C/A &= S(Y, AG, NFA, NFI, \text{inflation volatility, budget balance, social insurance, } r, e) \\ &\quad - I(\text{governance, business environment, } Y^e, r, E) \\ &= X(Y^*, E, COM, \text{other structural issues}) - M(Y, E, \text{other structural issues}) \\ &= \Delta RE - CF(r - r^*, VIX, LIQ) \end{aligned}$$

where

Y: GDP (where  $Y^*$ : foreign income,  $Y^e$ : income expectation)

AG: Aging (demography)

NFA: Net foreign assets

NFI: Net financial assets (to include access to credit, financial deepening, and financial wealth)

E: Real exchange rate

r: real interest rate

RE: International reserves

COM: Relative productivity growth

VIX: Stock market volatility

LIQ: Stock of global liquidity

In a simplified version:

$$C/A(r, E, F_{CA}) = S(r, F_S) - I(r, E, F_I) = X(E, F_X) - M(E, F_M) = \Delta RE - CF(r - r^*, F_{CF})$$

where

$F_{\text{other}}$ : All other factors influencing the relevant variable F

Starting from an equilibrium, if  $r^* \uparrow$ , then either  $\Delta RE \downarrow$  (with offsetting adjustments somewhere for  $F_S$ ) or  $r \uparrow + E \uparrow$  to bring down C/A back to its starting position.

Starting from an imbalance, i.e.,  $C/A \neq C/A^*$  (current account at equilibrium), conventional view is that if after all variables have adjusted except for E, then E being a “price”, it will adjust as long as there is no arbitrary restriction on market forces. If under fixed exchange regime, the authorities should adjust E such that the C/A returns to its equilibrium. The presumption is that if E is adjusted,  $\Delta RE=0$ .

If  $C/A^*$  is estimated or conjectured (including not factoring in the effect of QE or any other changes in  $F_{\text{other}}$ , which appear to be the case given global developments over the last decade), then the estimated adjustment of E will not result in  $\Delta RE=0$ . For EMs, in particular, there is

<sup>30</sup> Based on IMF’s EBA, ECB Working Paper Series No 1243, September 2010, and Menzie D. Chinn, Eswar S. Prasad (JIE 2003).

not much space to move  $r$  away from  $r^*$  unless other policy variables, e.g.,  $E$  and  $\Delta RE$ , are used as well.

If  $C/A^*$  has to be estimated for international policy consistency, then efforts are needed to factor in most  $F_{\text{other}}$  to ensure it approximates the actual equilibrium in the absence of any policy-induced interference, e.g., QE or exchange rate market interventions, and to let individual countries decide what policy combination would best achieve  $C/A^*$  in their respective economies. To minimize domestic policy response to QEs, introducing macro prudential measures or capital controls in response to incipient capital inflows would help.

### **Internal balance (inflation and output gap):**

A simple specification of internal balance would be

$$\bar{Y} = \bar{Y}(r, \text{FB}, \text{other structural issues})$$

$$\Pi = \Pi(\bar{Y}, \text{labor market conditions}, \text{other structural issues})$$

Where:

$\bar{Y}$ : output gap

FB: fiscal balance

$\Pi$ : inflation

If as before  $r^* \uparrow$ , then either  $\Delta RE \downarrow$  (with offsetting adjustments somewhere for  $F_S$ ) or  $r \uparrow + E \uparrow$  to bring down  $C/A$  back to its starting position. In the case of the latter, if the starting position was at internal balance, it will induce a positive output gap. Thus, the policy responses would require offsetting measures such as  $\text{FB} \uparrow$ .