

## **Post-crisis Monetary Response to Surge Capital Inflows: Policy Trilemma and Sterilizations in Emerging Asia**

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*This paper examines the monetary responses taken by Malaysia and another four regions in response to large capital inflows after the East Asian Crisis of 1997-98. It also explores why these five selected regions in emerging Asia chose to utilize different sterilization measures. This paper has special relevance today in 2014, given recent excessive global liquidity after the global financial crisis of 2008-2009. We examine the measures taken in different regions—some based on the trial and error method. Basically, each region faced the well-known trilemma in achieving the perfect policy, that is, how best to set the parameters of domestic interest rate, capital mobility, and foreign exchange rate. Importantly, this policy trilemma has a direct impact on the extent of sterilization interventions during surges of foreign capital inflow. Therefore, fully to understand their relationship is crucial in order to minimize GDP losses from foreign capital inflows in the future.*

**Field of Research:** International finance and macroeconomics

**JEL Codes:** E52, E58, F31, F33, F41, O53

**Keywords:** Monetary policy, monetary instruments, open market operations, intervention, exchange rate regimes, macroeconomic interdependence, emerging Asia

### **1. Introduction**

Capital inflow surges became common for emerging market economies (EMEs) after the East Asian financial crisis in 1997-98. This issue re-emerged recently in the wake of low interest rates and qualitative easing in developed countries, with flows of capital raising great concerns among policymakers.

This paper examines the monetary responses of five countries in emerging Asia (EA) which dealt with huge capital inflows after 1997. It further explores the three EA countries with a managed ER or exchange rate (Malaysia, China and India), and two with a floating currency (Thailand and Indonesia), which needed to neutralize the hoarding of foreign capital or reserves accumulation by different degrees of sterilization. Two research questions are formulated for this paper. Why should different regions in EA take different measures of sterilized intervention after the surge of foreign capital inflow during and after the 1997 economic crisis? Did those sterilization measures have any relation to the classic policy trilemma and its resolution in EA regions?

Sterilization is a monetary action taken by a central bank to counter the effects of a changing monetary base due to foreign exchange (FOREX) interventions. It is a market-based way to neutralize the impact of large foreign capital inflows through purchasing foreign currencies (that is, by selling domestic currencies) and injecting the

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liquidity back into the financial system (RBI 2003b). We show that different regions took different degree of sterilization operations, partial or full, based on trial and error, to cope with large and volatile capital inflows *during* the Asian crisis before seconded to different extent of sterilization interventions, less or more, *after* the crisis.

All countries in the world face a common problem in constructing their economic policies. Sivalingam (2009) uses the phrase *impossible trilemma* to suggest that lower interest rates (via freely set rates or independent monetary policy), free international capital mobility, and exchange rate stability (maintaining currency value via a managed float) cannot coexist. When free international capital mobility is implemented, it is impossible fully to control foreign capital inflows that contribute to the growth of foreign reserves. Therefore, regional authorities should persist with aggressive sterilizations on a huge scale to deal with reserves accumulation (Ouyang, Rajan & Willett 2008) and to maintain lower rates of interest and stable rates of currency.

We classify the EMEs into two, advanced EME and secondary EME, based on criteria categorised by the FTSE<sup>1</sup>. The story begins with advanced EME, which either has upper middle income gross national income (GNI) with advanced market infrastructures, or high income GNI with lesser developed market infrastructures (Malaysia, Turkey and Taiwan). In this category, we select Malaysia that faced large increases in their holdings of international reserves after the 1997 crisis (Ouyang, Rajan & Willett 2008).

This capital influx caused Malaysia to suffer a decline in gross domestic product (GDP) in 1998 (Kamer 2004). The 2008 global financial crisis again affected EA countries via the trade channel, and Malaysia experienced a sharp decline in export growth in 2007 due to sharp decrease of demand from G3 countries (Chia 2010). Today, five years after the 2008 financial crisis, Malaysia moves to hold and sustain a recovery by way of restructuring its banking and financial system (BNM 2012).

Advanced EMEs have either high incomes or advanced markets. On the other hand, China, Thailand, India and Indonesia are secondary EMEs because they either have upper middle, lower middle and low income GNI with reasonable market infrastructures and significant size, or upper middle income GNI<sup>2</sup> with lesser developed market infrastructures (Goldstein 2009). China with less advanced markets was less affected by the Asian crisis though it was one of the 'main drivers of the massive stockpiling of reserves in the emerging Asia' (Ouyang, Rajan & Willett 2008, p.171). Since 2001, China has accumulated large reserves due to surpluses in its accounts, both capital and current (Ouyang, Rajan & Willett 2010). More recently, the region launched its Economic Stimulus Plan to deal with the global financial crisis of 2008-09 (Yao 2012). Thailand, for its part, has increased the degree of capital liberalization since the early 1990s. It showed impressive growth for over a decade until it was hit by the financial crisis in 1997 (Sangsubhan 2008).

India and Indonesia, like Thailand, were deeply affected by the Asian crisis, experiencing a huge increase in international reserve holdings (Ouyang, Rajan & Willett 2008). Currently, India has been experiencing a negative impact on demand due to a slowdown in the global economy (Trevethan 2012). Due to that, India played safe, shifting from banking or portfolio flows to foreign direct investment (FDI) flow.

Indonesia finally raised its reserve requirement rate on foreign currency accounts in order to limit access to foreign credit, as announced on 30 December 2010

(Chantapacdepong 2012). During the 1997 crisis, Indonesia experienced a big increase in external debt, exhausting its external reserves and nearly causing the region to collapse (Ghosh 2013). However, Fitch Ratings in December 2012 and Moody's Investors Service in January 2013 announced good economic fundamentals in Indonesia. They upgraded its sovereign debt from junk status since the 1997-98 financial crisis to saleable bond (Suharmoko & Subhedar 2012).

In view of the increasing international capital reserves in emerging Asia during the 1997 and 2008 financial crises, it is indeed timely to specifically explore the different degree and extent of sterilization in Malaysia, Thailand, China, India, and Indonesia, and their relations with the policy trilemma adopted. As far as I know, this topic has not yet been discussed; previous studies are confined to the degree and extent of sterilization measures. Thus this paper hopes to contribute towards understanding the relationship between sterilization measures and policy trilemma tools (interest rate, cash flow, and exchange rate) and to show the impact of the policy trilemma setting on sterilization interventions, thus enriching the literature on international finance and monetary policy.

This paper has four sections, of which this is the first. Section 2 reviews the literature on the challenges to EMEs from volatile capital inflows. We discuss sterilization measures taken by Malaysia and the other four selected regions, focusing on the exchange rate regime and monetary instruments. Section 3 discusses the research questions and displays findings based on the review of the literature in Section 2. Section 4 draws conclusions on the sterilized interventions previously implemented in all five EA regions.

## 2. Literature Review

The 1997-98 East Asian financial crisis affected most of the middle-income countries in the region. In fact, some countries like Thailand, Malaysia and the Philippines still have not fully recovered. Loss of confidence among private investors resulted in a massive turnaround in capital flows in 2008. Tables 1 and 2 summarize balance of payments (BOP) data from the IMF. They reveal a 200 percent drop in net private capital flows – nearly 100 percent reversal between 2007 and 2008. Huge and volatile capital flows to emerging and developing Asian economies in the last fifteen years repay study. Volatility in private capital flows is mirrored by a change of reserves (Figures 1 and 2).

The volatile capital inflows will normally be sterilized to avoid domestic inflation (BNM 2010b). This paper ignores 'unsterilized' interventions and discusses only the 'sterilized' intervention that requires intervention in the bond or money market. Foreign currencies are replaced with domestic currencies via sterilization operations with no changes to monetary base and money supply, and thereby help to withstand inflationary impacts by maintaining domestic interest rates at the same level prior to the attack (Lien 2010).

Sterilization, full or partial, has mixed consequences. Capital flow affects interest rates. Currency reserves affect interest rates. The ER affects money supply. Prolonged sterilization causes an upward pressure on interest rates, thereby attracting further foreign capital inflows and enlarging the supply of money in the market. Therefore, we must understand how all three actions (interest rates, cash flow, and exchange rate)

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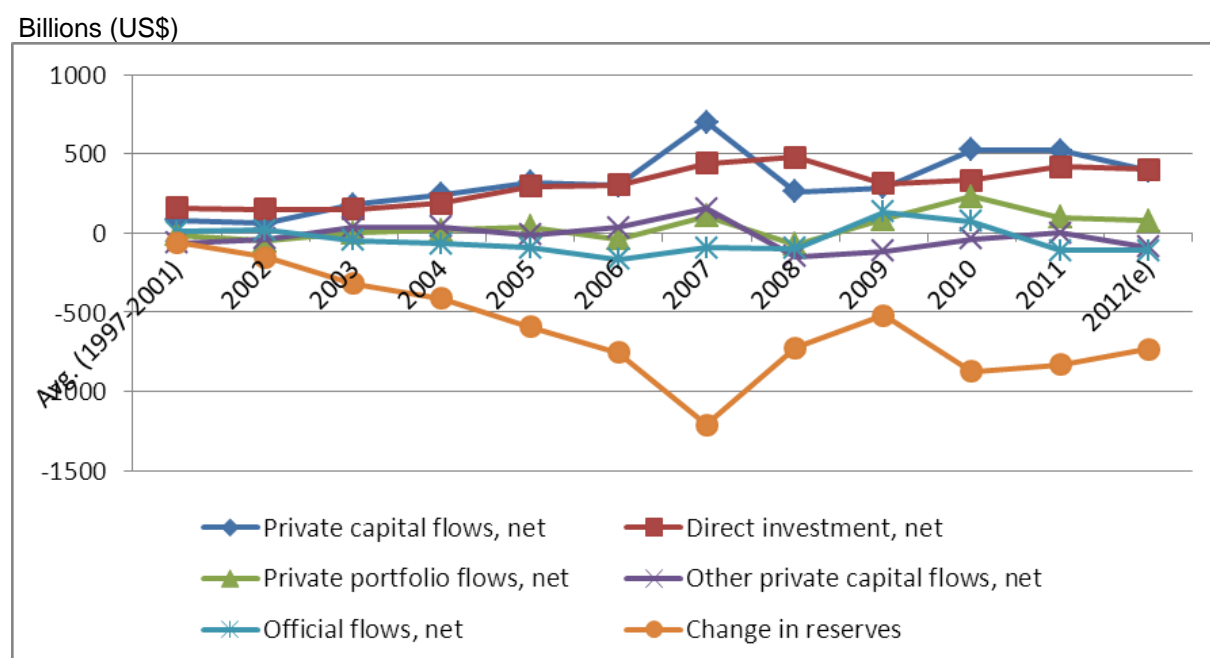
interact, if we are to reduce the negative effects of sudden large movements of foreign capital.

**Table 1: Gross capital flows to emerging and developing economies, 1997 – 2012 (USD billions)**

	Average (1997 – 2001)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012(e)
Private capital flows, net	80.3	61.6	181.1	242.4	320.7	299.4	700.1	259.5	285.2	527.0	521.0	394.7
Direct investment, net	158.0	149.0	148.8	187.5	293.2	303.6	440.2	479.6	313.9	332.0	418.3	403.8
Private portfolio flows, net	-13.7	-48.8	-1.0	16.9	41.1	-39.5	105.9	-72.9	86.0	232.9	101.1	79.3
Other private capital flows, net	-64.0	-38.6	33.3	38.1	-13.7	35.3	154.1	-147.1	-114.7	-37.9	1.6	-88.4
Official flows, net	10.0	16.4	-45.0	-68.4	-95.0	-163.9	-92.6	-97.8	135.0	74.7	-109.8	-109.7
Change in reserves	-58.4	-154.0	-320.0	-414.6	-590.6	-755.4	-1210	-724.9	-520.3	873.8	-831.6	-733.3

Source: IMF, WEO April 2012 database,  
<http://www.imf.org/external/pubs/ft/weo/2012/01/weodata/index.aspx>

**Figure 1: showing Table 1 above: Capital flows movements in emerging & developing economies, 1997 – 2012 (USD billions)**



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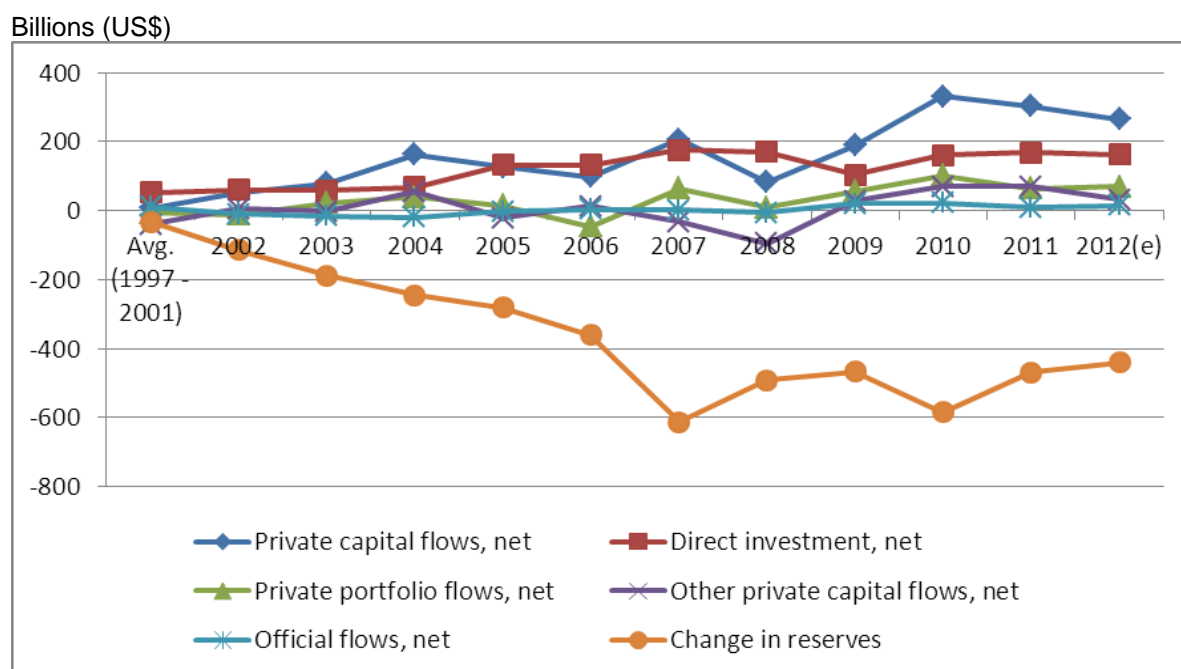
**Table 2: Gross capital flows to developing Asia,  
1997 – 2012 (USD billions)**

	Average (1997 – 2001)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012(e)
Private capital flows, net	6.4	53.4	78.6	162.4	126.8	97.6	206.5	83.0	188.7	331.8	303.2	264.9
Direct investment, net	53.5	60.1	58.5	68.3	131.9	131.6	175.4	169.6	104.1	160.1	168.1	163.2
Private portfolio flows, net	-6.8	-12.0	22.1	39.6	15.5	-46.3	64.0	9.1	56.8	101.3	64.7	69.8
Other private capital flows, net	-40.2	5.2	-2.1	54.4	-20.7	12.4	-32.9	-95.7	27.8	70.3	70.4	31.9
Official flows, net	10.8	-10.7	-16.0	-19.9	-3.2	2.7	1.3	-6.6	20.2	21.4	9.7	15.0
Change in reserves	-32.6	-114.5	-187.7	-245.5	-281.0	-361.5	-612.2	-491.5	-467.3	584.5	-468.5	-441.0

Source: IMF, WEO April 2012 database,

<http://www.imf.org/external/pubs/ft/weo/2012/01/weodata/index.aspx>

**Figure 2: showing Table 2 above: Capital flows movements in developing Asia,  
1997 – 2012 (USD billions)**



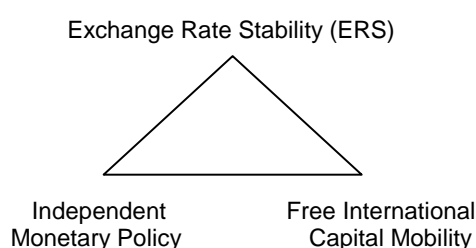
### 2.1 Policy Trilemma in Emerging Asia

EMEs experienced an influx of foreign capital during the 1997 Asian financial crisis and the 2008 global crisis due to a combination of push and pull factors. Strong output growth pulled international capital into the region for attractive investment returns. On the other hand, low interest rates in mature economies pushed the G3 countries (US, Europe, and Japan) to invest in EMEs for greater investment returns (Suttle et al. 2011). Weakness in the financial system triggered the Asian crisis: credits grew

rapidly, increasing the number of risky investments, and banks' balance sheets grew weaker (Ghosh 2013).

Various studies now look at intermediate solutions (sterilized interventions) to the problem of capital inflows in the regions, via the classic policy trilemma or *impossible trinity* (see Figure 3). Aizenman and Ito (2012) write about the *impossible trinity* but the term was first used by Mundell (1963). Mundell writes about the extreme degree of capital mobility that causes a country's failure to maintain an interest rate at its general level. Fleming (1962) previously confirmed that an excess of purchases over sales of domestic assets of the banking sector is sterilized either by increasing the money supply or by reducing the FOREX reserves. The expansionary effect of an increase in the money supply will be greater if the country's exchange rate floats.

**Figure 3: Classic policy trilemma**



Source: Adapted from Subbarao (2012)

The classic policy trilemma suggests that only two out of three goals can be achieved at a time (Sivalingam 2009).

- If a country wishes to increase or decrease their interest rates (independent monetary policy in controlling inflation) and to maintain an open capital account, they must allow their currencies to float;
- those that want to maintain an open capital account and a fixed ER must let go of an independent monetary policy and accept the inflationary and deflationary shocks from international financial flows;
- those that want both an independent monetary policy and a fixed ER must introduce capital controls (Dolan 2011).

The words *impossible trinity* hold true for some regions, apparently unable to control the interest rate, the exchange rate, and capital flows simultaneously. Hsing (2012) finds evidence for a trade-off among these three policy goals for Malaysia, the Philippines, and Singapore, but less evidence for Indonesia and Thailand. Malaysia faced this policy trilemma during the horrific 1997-98 crisis.

Concerning Malaysia, the country did not hold an independent monetary policy because the Malaysian government imposed capital controls and pegged its exchange rate in September 1998. After seven years, Malaysia then chose to unpeg the *ringgit* in July 2005, managing free flows of foreign capital that allowed its currency to operate in a managed floating exchange rate regime. In 2009, the Malaysian economy experienced similar external shocks when it could not sell manufactured exports following the financial crisis in the US. That time around, Malaysia weathered the storm because of large internal reserves (Sivalingam 2009).

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China and India face fewer output fluctuations because their policy options converge as they pursue managed exchange rates. They have large international reserves, and some degree of monetary autonomy and financial integration (Aizenman & Ito 2012). A large trade surplus with huge capital inflows to China in 2000s contributed to a massive accumulation of foreign reserves (Iley & Lewis 2007). Large international reserves help to stabilize exchange rates for EMEs fearful of floating their currency (Taguchi, Nataraj & Sahoo 2011). A component of FDI that shifted to banking flows in China recently worried the policymakers since this is more volatile (Chantapacdepong 2012). Although India changed from tight control to a more liberal regime, according to Hutchison, Sengupta and Singh (2012) the classic trilemma still faces her when she tries to control monetary policy and capital flows while actively intervening in FOREX markets (managed float). High levels of international reserves are neutralized by active intervention in FOREX markets through sterilized operations (Hutchison, Sengupta & Singh 2012).

Thailand and Indonesia have experienced a huge increase in foreign reserve holdings since the Asian financial crisis of 1997 (Ouyang, Rajan & Willett 2008). Historically, Indonesia had had a high degree of financial openness since the 1980s – a major reform of its banking sector came in October 1988 – but that openness decreased in 1995, and the 1997 crisis forced a structural change of the Indonesian economy.

After the crisis, Indonesia shifted from managed ER to a floating ER and achieved an independent monetary policy (Hadiwibowo & Komatsu 2011). Thailand and Korea are another two Asian countries that shifted to floating exchange rates, decreased their interest rates, and thereby retained monetary autonomy (Taguchi, Nataraj & Sahoo 2011).

Berrill and Mannella (2013) claimed there was a trade-off between developing and industrialized countries. Prior to the 1990s, maintaining exchange rate stability (ERS) was a top priority in all countries. China for instance, achieved considerable ERS, retained monetary policy autonomy and capital controls (Mankiw 2010), but failed to allow financial integration to play any significant role (Aizenman & Sengupta 2011). Starting in 2000, developing countries focussed on managing their ER and on retaining an independent monetary policy. Conversely, industrialised economies reduced their monetary policy autonomy and increased their reliance on ERS (Hsing 2012).

### **2.2 Capital Flows and Sterilization Measures Taken by Emerging Asia**

Foreign capital inflows to emerging Asia increased substantially for five years after the 2007-08 crisis, and Dr Zeti Akhtar Aziz, the Governor of Bank Negara Malaysia (BNM), believed this to have its roots in the aftermath of the 1997-98 Asian crisis (BNM 2010b). Conventionally, large and volatile capital inflows occur from industrial to emerging economies due to large-scale global liquidity, low interest rates in the source countries, and lower risk aversion by investors (Cavoli & Rajan 2009). The Federal Reserve's decision to buy another USD600 billion of US Treasury bonds under QE2 increased capital flows to the region. This scenario worsened when the Federal Reserve's maturity extension program known as 'Operation Twist' under QE3 sold USD400 billion of its short-term Treasury securities in June 2012 and used the proceeds to buy long-term Treasury securities (Burgess 2011).

After growth throughout 2012, EA most recently has started to slow-down. The Governor of BNM said back in 2010 that massive and more volatile capital flows will

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flood again into emerging markets in the next few years due to global policy spillovers and due to de-leveraging activities in US and Europe (BNM 2010a).

On the positive side, surges in capital inflows into the regions can finance investments, diversify risk and expand economic activity. On the negative side, if the flow is not properly managed then it can quickly reverse, causing instability and inflation. Emerging economies should cooperate to manage this risk.

Recently, the effect of volatile capital inflows and outflows has been extensively discussed (Aizenman & Glick 2009; Calvo, Leiderman & Reinhart 1996; Cavoli & Rajan 2006, 2009; Hutchison, Sengupta & Singh 2012; Iley & Lewis 2007; Ouyang, Rajan & Willett 2008; Saxegaard 2006; Sivalingam 2009; Suttle et al. 2011; Taguchi, Nataraj & Sahoo 2011). Those flows force a currency to appreciate. They promote inflation risks due to massive reserves accumulation, and they trigger BOP crises. This monetary effect can be neutralized by buying foreign reserves and engaging in sterilization – buying domestic currency assets in the open market (Cavoli & Rajan 2009).

Table 3 shows the degree of the sterilization (partial or full) and the extent of the sterilization (more or less) by EA regions during and after the 1997 crisis, which is the focus of the Cavoli and Rajan (2009) paper. Malaysia aggressively sterilized the full effect on reserves of any capital inflows. Indonesia, Thailand, China and India had sterilized only partially the effect of their capital inflows on reserves. However, there is a lack of discussion on the specific relationship in each of the selected EA regions between the sterilized interventions and the policy trilemma.

Sterilization is meant to avoid further capital inflows that might end up causing inflationary pressures. Full sterilization (coefficient  $\beta = -1$ ) takes place when 'the central bank allows domestic credit to [meet the] higher demand for money due to GDP growth' without changing the monetary base cause by influx of foreign capital inflows (Aizenman & Glick 2009, p.782). Partial sterilization ( $\beta < -1$ ) implies that the central bank allows domestic credit to meet to some extent the demand for money, with care to neutralize the impacts of large capital inflows (Aizenman & Glick 2009). Concern about the risks of excess liquidity weakening the transmission of monetary policy should extend to volatile capital inflows in the future (Saxegaard 2006).

From the tables below, we can see recent trends towards greater control of capital inflows in emerging markets. Earlier literature on the effect of reserve inflows on the domestic interest rates concluded that sterilization affects only domestic interest rates (Cavoli 2007). A model to measure the relationship between reserve and interest rate (that is, the interest rate determination) was introduced by Edwards and Khan (1985) and cited in Cavoli (2007) in order to investigate whether sterilization is an appropriate policy response during large and volatile foreign capital inflows in emerging Asia.

According to Cavoli (2007), sterilization of capital inflows raises interest rates or at least maintains the interest rate at the existing level prior to the surge. Indeed, sterilization may keep interest rates high and prolong the capital inflow. The paper's strength is they are able to show that the model also can be used to determine the degree of capital mobility and sterilization. The more mobile capital is, the more the domestic interest rate is influenced by external factors (i.e., foreign interest rates and fluctuations of current and expected future ER). High capital mobility renders sterilization ineffective; conversely, the less mobile that capital is, the more that the domestic interest rate is set by internal factors or domestic variables (i.e. sterilization).



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A model to examine the monetary policy implications of sterilized interventions was introduced by Qayyum Khan (2005) and cited in Hashmi et al. (2011), who applied this model in Asian countries. The same model was used to investigate whether foreign exchange intervention is an effective policy response to manage domestic liquidity, to maintain export competitiveness, and to overcome high inflation during surges of foreign capital inflow into the regions (Cavoli, Pontinesb & Rajan 2012). The purpose of sterilization in the case of currency devaluation is to reduce the amount of money supply. This policy works well in a managed floating regime in which sterilization may keep the money supply at equilibrium and may keep pushing the value of the currency to appreciate. According to the Mundell-Fleming framework (Fleming 1962; Mundell 1963), monetary policy will be ineffective under a fixed ER if international capital is perfectly mobile. Put simply, the central bank cannot control the supply of money, not even in the short term. Conversely, fiscal policy will be ineffective under a flexible ER (Hadiwibowo & Komatsu 2011).

That statement parallels David Hume's theory of the effect of exchange rate fluctuations on the money supply, which says a country will have an undervalued ER when it experiences a surplus account that will increase the money supply. Subsequently, inflation will occur until equilibrium is reached (Williamson 2009). In equilibrium, a fixed ER implies a particular value of the money supply (one cannot choose both). Williamson (2009) postulates that one way to reverse the negative effect of high inflation is to tolerate a real appreciation through sterilized intervention or to let central banks allow for currency appreciation.

Table 4 below summarizes the classic policy trilemma effect and the degree of sterilization utilized in selected EA countries. We can see that free flowing international capital with no control on interest-rate setting, between 1997 and 2005, forced Malaysia to fully sterilize their international reserves to cope with inflationary pressure.

We also see that China, Thailand and other Asian countries like Korea and the Philippines sterilized less while Malaysia, Indonesia and India sterilized more of their reserves after the financial crisis (Cavoli & Rajan 2009). Previous research on managing huge and volatile capital inflows has focused on reserves versus interest rates (Cavoli 2007; Cavoli & Rajan 2009; Ouyang, Rajan & Willett 2008) and on exchange rates versus money supply (Cavoli, Pontinesb & Rajan 2012; Fleming 1962; Mundell 1963; Williamson 2009).

Up to this point, none of the articles that have been reviewed show the relationships between the degree and extent of sterilization utilized in emerging Asia, during and after the economic crises, and their relationship with policy trilemma adopted. Specifically, none of the previous studies discuss why some regions have utilized partial and some have utilized full sterilization *during* the crisis, why some regions have to sterilize more and some have to sterilize less of foreign reserves accumulation *after* the crisis, and how the degree and extent of sterilization taken are directly related to the trilemma.

**Table 3: Sterilization – its effect on capital inflows in EA, 1990 – 2007**

Country	Degree of sterilization during crisis	Extent of sterilization after crisis	Remark (pre-vs.-post Asian financial crisis)
Malaysia	Full	More	Malaysia maintained high levels and did oversterilize after the crisis
Thailand	Partial	Less	Thailand sterilized less following the Asian crisis
Indonesia	Partial	More	Indonesia has tended to sterilize more since the crisis
China	Partial	Less	China only sterilized a little after the crisis
India	Partial	More	Like Malaysia and Indonesia, India sterilized more after the crisis

Source: Adapted from Cavoli and Rajan (2009)

**Table 4: Classic policy trilemma and sterilization adopted by EA, 1997 – 2007**

Country	Interest rate setting	Capital flow	ER regime	Degree of sterilization	Extent of sterilization
Malaysia	Non-independent MP	Free	Managed float	Full	More
Thailand	Independent MP	Free	Freely float	Partial	Less
Indonesia	Independent MP	Free	Freely float	Partial	More
China	Independent MP	Controlled	Managed float	Partial	Less
India	Independent MP	Controlled	Managed float	Partial	More

Source: Adapted from Sivalingam (2009), , Financial Times (2010), Hadiwibowo and Komatsu (2011), Taguchi, Nataraj and Sahoo (2011), Karahan and Colak (2012), and Subbarao (2012)

\* Note: MP Monetary policy

### 2.3 Exchange Rate Regime and Monetary Instruments

Each region in emerging Asia might have a different approach to domestic monetary policy, to exchange rate management, and to selection of monetary instruments. In general, the impact of large foreign inflows on domestic monetary policy depends on the adopted exchange rate regime. In mid-1997, Malaysia, Thailand and Indonesia had a freely floating regime, while China and India were de facto pegged to the USD (India with a crawling peg). Unable to withstand the pressure, Thailand moved to a managed floating system in January 1998, while in Indonesia in March 1999 did the same.

Malaysia, however, took the other direction in September 1998 by pegging the *ringgit* to the USD and trying to lessen the impact on ER. Seven years later in July 2005, Malaysia then decided to shift to a managed floating regime, an hour after China allowed her monetary authorities to intervene in the FOREX market to stabilize the exchange rate for the sake of exporters in particular and the economy as a whole.

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Summing up, the free floating ER system triggered economic crisis in Malaysia, Thailand and Indonesia in 1997. Figure 4 shows the EA chronology of exchange rates during the 1997 Asian crisis and 2008 global crisis, simplified in a timeline diagram.

EA countries each have their own monetary instruments. Sterilization (above) counters the effect of capital inflows. Buying and selling monetary instruments via open market operations (OMOs) is the most common instrument of sterilization. These markets are open in the sense that dealers compete with one another on the basis of price alone (Kocherlakota 2010) to gain domestic liquidity. OMOs by the central bank under fixed ER result in equal changes in the gold stock because open market purchases cause it to decline and open market sales cause it to increase.

Under flexible ER, budget deficits or surpluses induced by changes in taxes or government spending cause corresponding changes in the trade balance (Mundell 1963). Various market-based instruments counter attack the inflow of international capital. The measures adopted by emerging Asia are listed in Table 5.

All regions in EA except India use central bank securities (CBS) for OMOs. Central banks in Malaysia, Indonesia, Thailand and China issue their own short-to-medium-term CBS to supplement an inadequate volume of government securities and to maximise the absorption of excess liquidity in the market via sale through OMOs.

Apart from that, Malaysia, Thailand, China and India usually raise the cash reserve requirements (CRR) as another option to sterilize surplus foreign capital. Central bank deposits are least used, while FOREX swaps for OMOs and government deposits are more common. Neutralizing the effect of large capital inflows by way of swapping the FOREX transactions has been successful in developed countries like Australia and Germany, and has been utilized by central banks in Malaysia, Thailand and India.

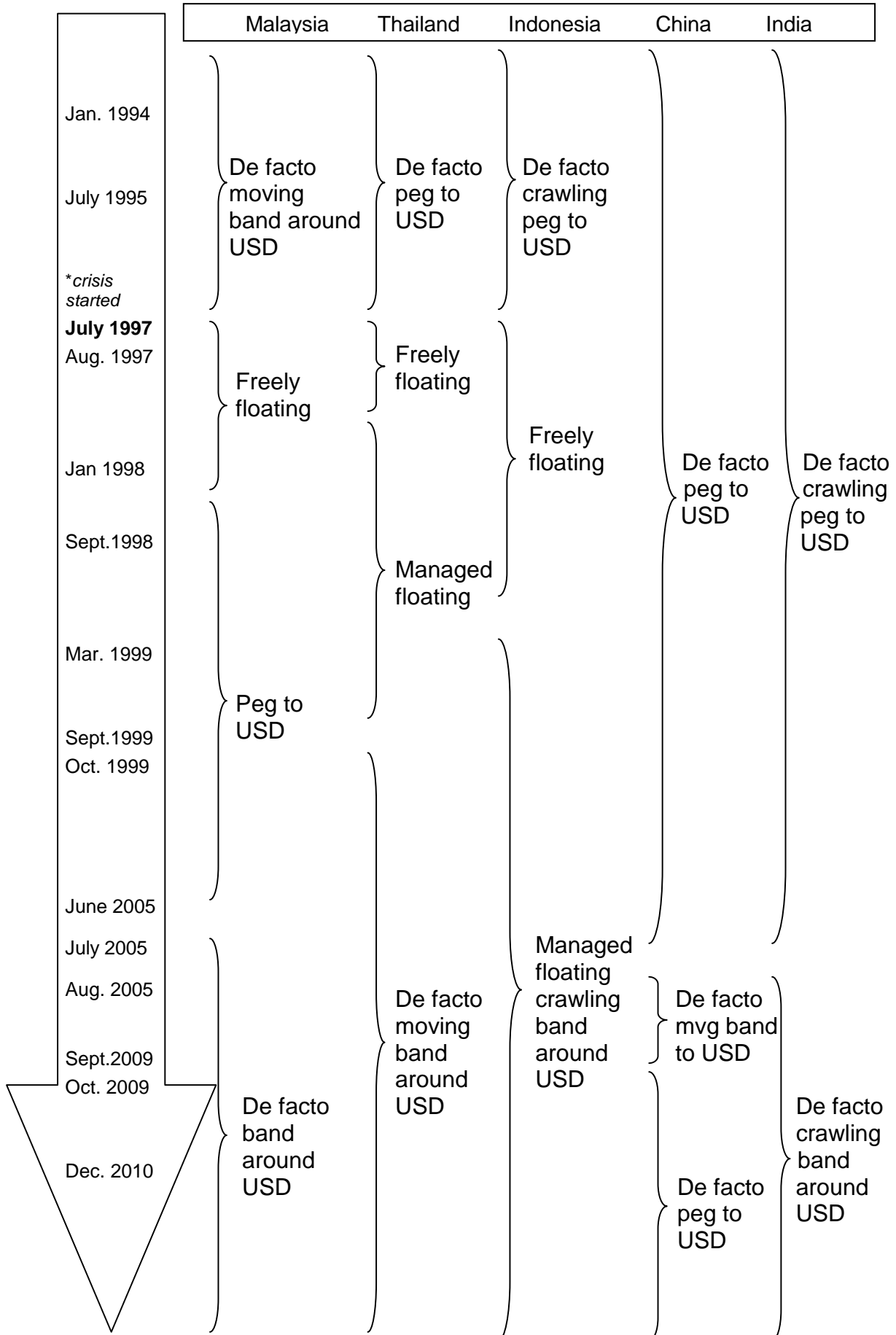
Government deposits are commonly used to cope with surplus liquidity in the market by transferring deposits of the government (public sectors) into the central bank, as in Malaysia, Indonesia and Thailand. Policymakers around the world hope that disequilibrium in the FOREX market in highly open economies can be addressed through sterilization operations, maintaining liquidity in the market and restoring equilibrium (BNM 2010a). It is not a surprise that Malaysia has fully sterilized its foreign reserves since the country has utilized all of the five listed monetary instruments (see Table 5).

**Table 5: Monetary instruments utilized in emerging Asia, 1997 – 2003**

Country	FOREX swaps for OMOs	CBS for OMOs	Deposits with CB	CRR	Government deposits
Malaysia	Yes	Yes	Yes	Yes	Yes
Thailand	Yes	Yes	-	Yes	Yes
Indonesia	-	Yes	-	-	Yes
China	-	Yes	-	Yes	-
India	Yes	-	Yes	Yes	-

Source: Adopted from RBI (2003a)

Figure 4: Timeline of exchange rate systems, emerging Asia, 1994 – 2010



Source: Adapted from Ilzetzki, Reinhart and Rogoff (2011)

### **3. Discussion on the Relationship between the Classic Policy Trilemma, Degree of Sterilization, and the Extent of Sterilization Measures Utilized in Emerging Asia**

The first research question above requires an assessment of sterilization during and after the crisis. The second question requires an exploration of the relationship between sterilization measures and the classic policy trilemma. We must look at how the *interest rate* management is being taken, how much control is needed for *foreign capital inflows* to flow in, and how an adoption of *exchange rate* regime is able to increase or decrease FOREX reserves.

High international reserve holdings in Malaysia, India, Indonesia, and Thailand were fully sterilized to reduce inflationary risks between 1995 and 1999 and between 2003 and 2005 (Ouyang, Rajan & Willett 2008). The turnaround effects of large capital inflows, that is, exchange rate overshoot, financial instability, inflation, and economic downturn, concern all banks in the affected regions (Chantapacdepong 2012).

Rapid growth of reserves becomes costly in the long-run, leaving central banks with less ability to sterilize the monetary effects. This issue has led the author to discuss further the important relationship (direct or indirect) between sterilization measures (degree and extent) and the policy trilemma (interest rate, cash flows, ER). Apparently, the sterilization measures and policy trilemma in a close relationship since the policy parameters significantly influence the decision to extend measures of sterilization past the first operation of sterilization. Next, we discuss this relationship in each of the selected EA regions. Discussion starts from the most to the least affected region after the influx during the crises.

#### **3.1 Malaysia**

In both the 1997/98 and 2007/08 crises, Malaysia was flooded with foreign capital inflows and had a substantial decline in her GDP. Malaysia decided to sterilize in full the foreign reserves in order to counter the negative impact of the large inflow. A direct impact can be seen when Malaysia had to sterilize more foreign reserves after the 1997 crisis due to the poor setting of its classic policy trilemma at that time (imposed non-independent MP, capital control, and pegged currency). In 2005, however, Malaysia acted correctly, re-setting its monetary policy by having an independent MP (free to reduce domestic interest rate when necessary), free capital mobility (allowing the reserves to adjust automatically), and a managed floating currency (allowing the ER to float but with government intervention when necessary).

#### **3.2 India**

India experienced a large increase of foreign reserves during the 1997/98 economic crisis. India's case is different because the country needed only partially to sterilize its international reserves, not fully sterilize as Malaysia did. A huge decline in India's GDP forced the country to shift from banking to portfolio investment or FDI. This shift encouraged the region to sterilize more of its reserves through FDI. Unstable MP setting at the point of time (Independent MP, capital control, managed floating ER regime) made things worse. The capital control directly restricted the flow of foreign currency.

### 3.3 Indonesia

Indonesia was one of the countries badly affected by the Asian economic crisis. The country experienced a large increase of foreign reserves that caused a huge decline in economic growth as shown in her GDP. Indonesia only partially sterilized the international capital inflows, but having an independent MP, free capital mobility, and a freely floating ER left the region in danger. This kind of MP setting directly allows foreign credit to increase. Indonesia increased her reserve rate to limit the access to external debts but the technique seemed not to work, forcing the country to sterilize more of its foreign reserves, just as Malaysia and India did.

### 3.4 Thailand

This region also was badly affected by the 1997/98 Asian crisis and recorded a substantial decrease in her GDP. Thailand's first response to the surge of international capital inflows was partly to sterilize the foreign reserves accumulation. Unlike Malaysia and India, Thailand accepted a helping hand from the IMF. That would be one reason why the country needed to sterilize less of the incoming foreign reserves. Having an independent MP, free capital mobility, and a free floating ER helped Thailand's fast recovery from an economic disaster.

### 3.5 China

Amongst all the selected EA regions, China is the single region that was least affected by both economic crises. China sterilized only part of its international reserves during both crises, and even less after the crises, due to their stable MP. The policy trilemma is less crucial in this region because by maintaining a combination of independent MP, managed floating ER and imposed capital control, China avoided the brutal effect of large foreign capital inflows.

## 4. Conclusion

Malaysia is the single region which needed to fully sterilize its foreign capital reserves. Other regions in EA – Thailand, Indonesia, China and India – only partially sterilized their reserves between the period of 1997 and 2007, one reason being their ability to adjust the movement of interest rates via independent monetary policy.

The responses of central banks vary in different regions, depending on policy constraints, and on the policymakers' economic and institutional background. EA countries shared the trauma of the financial crisis of 1997-98. We benefit from past experiences of volatile capital flows by understanding the significant relationship between sterilization measures and the classic policy trilemma. The extent of sterilization to be performed depends on each country's MP. Countries with a strong and stable MP require less sterilization; countries with a weaker or possibly unstable MP require more extensive sterilization for the second round.

Theoretically, prolonged sterilization is not advisable due to high cost and its potential to push up domestic interest rates, thus inviting more foreign capital inflows, increasing the supply of money, and finally causing inflation. To support this theory, we take Malaysia as an example. During the 1997 Asian crisis, Malaysia with a non-independent MP was not free to set her own interest rates. The region's free capital

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mobility demanded full sterilization of foreign capital. Indeed, large volumes of their own securities pressured the central bank's balance sheets. Consequently, aggressive sterilizations at this point, too quickly reversed, invited a second wave of international capital flows to the region, further increasing the money supply and triggering inflation. Policymakers, therefore, must choose the right combination of tools to solve the trilemma.

China is a good model to follow. The country sets interest rates to suit their domestic requirements, and maintains stability of their exchange rates via a managed ER. China restricts capital flows. By doing that, it can sterilize less of their reserves without needing to increase domestic interest rates. Though China is only a secondary EME, they managed to face volatile capital inflows more efficiently by managing and locating their reserves effectively. China grabbed most of our attention when the region was able to prevent BOP surpluses from spilling over to domestic markets (Iley & Lewis 2007). This country avoided inflation and withstood the shock of current and future capital inflows.

Last but not least, by carefully developing the classic policy trilemma, minimising the usage of sterilization, and effectively managing the exchange rate system, any country, we suggest, may face down surges and volatile capital flows in the future. Liquidity risks in relation to OMOs in money markets are paramount for monetary policy transmission, so policymakers in future crises must consider other options such as effectively implementing fiscal policy and maintaining the exchange rate system. This study is limited to the effect of *monetary* policy in managing influx of foreign capital inflows and does not consider the effect of *fiscal* policy.

## Endnotes

<sup>1</sup> The FTSE for EMEs is located at [www.ftse.co.uk/Indices/FTSE\\_Emerging\\_Markets/index.jsp](http://www.ftse.co.uk/Indices/FTSE_Emerging_Markets/index.jsp).

<sup>2</sup> World Bank classification of GNI (2011 per capita) for low income (\$1,025 or less), lower middle income (\$1,026 – 4,035), upper middle income (\$4,036 – 12,475), and high income (\$12,476 or more).

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