

EE452

International Monetary Economics

TOPIC 7 PART 4

FURTHER APPLICATIONS



Outline

- Sterilised Intervention: The case of China
- Sub-prime Crisis
- Impacts of US interest rates on the Emerging Markets
- Current Debates/Discussions

EXCHANGE RATE MANAGEMENT AND
STERILISATION INTERVENTIONS IN CHINA DURING
2000s

China Sterilised Intervention

As widely known, the US dollar has been serving as the “international” currency for trade transaction.

- Therefore, it is not surprising that small open economies would want to have a stable domestic currency against the dollar.
- Foreign exchange controls, then, became commonplace in Asia. (See Table in the next slide)

Official exchange regime and monetary framework

Country	Exchange Regime	Monetary framework
China	Fixed	Exchange Rate anchor/Monetary aggregate target
India	Managed Float	No explicitly stated anchor; monitors various indicators in conducting monetary policy
South Korea	Float	Inflation targeting
Thailand	Managed Float	Inflation targeting
Malaysia	Managed Float	Exchange Rate anchor

China Sterilised Intervention

When liquidity management is not a major concern, the difference in monetary policy across countries is not very obvious.

However, when there is huge capital inflow to several Asian countries like China and India, there is a question on the feasibility of the current monetary and exchange rate policies and practices.

- This is because the pegged (managed) exchange rate level may be severely undervalued one (such as China) and/or the monetary framework is not explicit to foreign investors (see table again.)

China Sterilised Intervention

By definition, when there is an increase in capital inflow, the domestic currency would *appreciate*.

Huge capital inflow will also lead to inflationary pressure and growth in money reserves.

Monetary authorities will step in and try to *sterilise* excess liquidity.

- This is intended to alleviate (1) inflationary pressures, (2) real exchange rate appreciation and (3) avoid loss of control over the domestic money stock.

China Sterilised Intervention

China experience rapid increase in foreign reserves of more than 30% in the past years since early 2000s.

Liquidity management become pressing issues.

The graph (previous annual exchange rate graph) shows that real appreciation of their currency against the US\$ during 2003-2004 indicated inflationary pressure.

- In addition, high foreign reserves accumulation suggests that the central banks have intervened to avoid exchange rate appreciation.

China Sterilised Intervention

We will look at the macroeconomic effects of sterilisation policy in China since early 2000s.

The Chinese central bank, the People's Bank of China (PBC) both employ direct intervention (such as purchases and sales of intervention currency, eg., US\$) to manage the exchange rate, and indirect intervention (such as the restrictions, reserve requirement and interest rate flexibility) to manage the exchange rate.

China Sterilised Intervention

With rapid growth of export earnings and FDI since 2002, PRC obtained high foreign exchange asset build-up.

- This led to increase in base money (refer to earlier Topic in EE452). Base money is the sum of currency in circulation and the reserves held by depository institutions at the central bank. (Base money is also called *monetary base* or *high-powered money*.)

China Sterilised Intervention

PBC continued to intervene in the foreign exchange market at a massive scale, buying as much as approximately US\$ 200 billion per year.

- This is equivalent to its BOP surplus (Exports-Imports+net capital flows, etc.)
- The intervention is intended to maintain the RMB's exchange rate against the US\$.
- The resulting excess liquidity has been contributing to the overheating of investment and the expansion of an asset bubble.
- At its own costs, PBC has been facing difficult challenges in steering its monetary policy. --- This is an example of “dollar-buying intervention” by a developing country's central bank for the purpose of holding down upward pressure on the domestic currency. That is, PBC simply lets out base money to the market in exchange for US\$.

China Sterlised Intervention

Impacts: massive intervention of approximately US\$200 billion per year has been directly boosting the amount of base money by 1.6 trillion RMB ($1\$ = 8 \text{ RBM}$) a year.

This represents an annual increase of approximately 30%.

China Sterilised Intervention

If we assume the money multiplier constant, the broad money supply, M2 is to increase in proportion to the amount of base money.

The money multiplier is the size of broad money supply (M2) relative to the size of base money. In order to prevent excess liquidity in the economy and to offset the rise in money supply resulting from such intervention, a central bank must opt for one of the monetary policy options, ie., “sterilisation policy”.

China Sterilised Intervention

To recall, monetary policy can be conducted by means of central bank increasing (easing) or decreasing (tightening) the base money supply.

The bank has three major tools in its monetary toolbox:

- Open-market operations
- Changing the reserve requirement
- Changing the discount rate

China Sterilised Intervention

Open Market Operation (OMO) – when central bank buys government bonds from or sells government bonds to the public.

- That is, when central bank buys government bonds, the money supply increases. When central bank sells bonds or central bank bills, the money supply decreases.

China Sterilised Intervention

Reserve requirements are regulations on the minimum amount of reserves that banks must hold against deposits.

The reserve requirements ratio is the percentage of bank's total reserves that may not be loaned out.

- When central bank increases the reserve requirement ratio, money supply will decrease.
- When central bank decreases the ratio, the money supply increase.

China Sterilised Intervention

The discount rate is the interest rate that the central bank charges commercial banks for loans.

- Increasing the discount rate decreases the money supply.
- Decreasing discount rate increases the money supply.

China Sterilised Intervention

Some limitations:

- The central bank's control of money supply canNOT be precise. This is because the central must struggle with two problems that arise due to fractional-reserve banking.
- The central bank does not control the amount of money that households choose to hold as deposits in banks.
- Moreover central bank does NOT control the amount of money that bankers choose to lend.

China Sterilised Intervention

In a narrow sense, the most typical method of sterilisation policy is to withdraw the base money through OMO.

The simultaneous activities of exchange rate intervention and sterilisation (through OMO) is called “sterilised intervention”

For the case of exchange market intervention that is unaccompanied by sterilisation, it is called “unsterilised intervention.”

China Sterilised Intervention

Apart from OMO, the PBC has other means of sterilisation to absorb the excess base money resulting from massive intervention.

- Manipulation of interest rates
- Changes in reserve requirement ratios,
- “moral suasion”

Particularly obvious, the PBC raised lending rates of banks by three times in succession. The rates were raised by 0.27% each on Oct 2004, April 2006, Aug 2006.

Furthermore, the reserve-deposit ratio has been raised three times since Sept 2003, a total of 2%.

China Sterilised Intervention

We can study the inter-relation among exchange rate intervention, sterilisation and sterilised intervention by the central bank by tracking the changes in the central bank's balance sheet. (see table next slide).

Simple Illustration of Central Bank's Balance Sheet from Sterilised Intervention

Intervention	Assets	Liability	
		Base Money (RMB)	Central Bank Bills
Unsterilised Intervention	↑	↑	
Sterilisation (OMO)		↓	↑
Sterilised Intervention	↑		↑

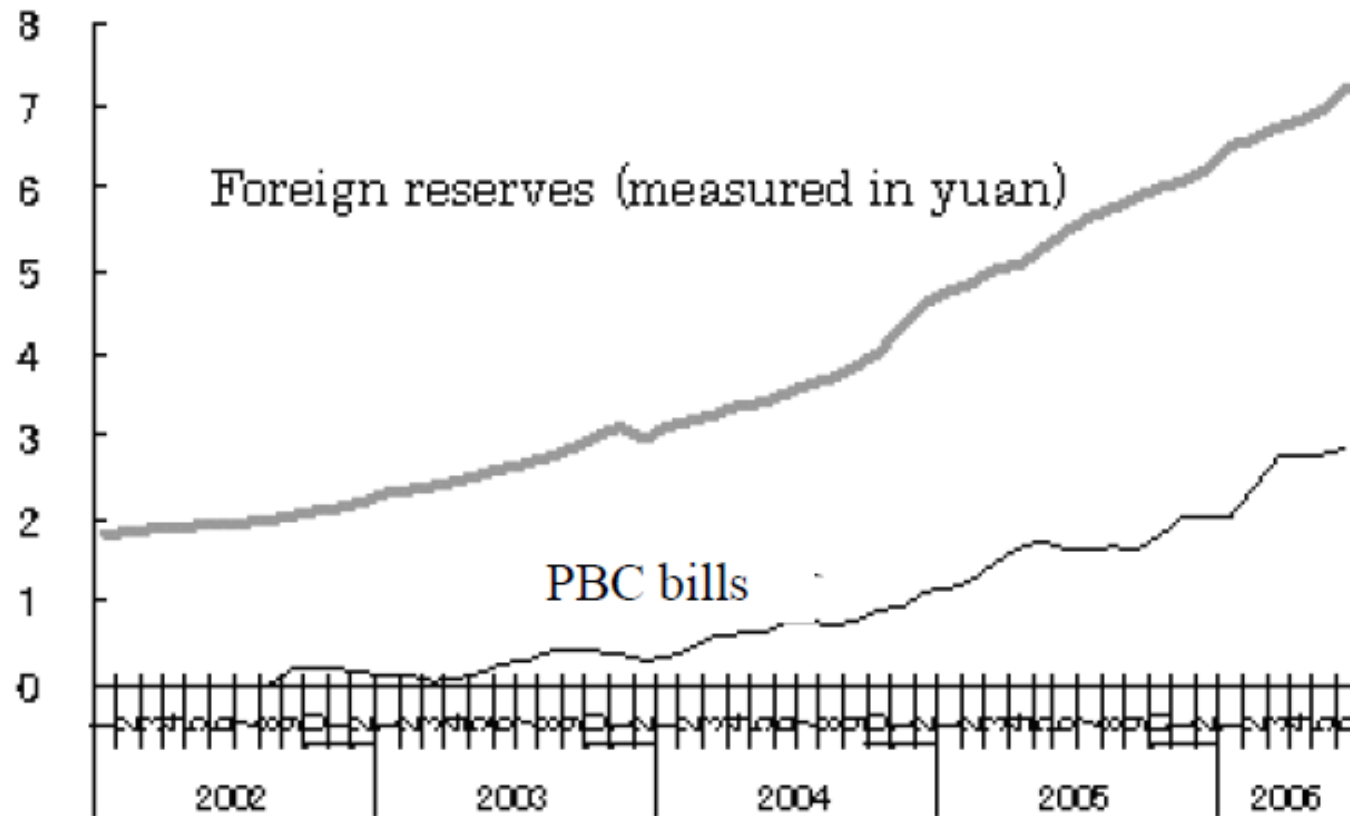
China Sterilised Intervention

Exchange rate intervention increases the amount of dollar-denominated assets (foreign reserves) and base money in the country (base money is part of liability, remember?).

On the other side, sterilisation (through OMO) reduces the base money and increases central bank bills.

- When the central bank sells government securities, rather than issuing bills, both base money (liability) and amount of government securities (asset) on the balance sheet will reduce.--- thus inflation is alleviated, reduced liquidity and overheating.
- We can see from the PBC bills (graph) outstanding of foreign reserves.– they are positively correlated.

PBC bills outstanding and foreign reserves



China Sterilised Intervention

Sterilised intervention results in an increase in dollar-denominated assets as well as in central bank bills, a liability item.

For unsterilised intervention, the central bank supplies to the market the highly liquid base money (which eventually leads to inflation and overheating).

Which way is better?

China Sterilised Intervention

Throughout literature, opinions have been divided as to whether sterilisation in China has been a success.

Intervention has been so enormous in scale and has been conducted over a prolonged period of time.

Hence, it is becoming increasingly difficult for the PBC to implement sterilisation operation to keep the money supply under control.

China Sterilised Intervention

Other concerns:

- The maturity of PBC bills is becoming longer as time goes, that is, having maturity of one-year and is becoming the largest portion in the liability portfolio. **This implies that the borrowing cost of PBC is increasing since long-term interest rates are higher than the short-term rates.**
- The yield at issue of PBC bills is rising. This rise may promote **more attractive of further capital inflows**. This would then force the Central Bank to further expand the amount of intervention and sterilisation.
- The PBC had issued bills by means of a “targeted issue” scheme in combination with selling at auction. **This scheme is to force specific targeted commercial banks to underwrite PBC bills at a yield lower than prevailing market rates.** Hence, banks posting a higher increase in lending have a greater chance to be targeted in the scheme. This is a sort of penalty to these banks and the sustainability of such conduct may not be successfully maintained in the long-run.

Sub-prime Mortgages

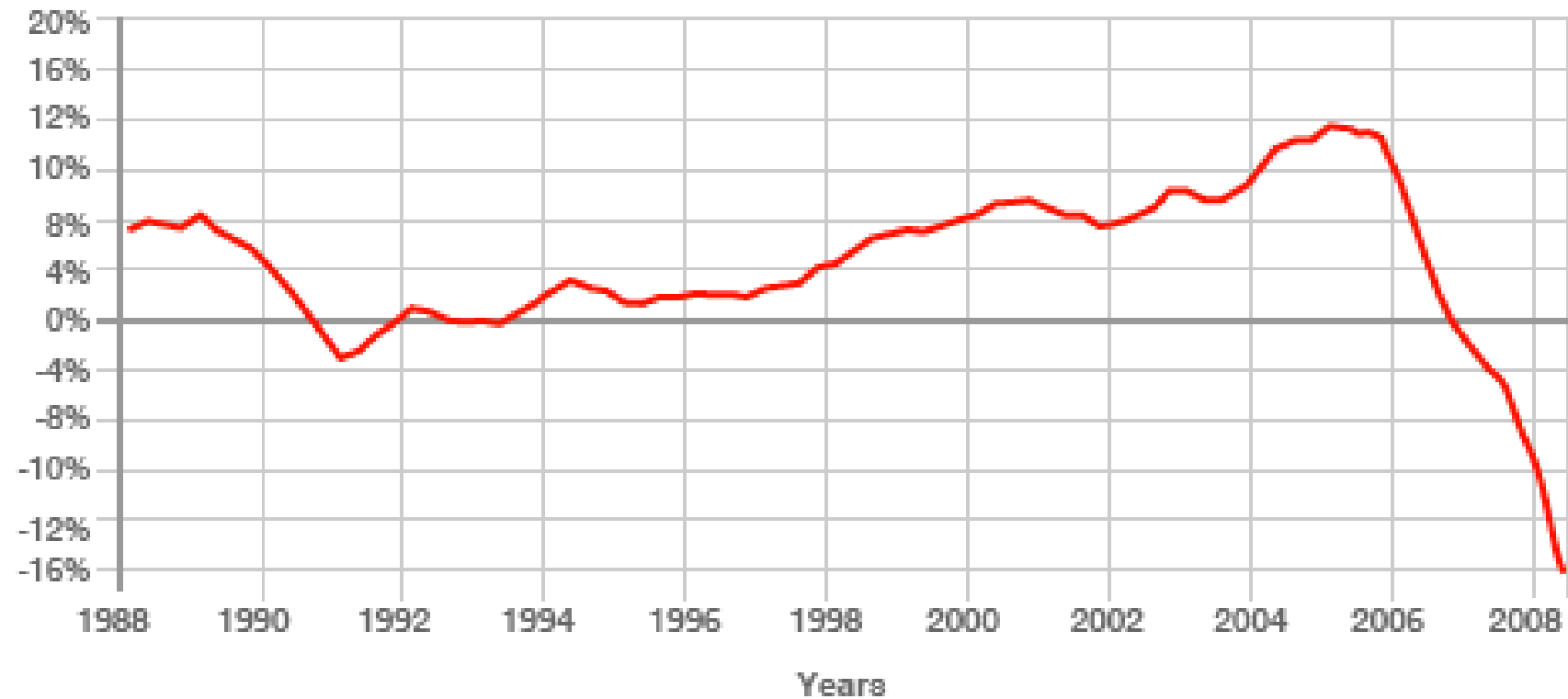


Origins

- Since 1990s, deregulation of financial markets: risk pricing replaces prudential supervision. Rise of derivative “assets” with opaque markets and few players. Bank loans replaced by bonds etc.
- Huge US fiscal deficit, monetary expansion (“Greenspan put”), low savings led to a US mortgage boom/bust (non-traded sector) and a huge current account deficit (traded sector).
- Mortgage bubbles (e.g. 1992 in UK) are familiar with obvious political costs; join recurrent bubbles in past decade;
- This was by far the most serious *systemically* because it threatens the global banking system itself as creditor, and US as debtor.

US HOUSE PRICE TRENDS, 1988-2008

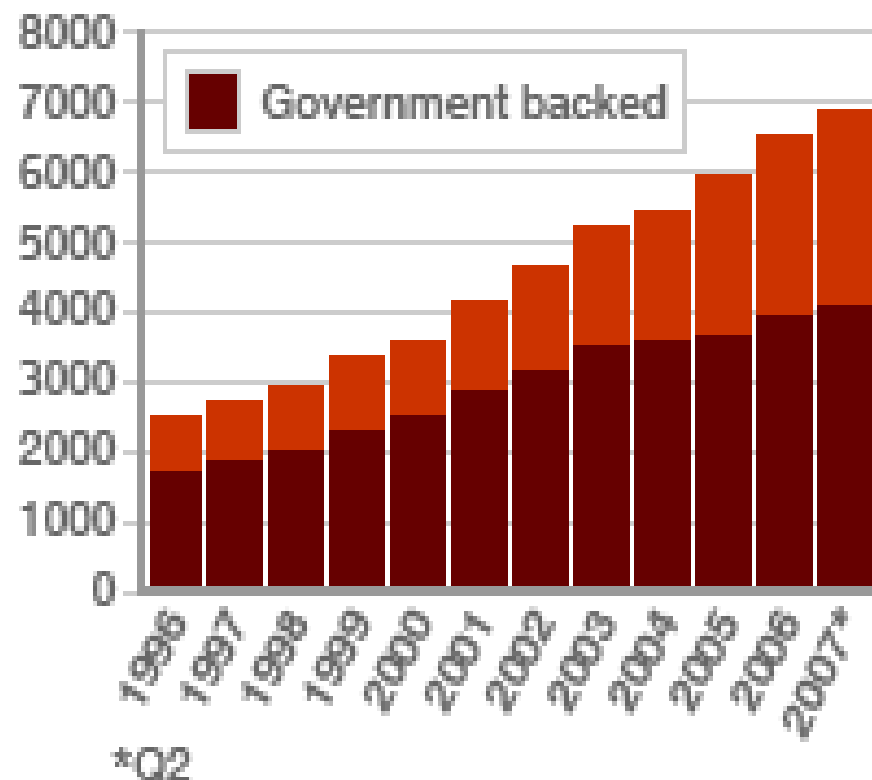
Per cent change, year ago



SOURCE: S&P/Case-Shiller

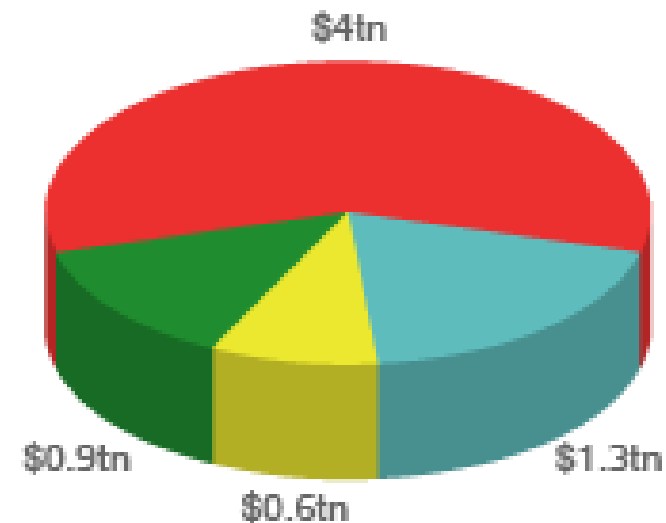
RISE OF MORTGAGE BOND MARKET

Outstanding mortgage-backed securities
(\$ billion)



SOURCE: SIFMA

MORTGAGE BOND MARKET



Total: \$6.8 trillion, 2007 Q2



SOURCE: Source: Federal Reserve;
Bank of England; SIFMA

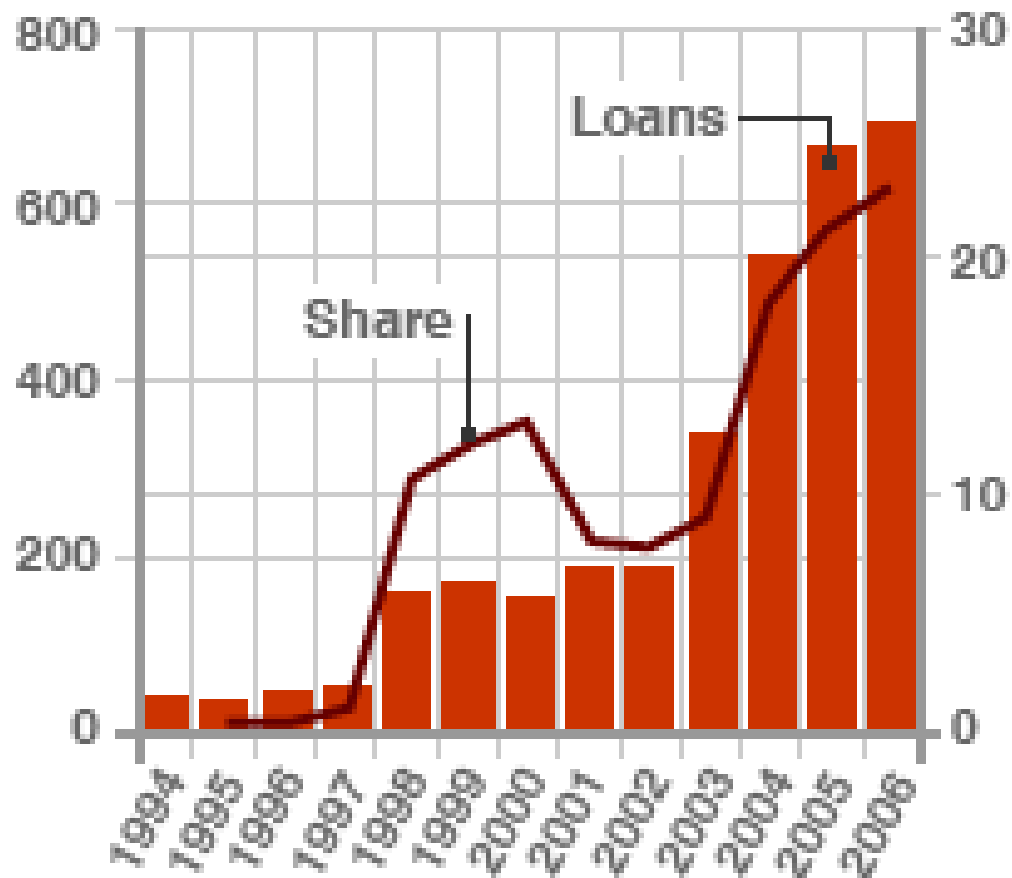
Sub-prime lending

- Sub-prime lending had spread from inner-city areas right across the US by 2005.
- By then, one in five mortgages were sub-prime, and they were particularly popular among recent immigrants trying to buy a home for the first time, and the poor.
- House prices were high, and it was difficult to become an owner-occupier.
 - These mortgages had a much higher rate of repossession than conventional mortgages (and thus much riskier) because they were adjustable rate mortgages (ARMs).
 - Payments were fixed for two years, and then became higher and linked to Fed interest rates, which also rose substantially.

GROWTH OF SUB-PRIME LENDING

Annual volume of
sub-prime \$bn

% share of
mortgage market



SOURCE: Center for Responsible Lending
/Inside Mortgage Finance

Sub-prime

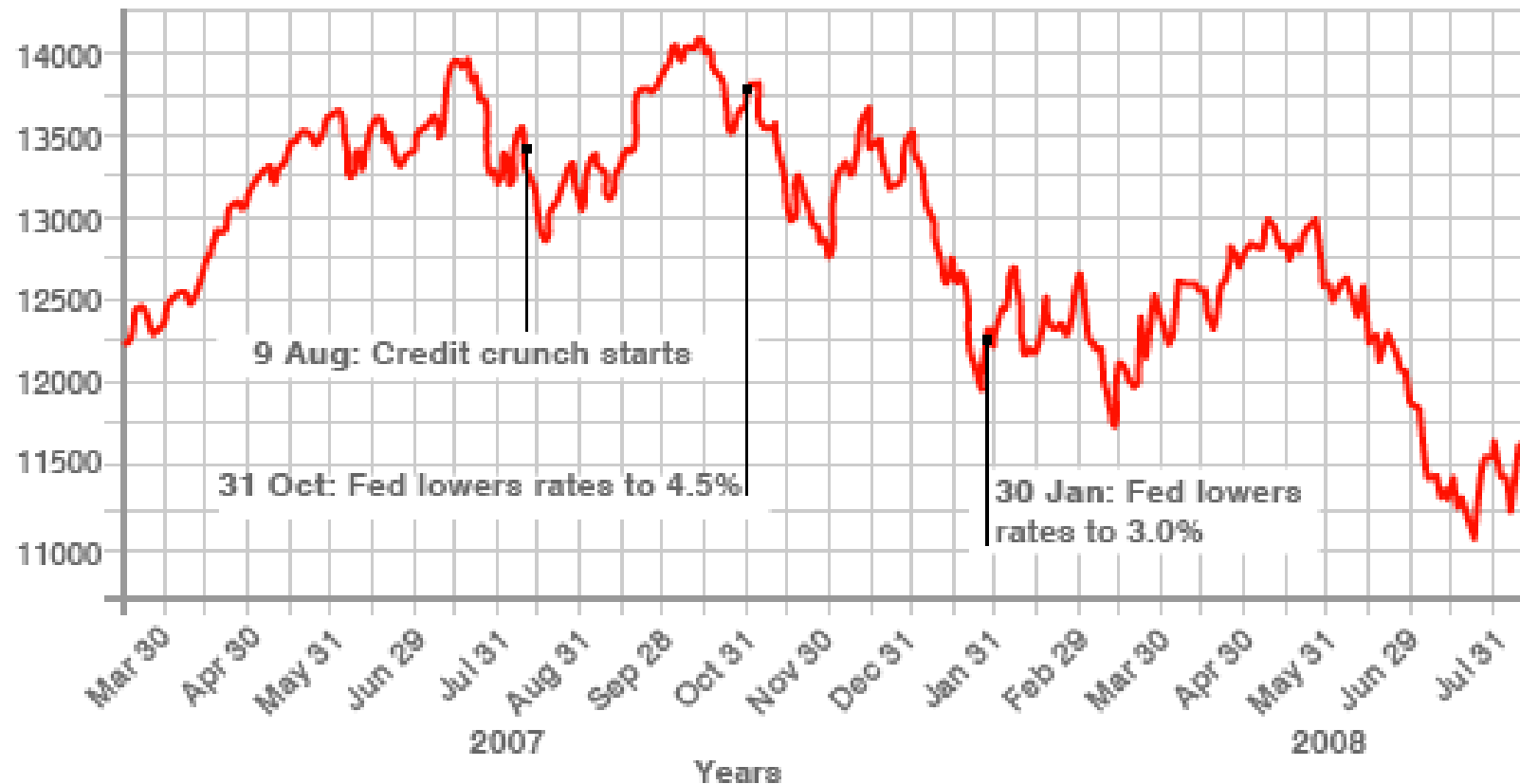
- A wave of repossessions was sweeping America as many of these mortgages reset to higher rates.
 - By late 2007, one in ten homes in Cleveland had been repossessed and Deutsche Bank Trust, acting for of bondholders, was the largest property owner in the city.
- As many as two million families will be evicted from their homes as their cases make their way through the courts.
 - The Bush administration was pushing the industry to renegotiate, but mortgage companies are being overwhelmed by a tidal wave of cases.

Consequences

- Collapse of the government-backed mortgage system in US (Fannie and Freddie), followed by meltdown of major investment banks (Lehman, Bear, Merrill) exposed to mortgage market
- Market-to-market asset pricing effects on balance sheets and cumulative liquidity retraction due to rising risk aversion;
 - affected insurance (AIG); and later pensions funds (?)

Stock market boom ended

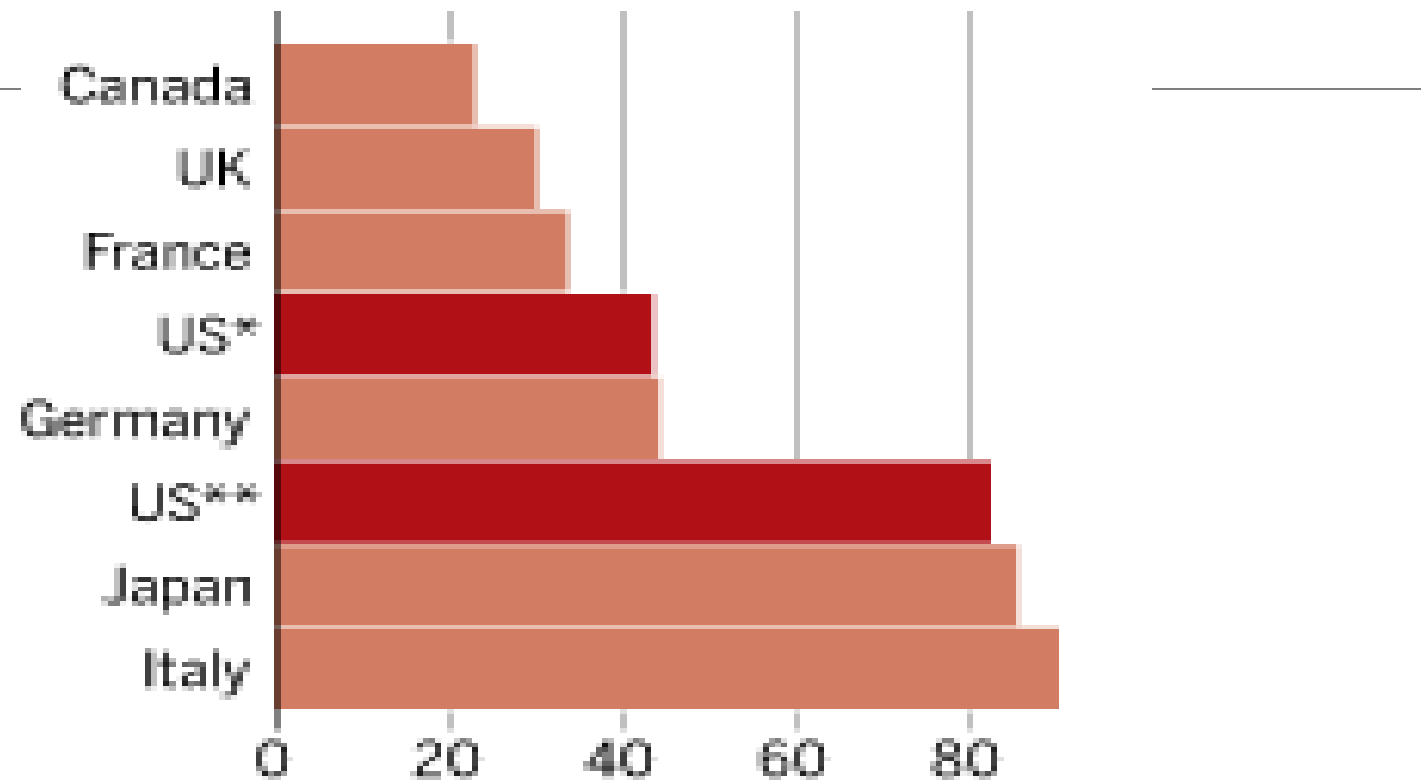
**STOCK MARKET JITTERS: DOW JONES INDUSTRIAL AVERAGE,
LAST 12 MONTHS**
US\$



SOURCE: Bloomberg

Loading up

Net public sector debt as a % of GDP



* Pre - Fannie/Freddie rescue

** post - Fannie/Freddie

Source: Lombard Street Research

POLICY OPTIONS



Pro-active macroeconomic policy

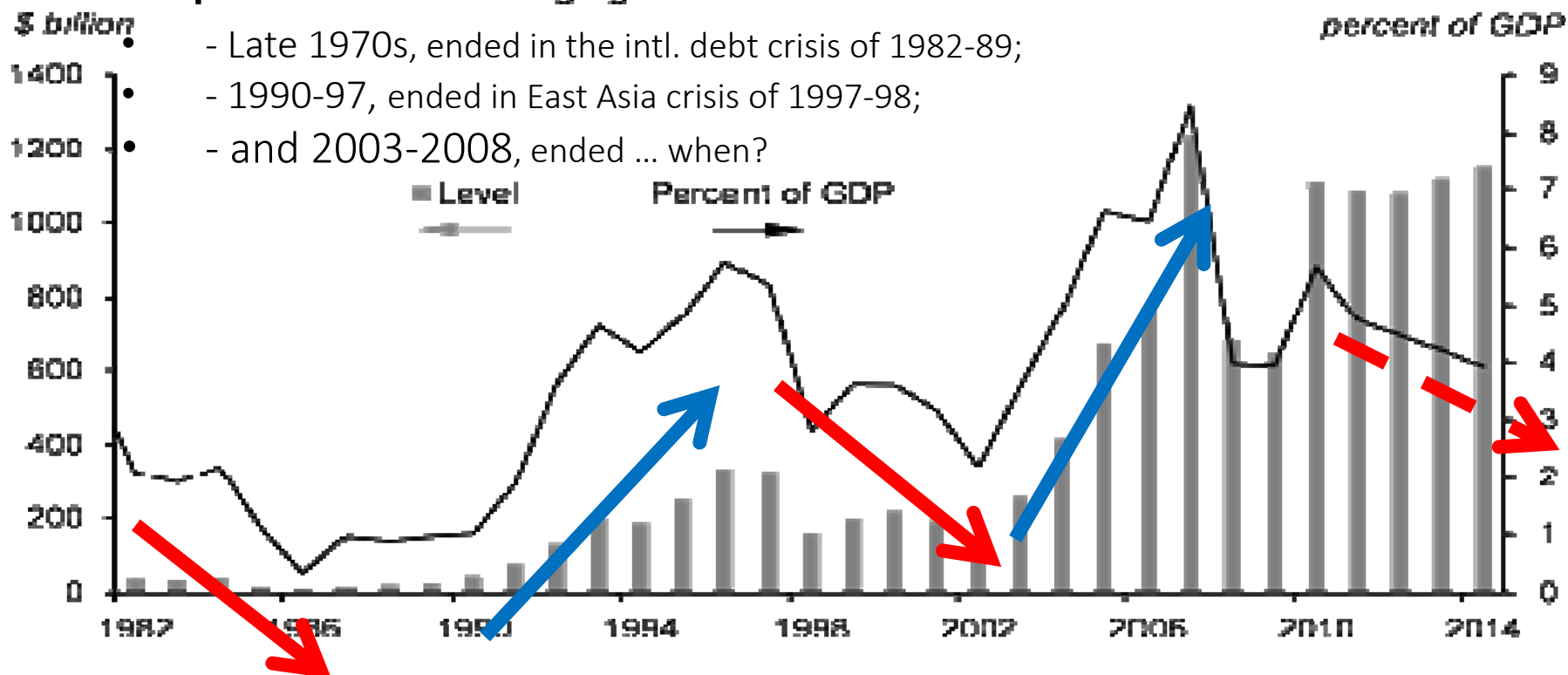
- Counter-cyclical monetary policy and real exchange rate management (including capital controls) necessary
- Support domestic banks (especially for agriculture and SMEs), underwrite long-term investment lending; keep real interest rates low.
- Raise tax pressure (*not* rates) to maintain fiscal balance and reduce public borrowing.

IMPACTS OF THE US INTEREST RATES ON THE EMERGING MARKETS



3 waves of capital flows to Emerging Markets

Private Capital Inflows to Emerging Market Economies



“Joseph Cycle”

- Joseph prophesied 7 years of plenty, with abundant harvests from a full Nile -- followed by 7 lean years of drought & famine.
- The Pharaoh empowered his technocratic official (Joseph) to save grain in the 7 years of plenty,
 - building up sufficient stockpiles to save the Egyptian people from starvation during the bad years.

a valuable lesson for today's government officials in industrialised and developing countries.

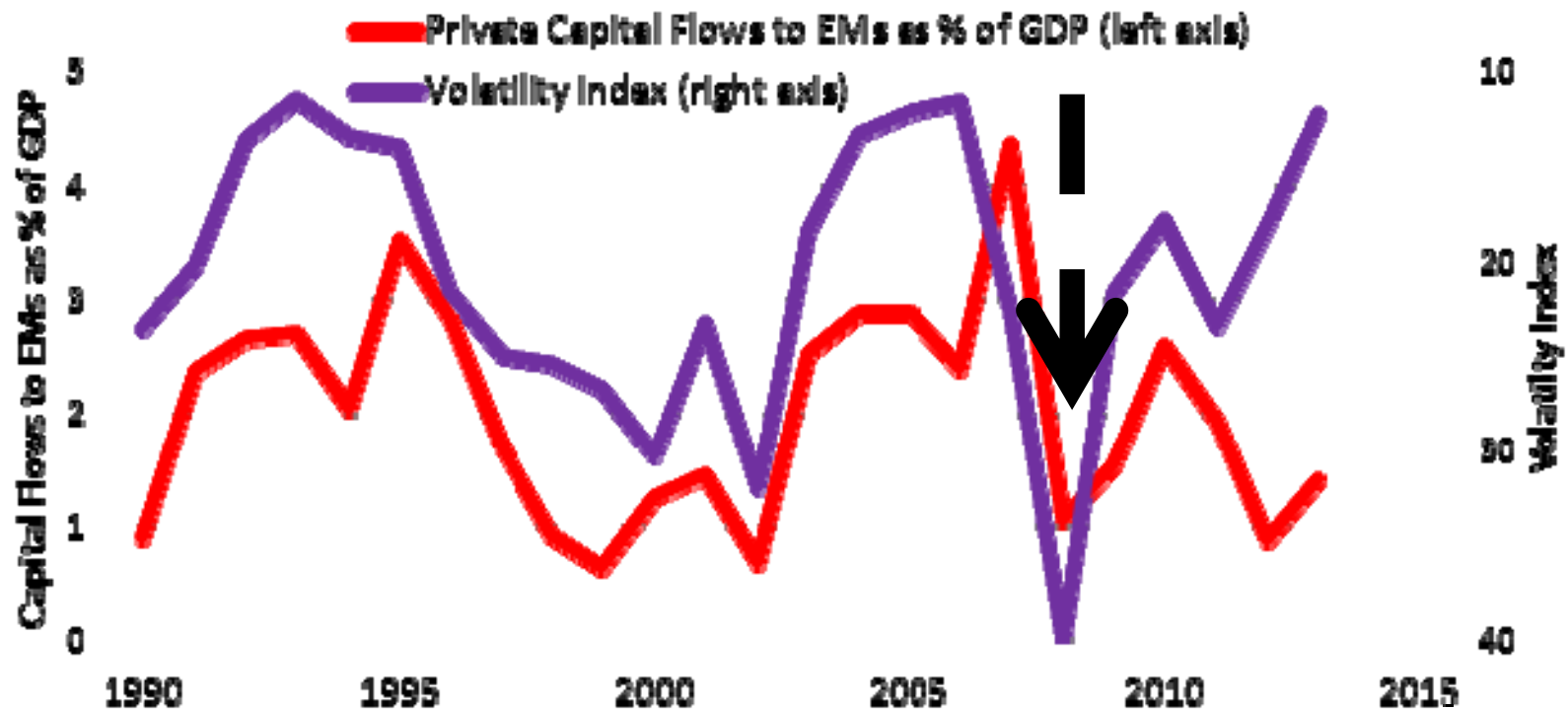
“Joseph Cycle”

- For emerging markets, the first phase of 7 years of plentiful capital flows occurred in 1975-1981,
 - recycling petrodollars as loans to developing countries.
- The international debt crisis that began in Mexico in 1982 was the catalyst for the 7 lean years, “Lost decade” for Latin America
- The turnaround year, 1989, saw the 1st Brady bond issue.

“Joseph Cycle”

- The second cycle of 7 fat years was the period of record capital flows to emerging markets in 1990-1996.
 - Then, the 1997 “sudden stop” in East Asia was then followed by 7 years of capital drought.
- The third cycle of inflows, often identified with “carry trade” & “BRICS” came in 2004-2018
 - and persisted even through the Global Financial Crisis.
- If history repeats, it may be time for a 3rd sudden stop of capital flows to emerging markets!
 - We never know...

When implicit volatility is high (↓ in graph), capital flows to EMs fall: “Risk off” (e.g., 2009 Global Financial Crisis)

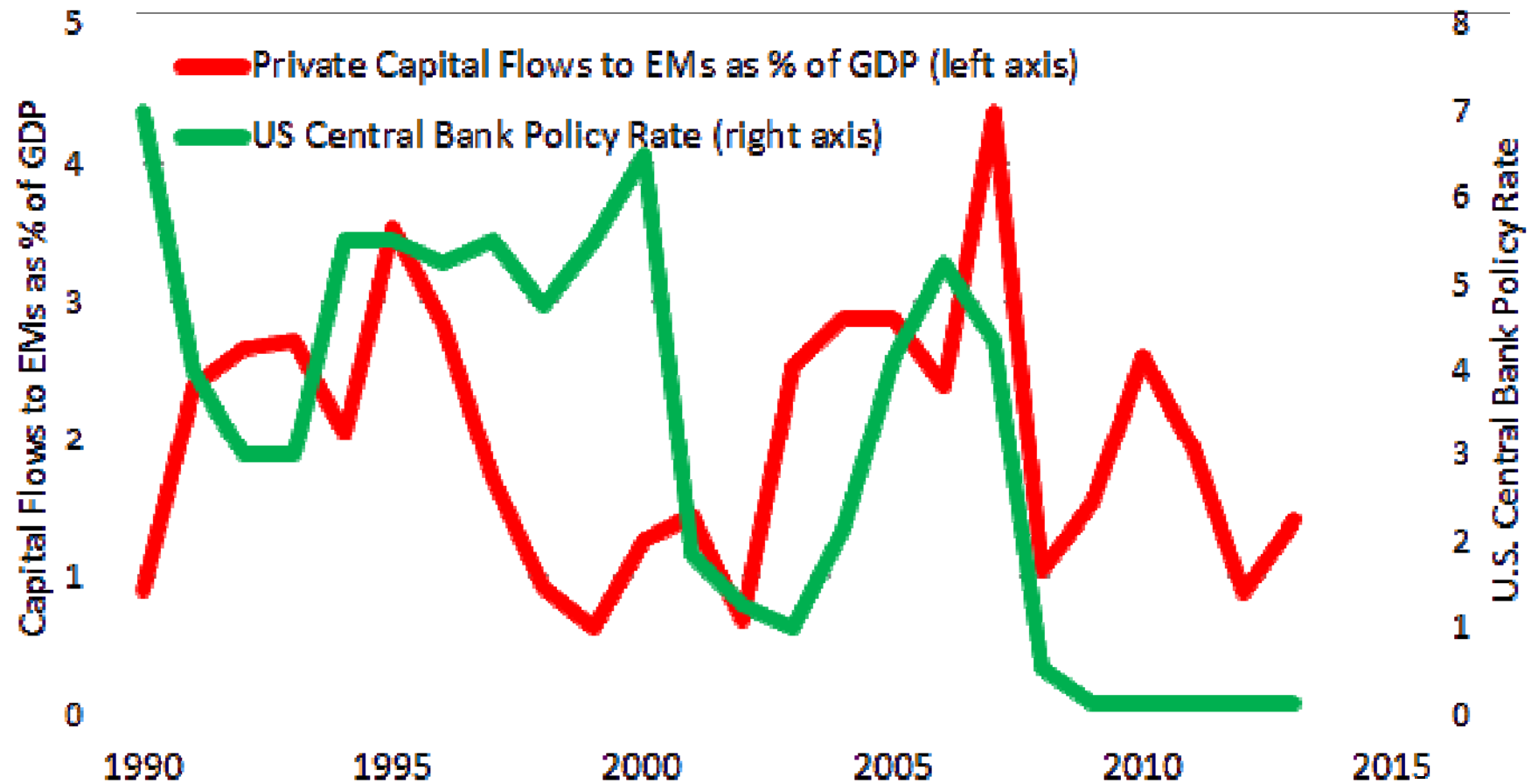


Source: Forbes (2014) <http://www.voxeu.org/article/understanding-emerging-market-turmoil>

The role of US monetary policy

- Low US real interest rates contributed to EM flows in late 1970s, early 1990s, and early 2000s.
- The Volcker tightening of 1980-82 precipitated the international debt crisis of 1982.
 - The Volcker Rule seeks to limit certain risks that Congress believed insured depository institutions and certain foreign banking organizations with U.S. operations and their respective affiliates (banking entities) might be exposed to in connection with short-term proprietary trading and investments in and certain relationships with private equity funds and hedge funds (covered funds).
- The Fed tightening of 1994 helped precipitate the Mexican peso crisis of that year.
- However, the correlation is not always there.

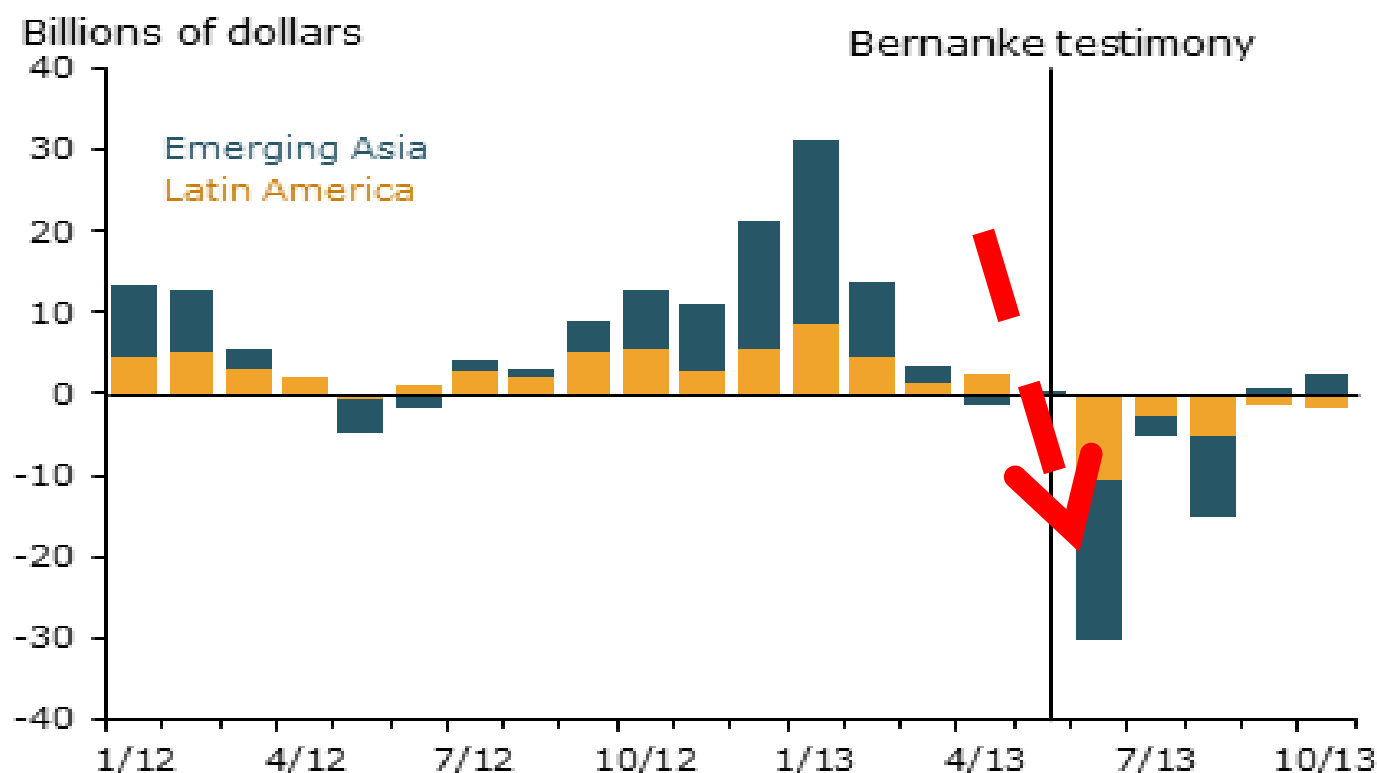
The relationship between the Fed's interest rate and EM capital flows does not always hold.



Kristin Forbes, 2014 <http://www.voxeu.org/article/understanding-emerging-market-turmoil>

Notes: Data on private capital flows and policy rates from IMF's IFS database, Dec. 2013 version. Capital flows are private financial flows to emerging markets and developing economies. Policy rates measured at end of period. Data for 2013 are estimates.

After Fed “taper talk” in May 2013, capital flows to Emerging Markets reversed again.

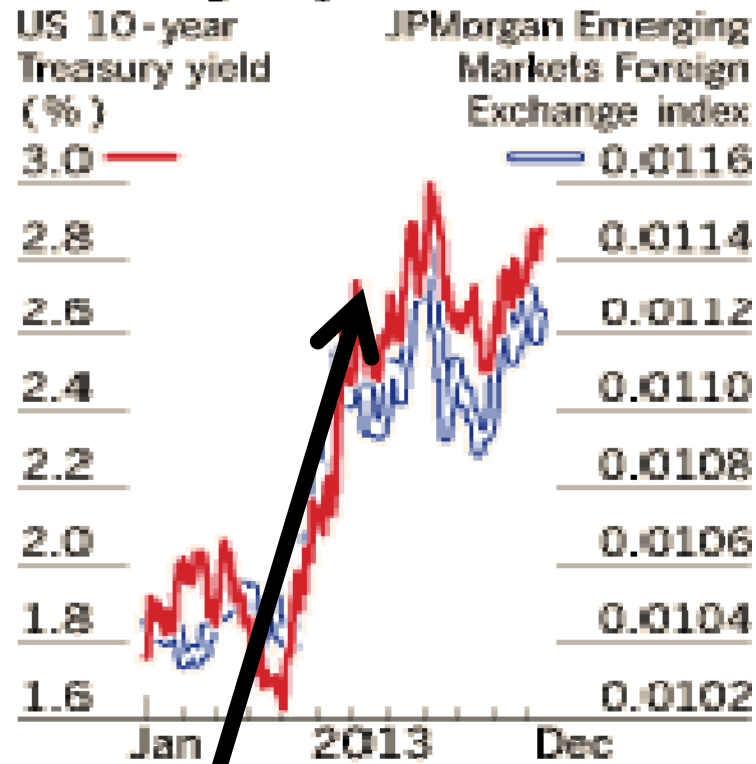


Powell (2013) “Advanced Economy Monetary Policy and Emerging Market Economies.”
Speech at the Federal Reserve Bank of San Francisco Asia Economic Policy Conference, November .
<http://www.frbsf.org/economic-research/publications/economic-letter/2014/march/federal-reserve-tapering-emerging-markets/>

Also read : <http://www.voxeu.org/article/fed-tapering-and-emerging-markets>

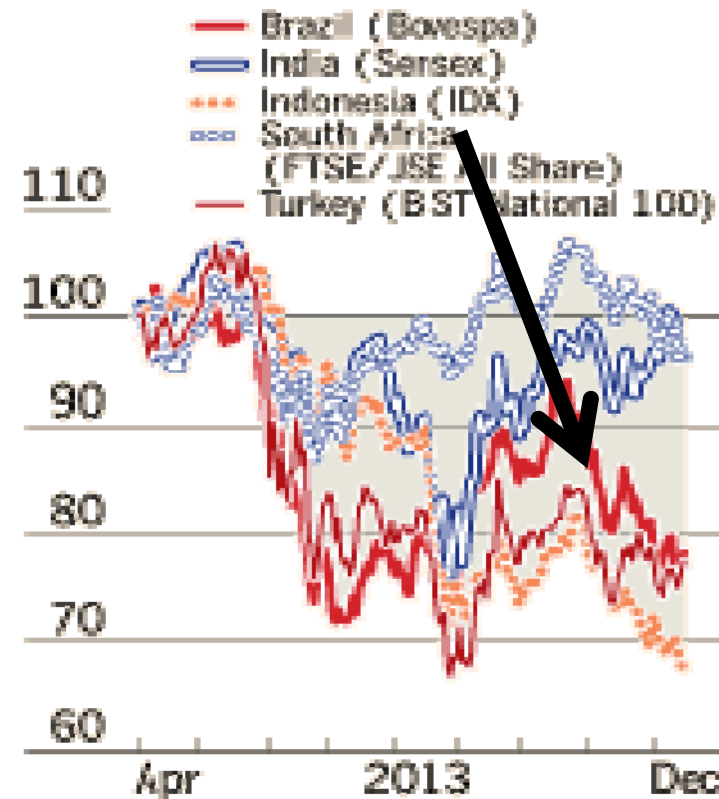
When Ben Bernanke warned of tapering QE in May/June 2013, US interest rates rose and emerging market stocks fell.

And when the Fed actually tapers?



Source: Bloomberg

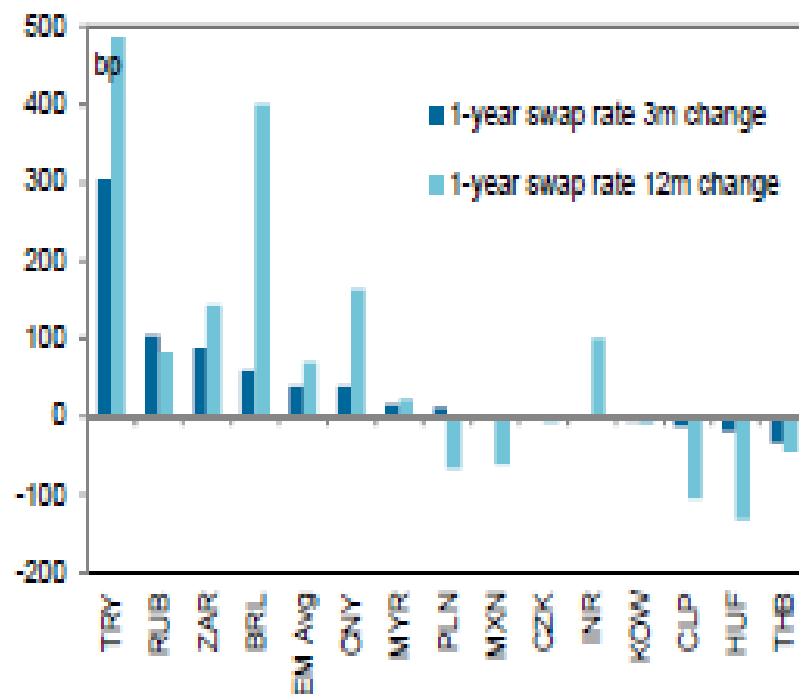
Emerging markets stocks Indices rebased (in \$ terms)



Source: Thomson Reuters Datastream

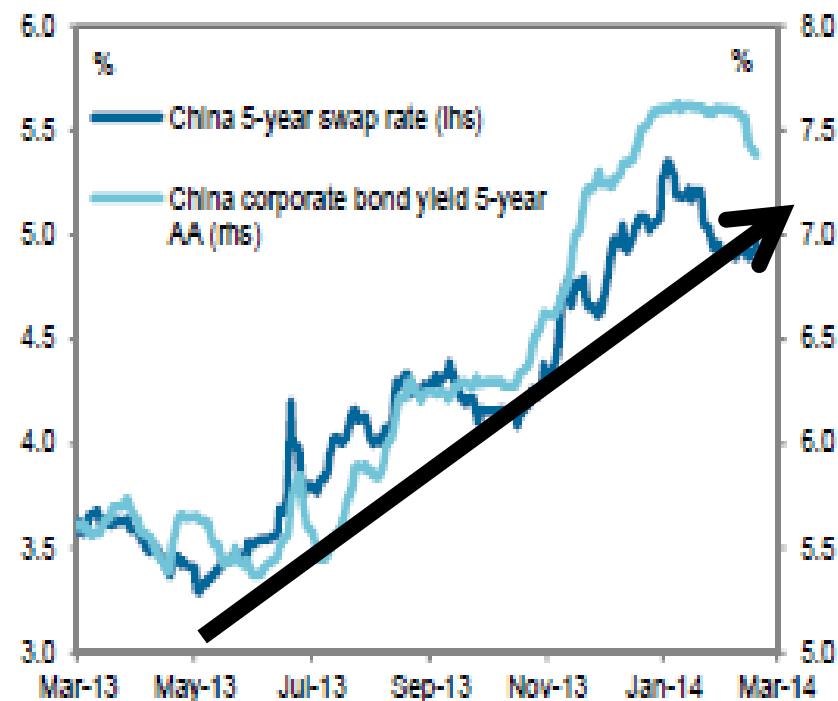
Global investors required higher interest rates from EMs after May 2013

Exhibit 3: Rates have increased in high yielders (Turkey, Russia, South Africa, Brazil) ...



Source: Goldman Sachs Global Investment Research.

Exhibit 4: ... and in China



Source: Bloomberg, Goldman Sachs Global Investment Research.

Global Economics Weekly: 14/07 - The downside risks to EM growth and their market implications, 2/19/2014

Which EM countries are hit the hardest?

For past studies of past crises, such as 1997-98,

Early Warning Indicators that worked well include:

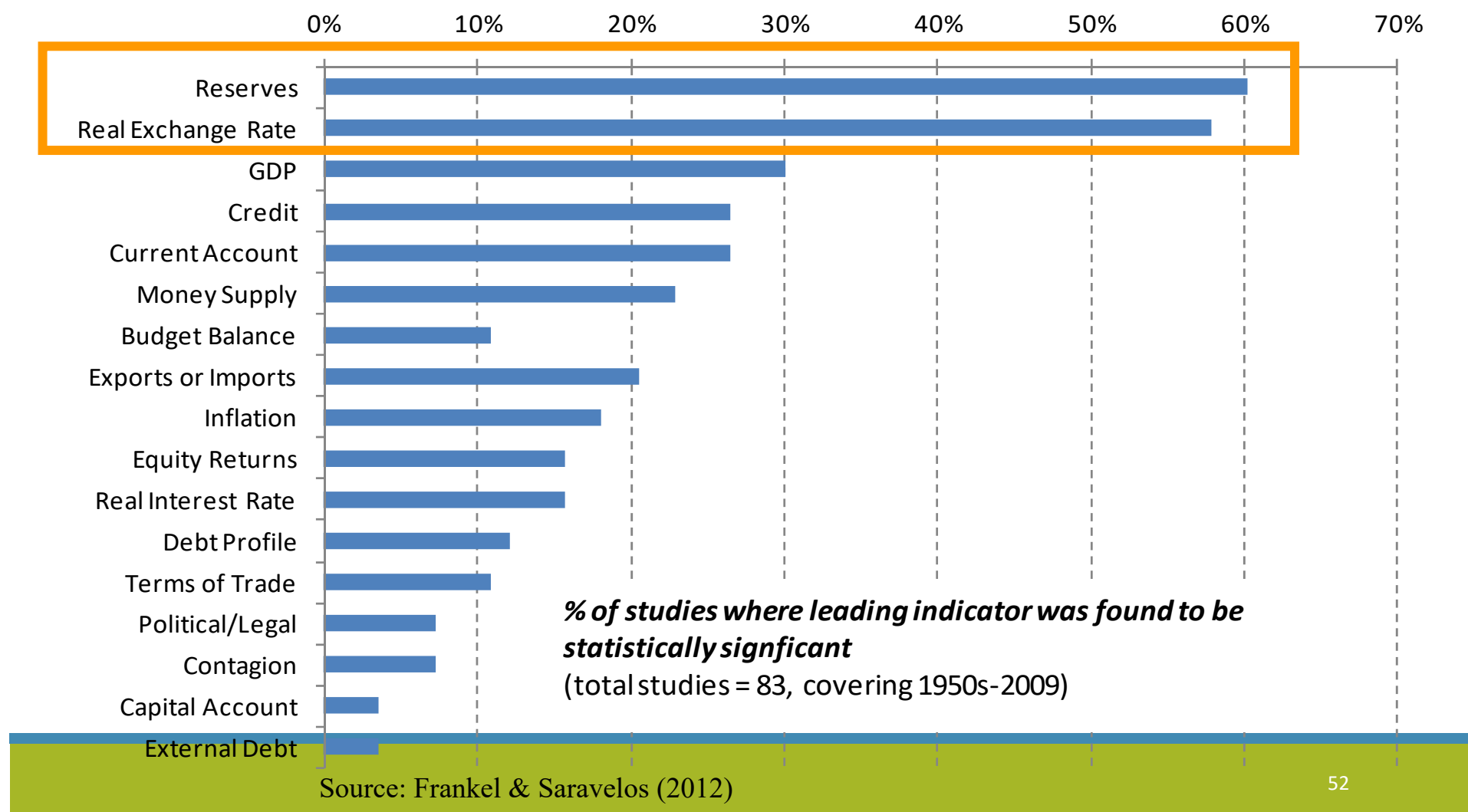
- Foreign exchange reserves
 - especially relative to short-term debt;
- Currency overvaluation;
- Current account deficits.

E.g.,

- Frankel and Rose (1996) “
- Kaminsky, Lizondo and Reinhart (1998)
- Kaminsky and Reinhart (1999)
- J. Frankel & G. Saravelos (2012) “
- Blanchard, Faruquee and Klyuev (2009)
- Rose and Spiegel (2009, 2010, 2011).

The variables that show up as the strongest predictors of country crises in the past are:

(i) reserves and (ii) currency overvaluation



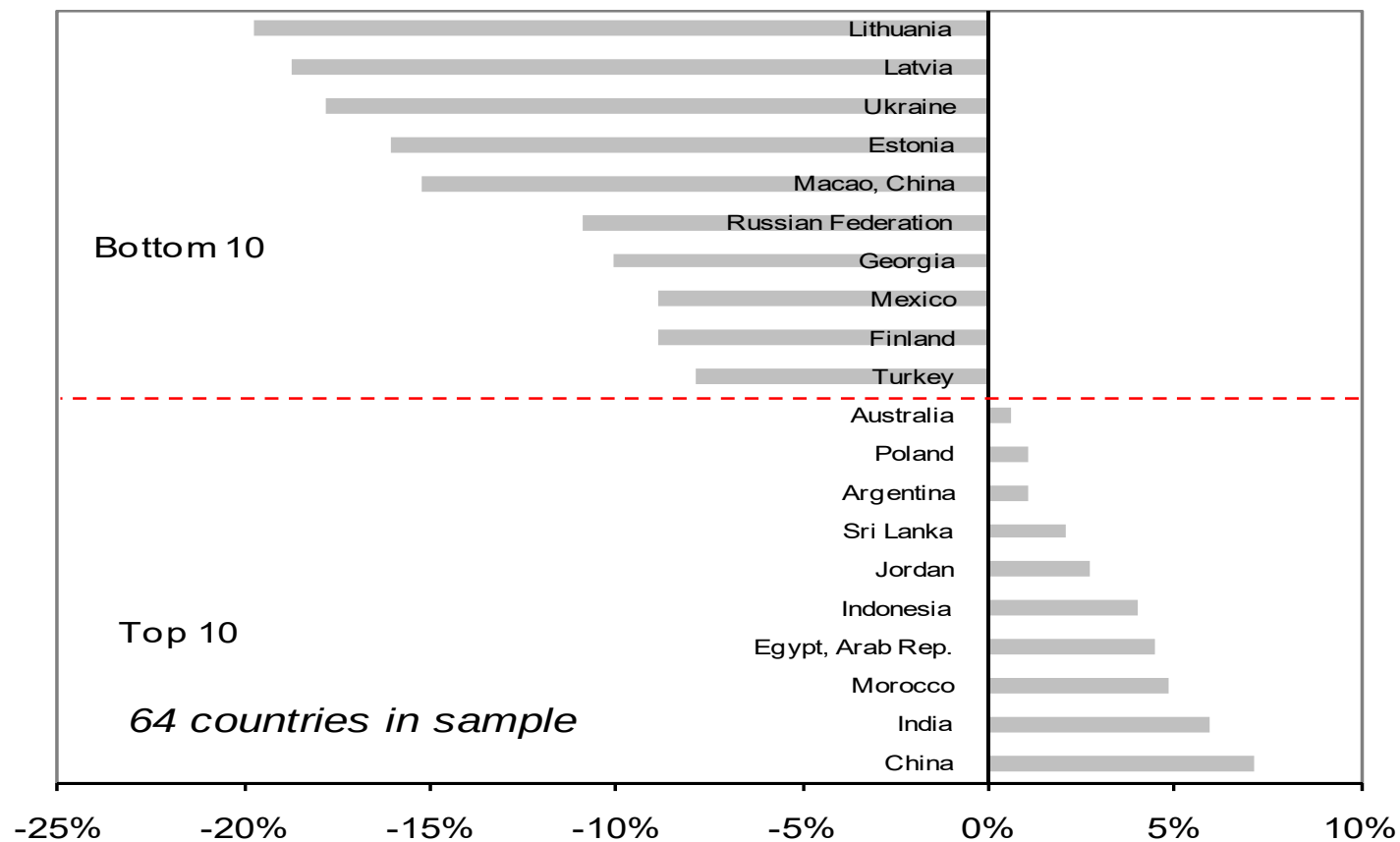
Many EM countries learned lessons from the crises of the 1990s, which better-prepared them to withstand the Global Financial Crisis of 2008-09 (or “North Atlantic Financial Crisis” – R.Mohan)

- More-flexible exchange rates
- Higher reserve holdings
- Less dollar-denominated debt
 - More local-currency debt
 - More equity & FDI
- Fewer Current Account deficits
- Counter-cyclical government budgets

Best and Worst Performing Countries in Global Financial Crisis of 2008-09

(Frankel and Spiegel, 2010)

GDP Change, Q2 2008 to Q2 2009



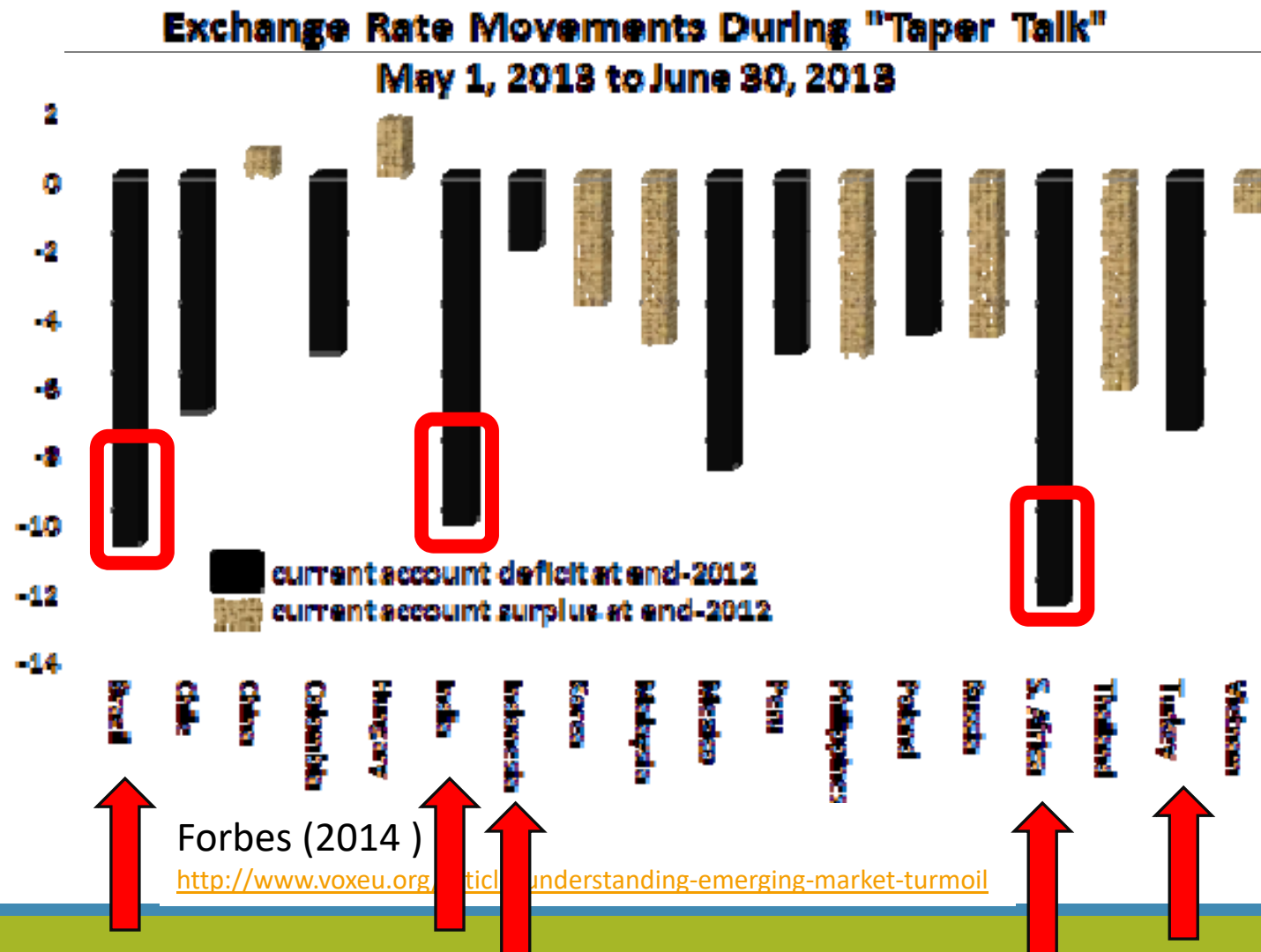
Which EM countries were hit the hardest by the “taper tantrum” of May-June 2013?

- Those with big current account deficits,
- or with exchange rate overvaluation.
- Reserves did not seem to help this time.

E.g.,

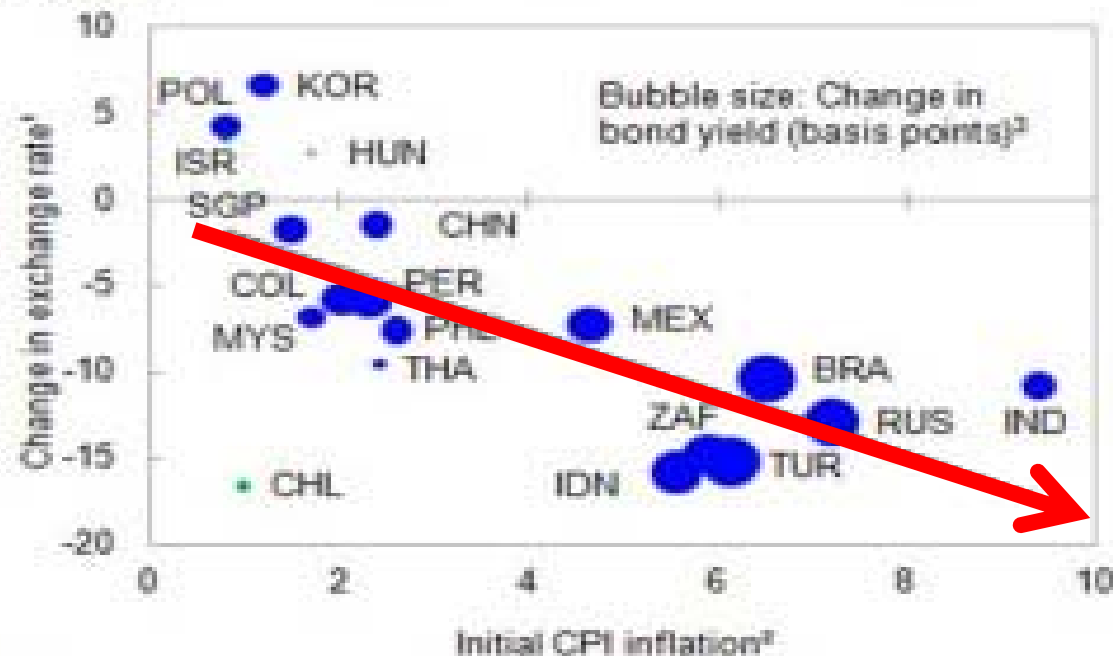
- Eichengreen and Gupta (2013) “Tapering Talk: The Impact of Expectations of Reduced Federal Reserve Security Purchases on Emerging Markets,” Working Paper.
- Hill (2014) “Exploring Early Warning Indicators for Financial Crises in 2013 & 2014,” HKS, April.

Countries with current account deficits were hit in June 2013.



Countries with high inflation rates were also hit in the year since May 2013.

Figure 3. Changes in Exchange Rates and Domestic Bond Yields Since End-April 2013 vs. Initial Inflation (Percent)



Sources: Bloomberg L.P.; Haver Analytics; and IMF staff calculations.

¹ Percent change in the U.S. dollar per local currency exchange rate between April 30, 2013 and April 30, 2014.

² Percent change in inflation over the year through April 2013.

³ Change in 10-year bond yield between April 30, 2013 and April 30, 2014. Changes for Chile and Israel were negative.

Source: Klemm, Meier and Sosa (2014), IMF.

[Taper Tantrum or Tedium: How U.S. Interest Rates Affect Financial Markets in Emerging Economies](#)

Overall

Many EMs learned lessons from the 1980s & 1990s, and by 2008 were in a stronger position to withstand shocks.

- More flexible exchange rates;
- More foreign reserves;
- Less foreign exchange-denominated public debt
- Stronger budget positions;
- Stronger current account positions.

Some backsliding since 2009:

- Weaker budgets;
- Current account deficits;
- The return of foreign exchange-denominated *private* debt.

A promising direction: macro-prudential regulations

- E.g., counter-cyclical loan-to-value ratios for mortgages, capital flows management (CFM) in E.Asia.
- Read: https://www.imf.org/external/pubs/ft/reo/2014/apd/eng/c4_0414.pdf

Further Discussion:

What is the desirable exchange rate regime?

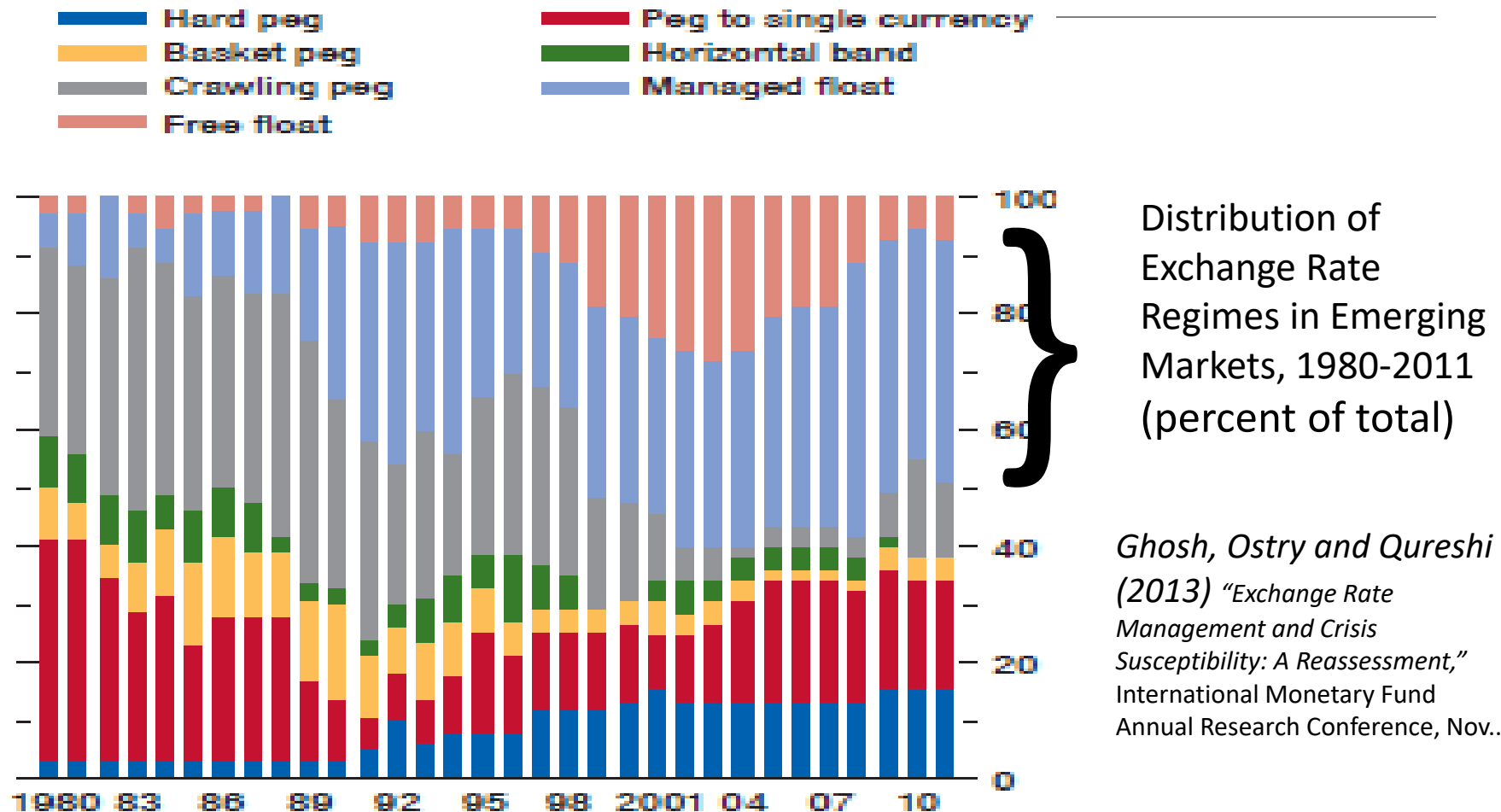
- Very small, very open, economies will continue to want to fix their exchange rates, in most cases.
- Most countries are in between,
 - particularly middle-sized middle-income countries.

Most of these countries should have intermediate exchange rate regimes,

- neither firm fixing nor free floating.
- They include band & basket arrangements.

Distribution of EM exchange rate regimes

The biggest rise is in the “managed float” category

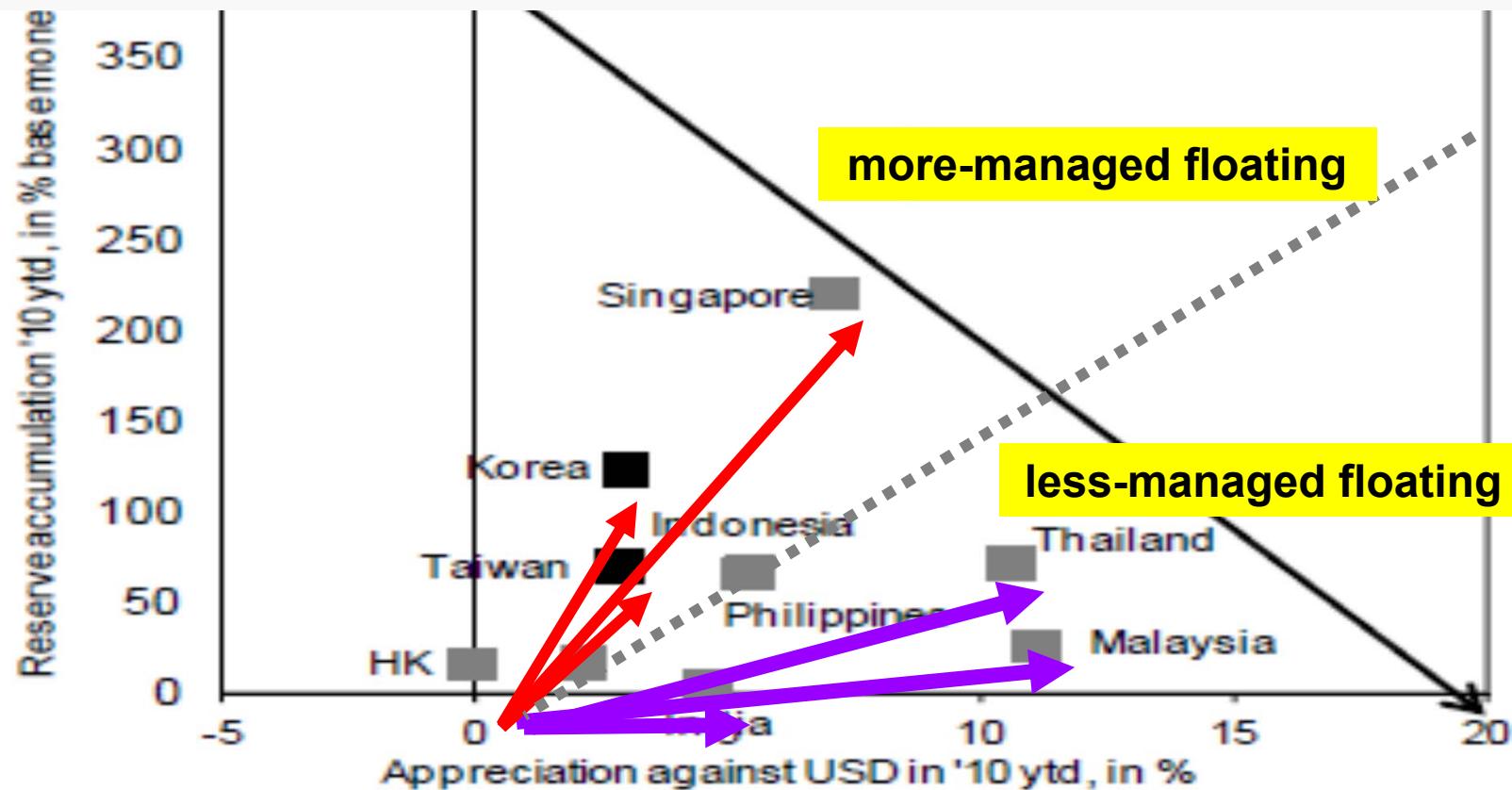


Any Corner Solution?

- Fischer's suggestion: giving speculators a target to shoot at it is often a losing proposition
 - such as the boundary of a declared band.
- A particular intermediate regime could be useful, a systematic sort of managed floating:
- A rule could say that for every 1% of Exchange Market Pressure, the central bank takes x % as an appreciation of the currency and $(1-x)$ % as an increase in reserves (relative to the monetary base).
 - This arrangement, though rather obvious, has seldom been formalised.
 - The parameter x calibrates exchange rate flexibility,
 - and can range from 0 (fixing) to close to 1 (full flexibility).
 - Thus one can have $\frac{1}{2}$ monetary independence + $\frac{1}{2}$ exchange rate stability.

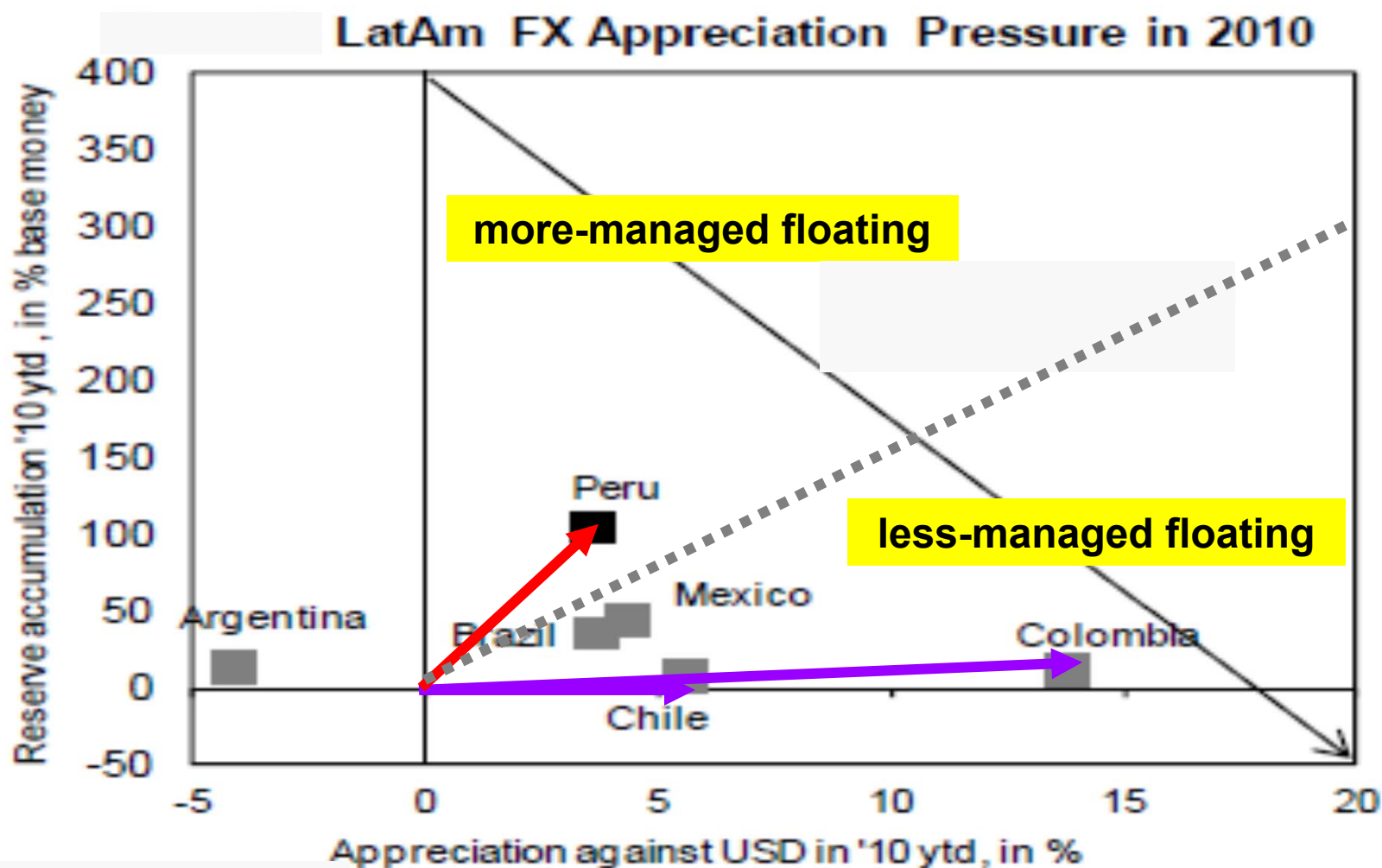
Example: Renewed capital inflows to Asia in 2010

Korea & Singapore took them mostly in the form of reserves,
while India & Malaysia took them mostly
in the form of currency appreciation.



Source: Haver Analytics and Bloomberg

Renewed inflows in 2010 in Latin America were reflected mostly as reserve accumulation in Peru, but as appreciation in Chile & Colombia.



Systematic managed floating

refutes the corners hypothesis,

- but without violating the Impossible Trinity,
- without capital flow management measures,
- and even without giving speculators a line to shoot at.

- Attempts at econometric estimation

- Adler and Tovar (2011) “Foreign Exchange Intervention: A Shield Against Appreciation Winds?” IMF WP 11/165.
- Frankel and Xie (2010) “Estimation of De Facto Flexibility Parameter and Basket Weights in Evolving Exchange Rate Regimes,” *Amer.Econ.Rev.*, May.

If the exchange rate is not to be the anchor for monetary policy, what is?

- The need for an alternative anchor for monetary policy led many countries to Inflation Targeting (IT),
 - after the currency crises of the late 1990s pushed them away from exchange rate targets.
- IT was in many ways successful.
- One problem with IT:
Exogenous supply & trade shocks.
 - Remember the textbook convention that the exchange rate should accommodate terms of trade shocks.
 - If IT is interpreted in terms of the CPI, in theory it doesn't allow the exchange rate to rise and fall with the terms of trade.
 - For oil importers, when the world price of oil goes up, a literal CPI target says to *tighten* monetary policy enough to *appreciate* the currency,
 - the opposite direction from accommodating the adverse trade shock.

Nominal GDP Targeting

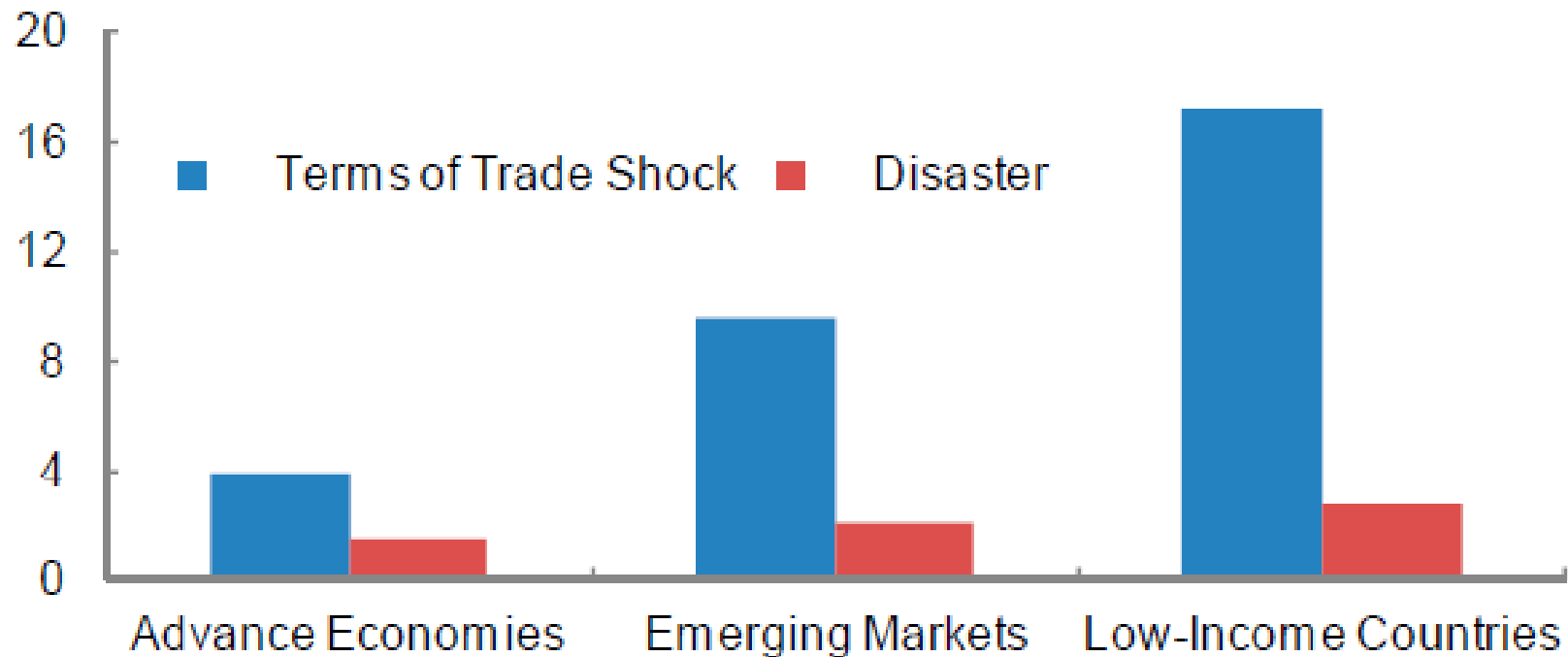
- NGDPT is more robust with respect to supply shocks & terms of trade shocks.
 - That is, compared to the alternative of IT.
- If the alternative is a money target, NGDPT is more robust with respect to velocity shocks.
- If the alternative for a threshold is the unemployment rate, NGDPT is more robust with respect to
 - shocks to the labour force participation rate,
 - as the Fed faced last year, and
 - shocks to labour productivity,
 - as the Bank of England has faced.

NGDPT

- The proponents of Nominal GDP Targets have focused on the biggest countries.
- But middle-size, middle-income countries are better candidates.
- Why? They suffer bigger supply shocks and trade shocks.
- NGDPT may be considered as a serious alternative to IT & exchange rate targeting.

Trade and Supply Shocks are More Common in Emerging Markets & Low-Income Countries

Probability of Shocks, 1970-2007
(In percent of country years)



IMF SPRD & World Bank PREM, 2011, "Managing Volatility in Low-Income Countries: The Role and Potential for Contingent Financial Instruments"