

# Foreign Exchange Interventions

## Theory and Practice

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## 1 Conceptual Framework

- Monetary Frameworks
- Goals and Intermediate Objectives
- FX Interventions Typology
- Transmission Channels

## 2 Implementation

- FXI Timing, Rule vs. Discretion
- FXI Size
- Instruments
- Communication
- Intervention Effectiveness
- FX Interventions and Exchange Rate Management

## 3 Practical Cases

- Mexico
- Brazil
- Colombia
- Peru
- Thailand
- Philippines

# Resources

- A textbook presentation of foreing exchange interventions can be found in Sarno and Taylor (2012): [► The Economics of Exchange Rate](#)
- The IMF has published a guidance note on FX interventions on the spot and derivatives market (2021): [► Link](#)
- The BIS publishes interesting papers reflecting BIS surveys conducted with central banks. For instance (2019):
  - FX Interventions: Goals, Strategies and Tactics
- A recent and quite comprehensive database on FX Interventions (2021), compiled by IMF colleagues:
  - Foreign Exchange Interventions, A Dataset
- I am borrowing materials from Kathryn Dominguez, professor at U-Michigan, specialized on FX interventions:
  - Kathryn Dominguez Personal Webpage
- Popper (2022) provides a very complete literature review on FX

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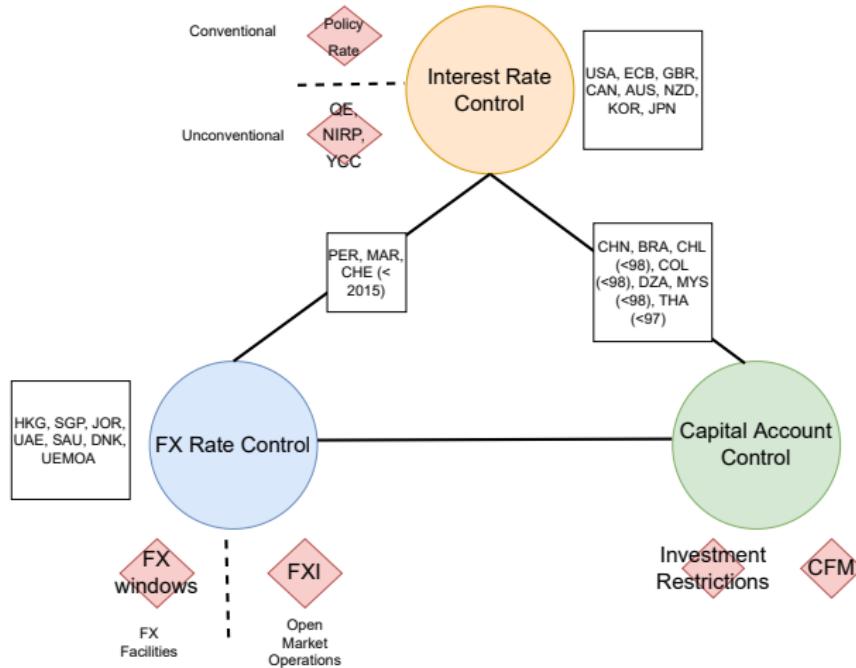
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# Monetary Frameworks and the Mundell Trilemma

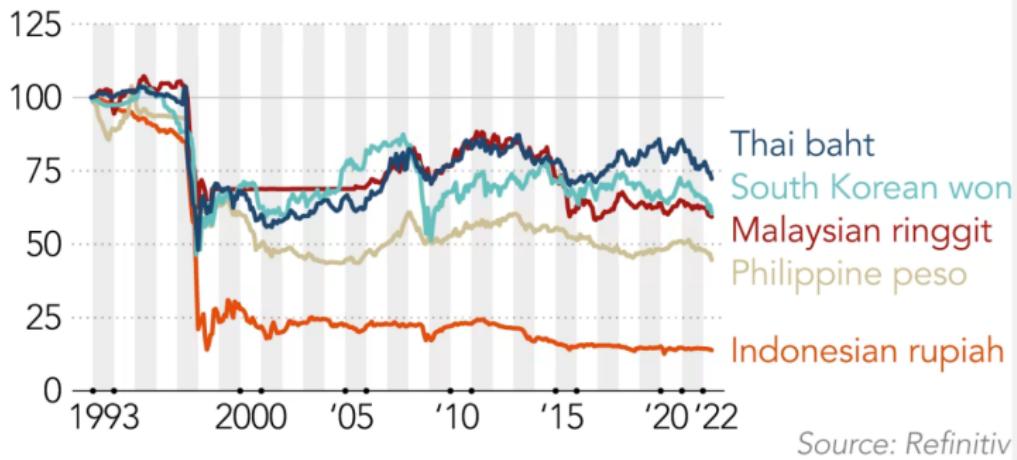


# FX, the Trilemma and the 1997 Asian Financial Crisis

- Most East-Asia in the 90s: *de facto* peg to the USD
- Free mobility of capital (except in China)
- Independent monetary policy with a high domestic interest rate to attract foreign investors
  - Countries were growing fast, foreign capitals supplemented domestic savings
  - FX peg + high interest rate = positive carry without FX risk for investors. Fuel **hot money**
  - Huge credit boom: South-East Asia was receiving **half** of the world total capital flows to EM by the time
  - **Credit bubble** and over-leveraged economies on hot money
- Yet, when the credit bubble bursts (first in Thailand), investors ran: capital outflows, weakening currencies
- Not enough FX reserves: forced devaluation, **FXI not possible**
- Huge FX mismatch on banks and corporate balance sheets: crisis, amplified by hiking interest rate to fight depreciation...

# When FX Matters: FX Devaluations during the AFC

**A currency crash ushered in a new era for Asian exchange rates** (December 1992=100; monthly basis)



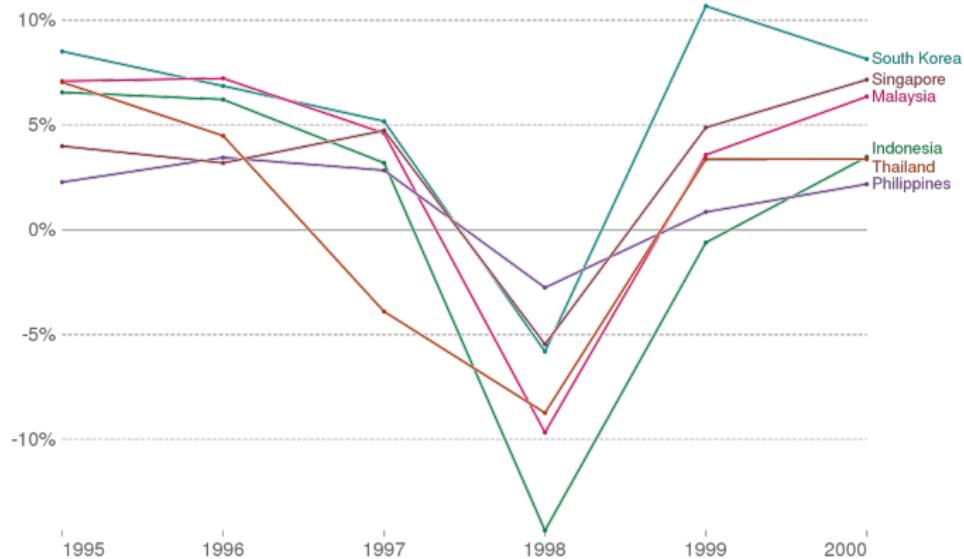
Source: Refinitiv

Source: Nikkei Asia and Refinitiv

# FX Crises: Consequences on the Real Economy

## Annual growth of GDP per capita, 1995 to 2000

Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2010 U.S. dollars.



Source: World Bank and OECD

*Source: Mark Roser, Our World in Data*

# Definition of FX interventions

## FX Interventions: Definition

Any official sale or purchase of foreign assets against domestic assets **in the foreign exchange market**

- FXI are usually carried-out by the central bank, but can sometimes be under the responsibility of the Ministry of Finance (eg. [Link](#))
- *To simplify, in this presentation, we assume that domestic assets are in the domestic currency, while foreign assets are denominated in the foreign currency*

# Goals and Intermediate Objectives

- **Goals:** ultimate purpose of the FX intervention. Consistent with the monetary framework of the central bank
  - *For instance, preserving financial stability*
- **Intermediate objectives:** reach the goals via the operational framework of the central bank
  - *For instance, mitigating FX daily volatility via open-market interventions*

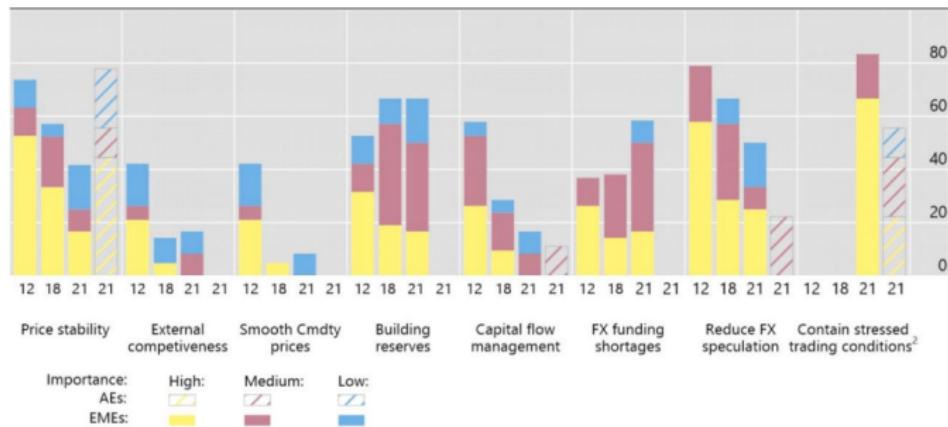
# FXI Main Goals for Central Banks

- **Price stability**
  - When large exchange rate movements pass-through inflation, generating temporary shocks
- **Financial stability**
  - Calm "disorderly market conditions" (for a discussion, see [Link](#))
  - Smooth capital flows and credit spillovers (impact on carry trade and excess returns)
  - Alleviate FX funding shortage
  - Reduce FX speculation
- **Terms of trade**
  - Support external competitiveness (especially in USD weakening phases)
  - Smooth commodity prices fluctuations
- **Building/managing FX reserves**
  - *In principle, without market impact*
- Support fellow central banks in their exchange rate operations

# Survey: FXI Main Goals for Central Banks

As a percentage of respondents

Graph 2



<sup>1</sup> 2012: based on the responses of 19 EME central banks. 2018: based on the responses of 21 EME central banks; 2021: based on the responses of nine AE and 12 EME central banks. As no central banks indicated that the goal was "Containing excessive credit growth", this goal is not included in the graph. <sup>2</sup> "Containing stressed trading conditions" was not included in the 2012 and 2018 surveys.

Sources: BIS surveys on FX intervention 2012, 2018 and 2021.

Source: BIS 2021 [Link](#)

# FXI Interventions Should be Consistent with the Monetary Framework

- **Floating exchange rate regimes** (for instance, inflation targeters) should parsimoniously use FX interventions for:
  - Financial stability
    - ★ *For instance, when domestic agents face severe currency mismatches on their balance sheet*
  - To ensure that the monetary objectives are reached
    - ★ *For instance, when the pass-through of large - and temporary - exchange rate movements threaten the inflation target*
- **Hard-peg and currency board** regimes typically intervene on the FX market to defend the peg, usually via FX windows, at a fixed exchange rate (the monetary policy objectives)
- **Crawling- and soft-peg** conduct infrequent FXI when the exchange rate deviates outside of the central bank tolerance
  - However, there is a risk between *de-jure* and *de-facto* monetary objectives

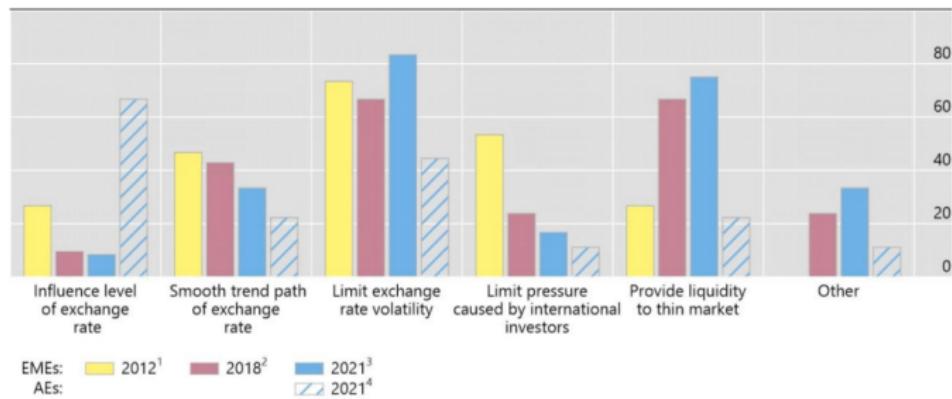
# FXI Intermediate Objectives

- **Limit exchange rate volatility**
  - Even if the main goal is price stability, limiting FX volatility is important. Affect the price-setting behavior of firms; cause average imported inflation to rise
  - Excessive FX volatility can also derail the transmission of monetary policy
- **Provide liquidity to think market**
- **Smooth the path** of the exchange rate
- Limit FX pressure caused by international investors
- Influence the level of exchange rate (if the main goal of the central bank is indeed an exchange rate nominal anchor)

# Survey: FXI Intermediate Objectives for Central Banks

As a percentage of respondents

Graph 3



<sup>1</sup> 15 central banks. <sup>2</sup> 19 central banks. <sup>3</sup> 12 EME central banks. <sup>4</sup> 9 AE central banks.

Sources: BIS surveys on FX intervention 2012, 2018 and 2021.

Source: BIS 2021 [Link](#)

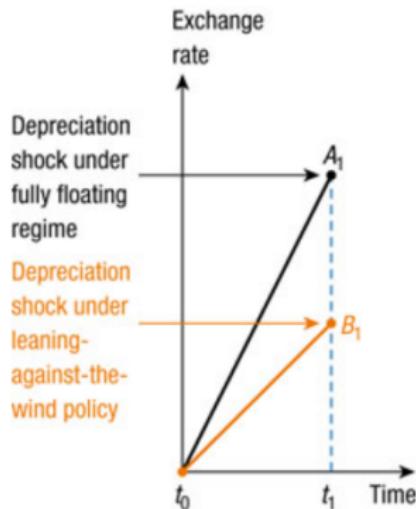
# Smoothing Shocks

FX interventions consistent with floating exchange rate regimes can typically be designed to smooth exchange rate shocks, either:

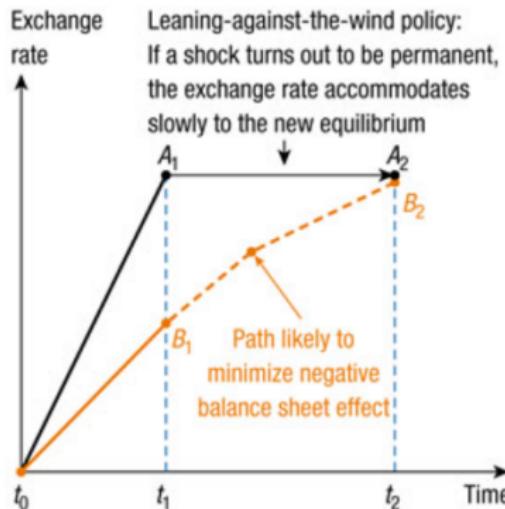
- **Permanent shock:** smoothing the exchange rate path dynamic to reach the new equilibrium
- **Temporary shock:** smooth the temporary impact while allowing the economy to quickly return back to the previous state

# FXI to Smooth Shocks: Permanent Shock

## 1. First Period



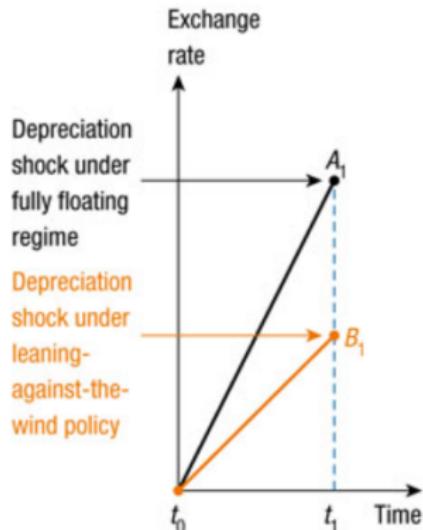
## 2. Second Period



Source: Central Bank of Peru and IMF (2018) Link

# FXI to Smooth Shocks: Transitory Shock

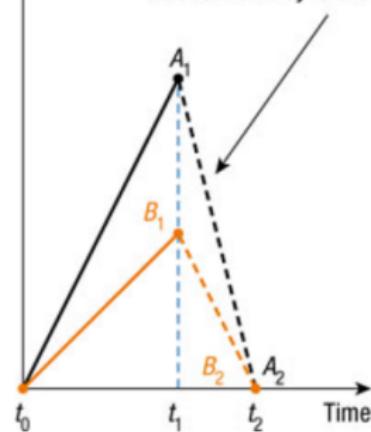
## 1. First Period



## 2. Second Period

Exchange rate

Leaning-against-the-wind policy:  
If a shock turns out to be transitory,  
excess volatility is averted.



Source: Central Bank of Peru and IMF (2018)

# Risks Associated with FX Interventions

- **Moral hazard** and encouragement of greater-risk taking
- **Negative effects on market development** (e.g. hampering the development of derivative markets by removing the need for currency hedge)
  - which in turn increases the need for future FXI in the future...
- Potential difficulties in balancing the **orderly functioning of local FX markets** while maintaining **openness to foreign investors**
- Possible inconsistencies between monetary policy and FXI, with complex interactions difficult to understand and communicate, which overall increase **policy uncertainty**
- *Note that the risk-based intervention rule we will present during this course is addresses some of these issues*

# FX Interventions Typology

There are two types of foreign exchange interventions:

## ① Non-sterilized interventions

- Buy and sell foreign assets against banks' reserves at the central bank
- Increase or decrease the monetary base, and therefore impact the monetary stance

## ② Sterilized interventions

- Buy and sell foreign assets against banks' reserves at the central bank
- Sterilize the intervention by either (i) selling or purchasing home-currency assets or (ii) issuing sterilization instruments
- No impact on the monetary stance

# Central Bank Balance Sheet

## Assets

### Net Foreign Assets

- (Claims – liabilities to non residents)

### Domestic assets

- Claims on the government
- Claims on deposit money banks

### Other assets net

- Other assets – other liabilities

## Liabilities

Currency in circulation

Government deposits

Securities issued by the central bank (e.g. for sterilization)

Banks Excess Reserves

Banks Required Reserves

Source: Author

# Can All Countries Sterilize?

- In practice, it may be difficult to offset fully the effects of FX interventions
  - Countries with under-developed financial markets might not offer enough assets for the central bank to sterilize
  - There are second-round effects that dampen the impact of sterilization
    - ★ *For instance: after FXI (buying), sterilization via domestic assets sale, attracts capital inflows, the CB will have to purchase FX further, etc.*
- One potential solution: using **FX derivatives**
  - For instance, some East-Asian central banks have been using FX swaps to sterilize their interventions
    - ★ Purchasing FX on the spot
    - ★ Swap by selling FX spot, unwinding by buying FX in the future

# The Costs of Sterilization

- **Fiscal cost**

- Depends on the interest rate differential between domestic and foreign assets
- Cost of the conduct of monetary policy. It is crucial to be consistent, even if it implies a cost for the central bank
  - ★ Some central banks try to pass the costs to the banking sector, either via the required reserves (FX or domestic, high ratio with below-market remuneration) or forced-holdings of sterilization assets below market rate
  - ★ This is a form of financial repression, and is not advised...

- **Valuation risk**

- Foreign reserves expose the central bank to foreign exchange risk
- If the foreign currency depreciates, the valuation losses on the FX reserves will reduce the central bank equity
  - ★ For instance, the Swiss National Bank (SNB) had to intervene to prevent an appreciation of the Franc that ended up FX reserves representing 130% of GDP, x12 since 2012
  - ★ Valuation losses in 2022 of 95 bn CHF (105 bn USD), or 15 % of GDP... (were absorbed by SNB very large equity buffer)

# Central Bank Balance Sheet With Rates and Risk

## Assets

### Net Foreign Assets

- International rate (often US Treasuries):  $r^*$
- Depending on foreign reserves management and portfolio duration: can include a term premium

### Domestic assets

Domestic interest rate ( $r$ ), usually with term premium

### Other assets net

Domestic interest rate ( $r$ )

## Liabilities

### Currency in circulation

No remuneration, no cost for the central bank

### Government deposits

Usually at short-term domestic market rate  $r$

### Central Bank Securities

At market rate ( $r$ ), depends on maturity

### Banks' Excess Reserves

At the policy rate, short-term domestic risk-free rate:  $r_0$

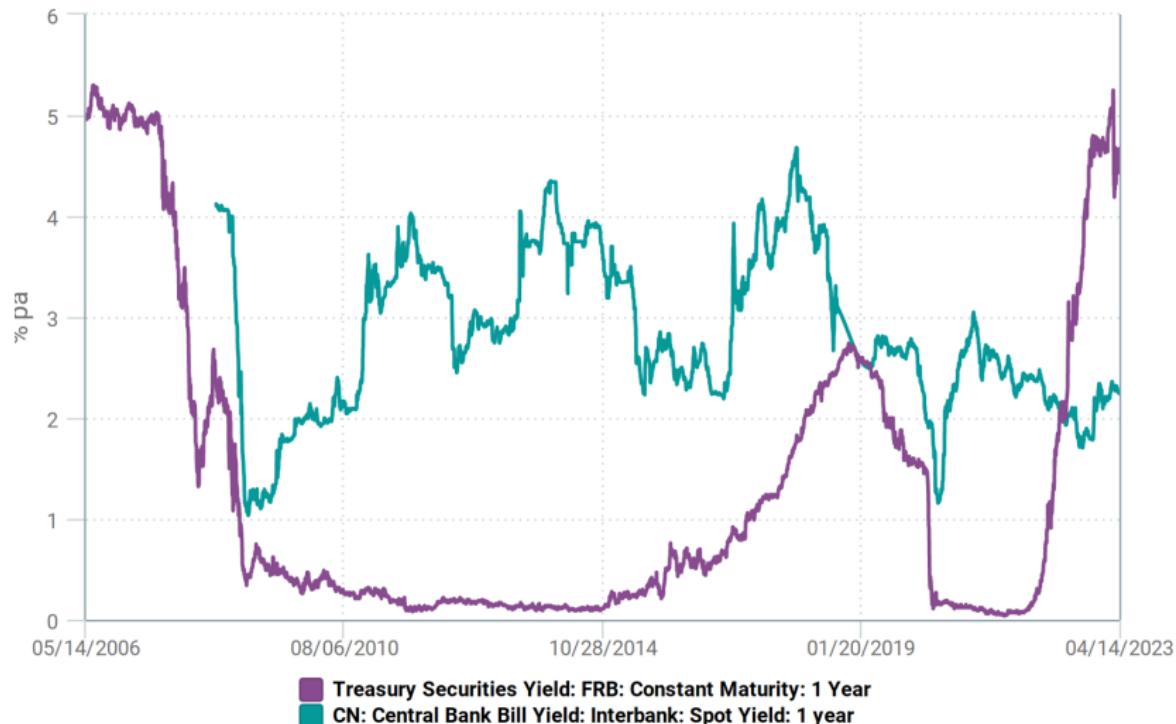
### Banks' Required Reserves

Preferably remunerated at the same rate as excess reserves, to avoid distortions

Source: Author

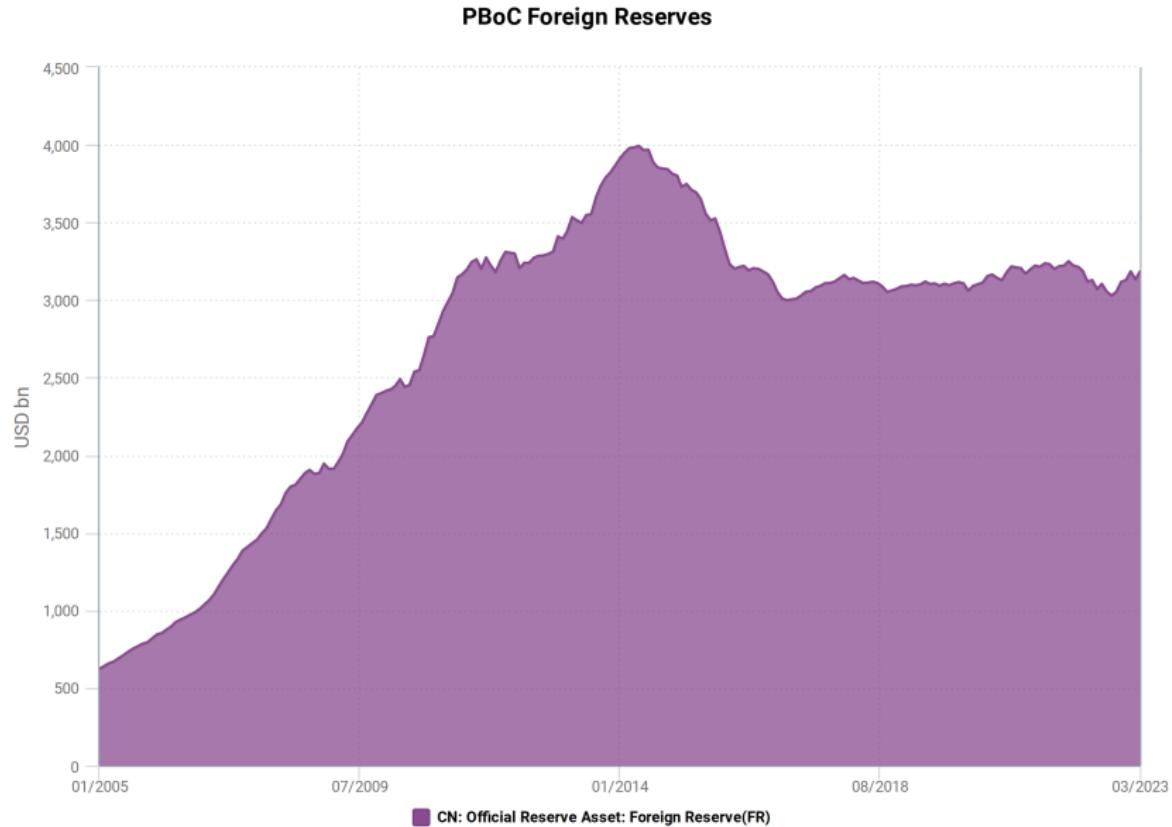
# PBoC FX Sterilization Costs

## The Cost of FX Sterilization: PBoC Central Bank Bills vs US Treasury Yields



Source: CEIC and author's computations

# PBoC Foreign Reserves



Source: CEIC and author's computations

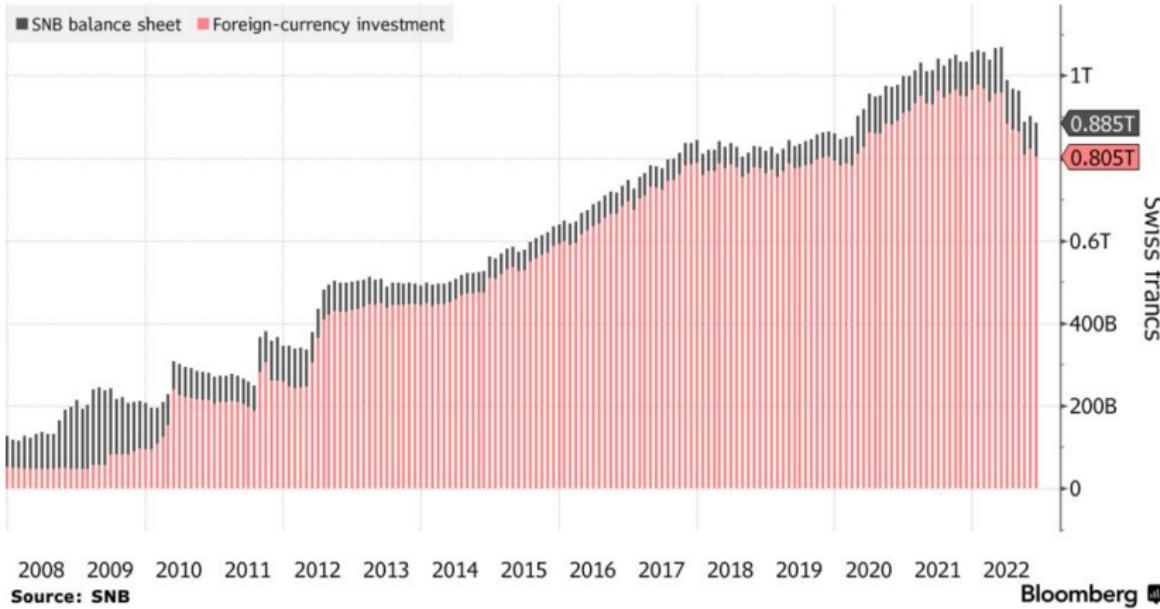
# Franc Suisse against Euro (Down Means CHF Appreciation)



Source: Bloomberg

# Swiss National Bank Balance Sheet

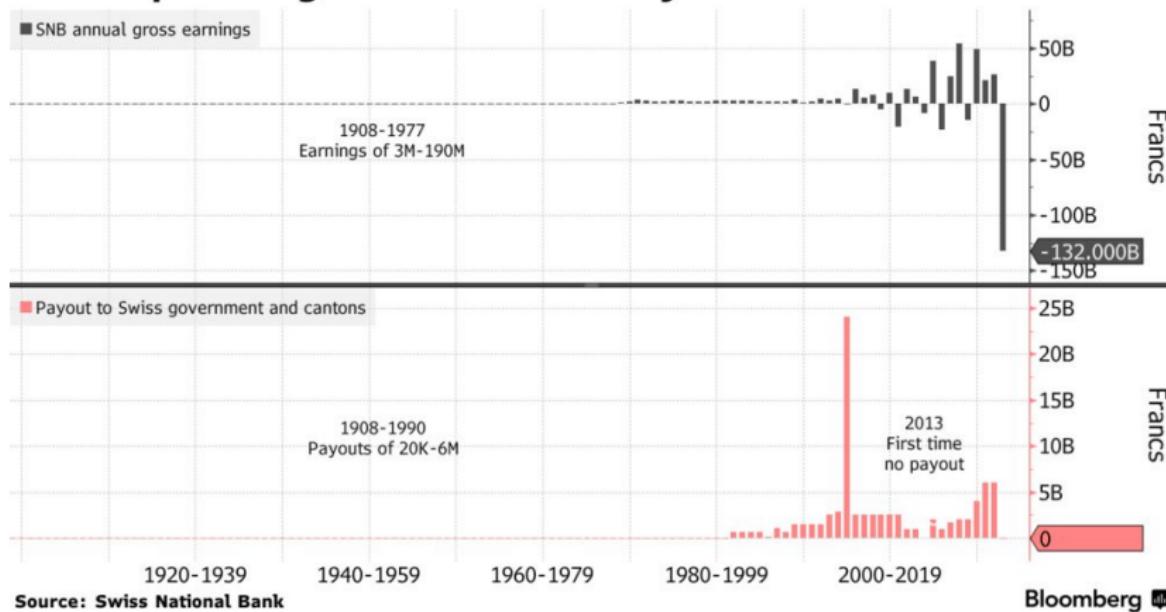
**Foreign Currencies Constitute 90% of the SNB's Balance Sheet**



Source: Bloomberg

# Swiss National Bank Losses

## SNB Reports Highest Loss in History



Source: Bloomberg

# Transmission Channels

FX interventions influence the exchange rate through two main channels:

- ① Signaling channel
  - Signal the future monetary policy stance
  - Signal future exchange rate and FX interventions
- ② Portfolio and risk rebalancing channel

# Signaling Channel

- FX Interventions provide investors with "information" about:
  - The central bank view of the appropriate exchange rate
  - The signal of future monetary policy intentions
- As long as the **central bank is credible**, the signal can influence the exchange rate

# Signaling and Transparency

- Despite the signaling effect, some central banks prefer to keep their interventions secret, even ex-post
  - Fear of losing credibility if the intervention is unsuccessful
  - "Wants to keep control", tradition of secrecy
  - Shield from political repercussions
- As discussed later, empirical evidence tend to suggest that the signaling effect indeed plays an important role, and that secret FX interventions should, in general, be avoided

# The Portfolio Rebalancing Channel

- Theory: FXI -> change the relative supply of foreign versus domestic assets -> change expected returns and FX rate
  - *For example, after a sterilized FXI selling-side, increase the supply of foreign assets, depreciating the foreign currency*
- Sterilized FX interventions also alter the **risk characteristics** of foreign/domestic assets
  - Domestic investors are exposed to FX risk when holding foreign assets
  - Sterilized interventions influence the equilibrium exchange rate via a change in the **risk premia**
- The portfolio rebalancing channel is maximized when:
  - Investors **diversify their holdings** domestic/foreign as a function of **expected returns and variance of returns**
  - **Foreign and domestic assets are imperfect substitutes**: the uncovered interest parity doesn't hold

# Summary of the Main Transmission Channels

	Signaling	Portfolio Rebalancing
Assumption	The central bank is credible	Assets are imperfect substitutes
Channel	Market Expectations	Relative supply and returns, risk premium

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# Challenges for FX Interventions

Typically, central banks, in particular among EMs, face a set of challenges:

- What is the appropriate timing for FX interventions?
- Should intervention be discretionary or follow rules?
  - If rules, what kind of rules?
- What should be the FXI size to preserve FX reserves while maximizing efficiency?
- What should guide the decision between spot vs derivatives instruments?
- Should CBs provide targeted FX provision to specific banks or engage in open-market FX interventions?
- Under what conditions is it appropriate to deploy intervention and capital controls jointly?

# FXI Timing

- Deciding on the right FXI timing is difficult and entail significant risks:
  - Don't want to intervene too often, at the risk to create market distortions, lose credibility and exhaust FX reserves
  - Still, need to intervene often enough to preserve financial stability and mitigate volatility, for instance
- Some simple rules with fixed thresholds (e.g. intervening when the daily variation exceeds +/- 2%) often guidance, at the risk of creating speculation
- Lafarguette and Veyrune (2021) designed a rule to decide on the optimal triggers for FX interventions based on risk level

# Rule vs. Discretion

- Often, central banks prefer to operate via un-disclosed, discretionary interventions
  - Idea to "surprise the market"
  - No commitment of intervention, perceived control on FX reserves level
- On the contrary, some central banks use rule-based systems:
  - Indicates no explicit intention to target an exchange rate level
  - Aligned with the monetary objectives (if the rule is correctly defined)
  - Maximize signaling channel, help agents forming their expectations
  - Helps the central bank to shield-off political pressures
  - Should be properly designed to avoid speculative behavior

# Rule vs. Discretion

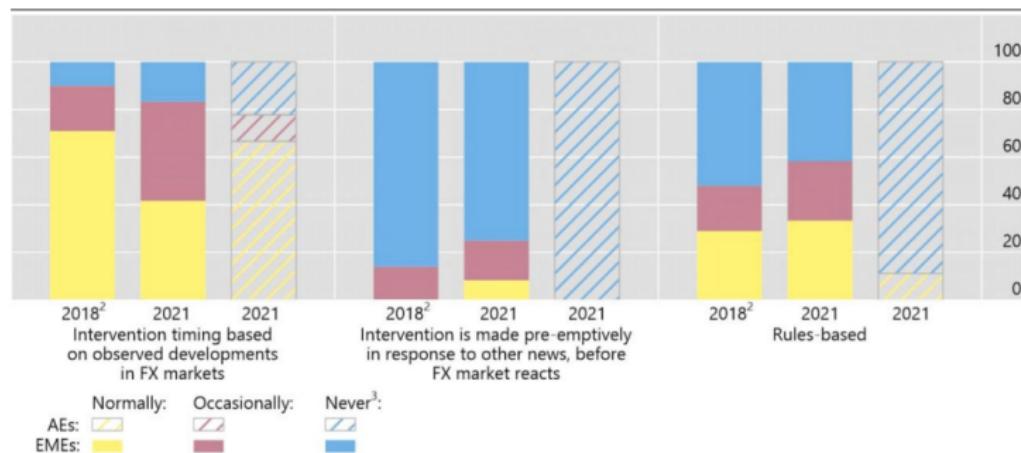
- Countries that have implemented rules-based interventions:
  - Mexico, Chile and Columbia: rules-based programs of pre-announced daily purchases/sales of FX
  - Czech Republic and Russia used to have "automatic interventions"
- Evidence from the Czech National Bank [▶ Link](#) "automated interventions" suggest that rule-based interventions were more effective in steering the FX rate than discretionary interventions
- In general, empirical evidence suggest that the effect of discretionary, "surprise" intervention fades very fast

# BIS Survey on Rule vs Discretion

Interventions are mostly discretionary and in response to market developments<sup>1</sup>

As a percentage of respondents

Graph 5



<sup>1</sup> 2018: based on the responses of 21 EME central banks; 2021: based on the responses of nine AEs and 12 EME central banks. <sup>2</sup> Answers from one central bank corresponds to 2017. <sup>3</sup> Categories for which a response is lacking are assumed to constitute a "Never".

Sources: BIS surveys on FX intervention 2018 and 2021.

Source: BIS 2021 [Link](#)

# Assessing Central Banks' Rules/Discretion in Practice

- Central banks often don't follow a rigid rule: it is difficult to quantify their objectives and rationales
- Policies are often **episodic**: frequent in some periods and then none in other periods
- FX interventions largely "lean against the wind" to react against deviations from target

# FX Intervention Size

- To the best of my knowledge, there is no theory determining the optimal amount
- The general guidance is to intervene infrequently, with relatively large amounts (as share of daily market turnover)
  - Impact the market
  - Maximize signaling effect
  - Gain credibility
- Yet, to decide on a specific amount, it is critical to:
  - Consider the level of foreign reserves, and the adequate reserves level (e.g. ▶ ARA metric or any other metric)
  - Assess the liquidity conditions and the FX market impact
  - Calibrate as percent of daily FX market turnover

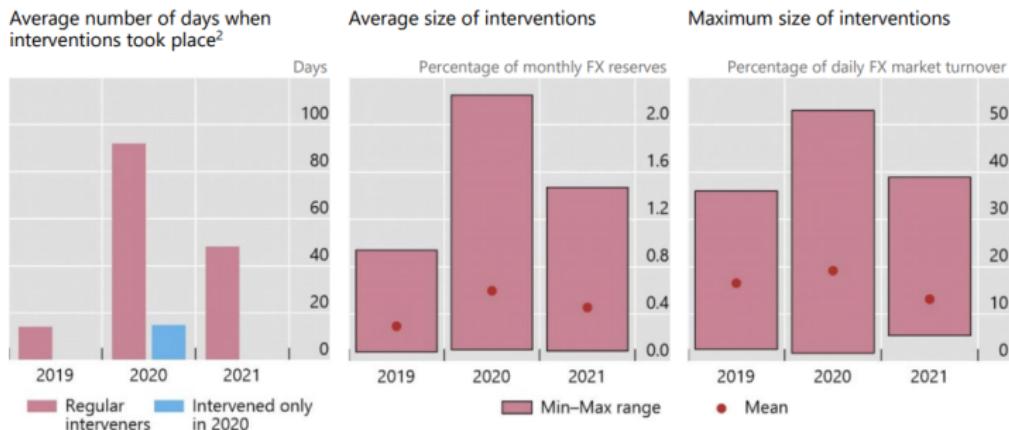
# Orders of Magnitude

- The BIS has conducted a survey of central banks interventions in 2021 [▶ Link](#)
- On average, cumulated FX interventions during a day represent between 15% and 20% of market turnover, with some central banks exceeding 50%
  - Representing between 0.3% and 0.8% of the monthly FX reserves
- For regular interveners, frequency of intervention during "normal years" (not COVID) is around 10-15 days per year
  - But climbed up to 80 days in 2020 !

# BIS Survey on Size and Frequency

EME central banks used FXIs in response to the Covid-19 shock<sup>1</sup>

Graph 1



<sup>1</sup> Based on the responses of EME central banks that reported non-zero values (eight). <sup>2</sup> The responses are grouped by the frequency of interventions. Regular interveners include those that intervened only in all three years according to the survey.

Source: BIS survey on FX intervention 2021.

Source: BIS 2021 [Link](#)

# Instruments for FX Interventions

- **FX Spot**
- **FX Forward and FX Non-Deliverable Forward**
- **FX Options**
- **FX Swaps**
- **FX Repos**

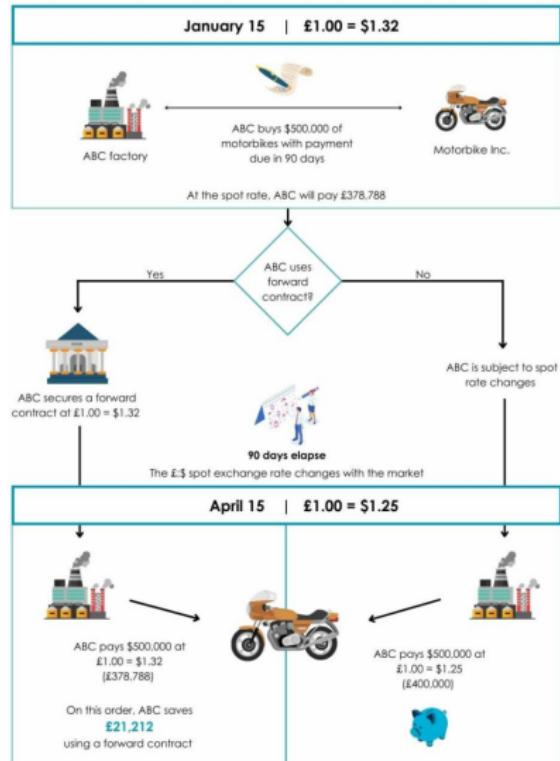
# FX Spot

- Standard transaction on the spot market
- Direct impact on the exchange rate, no arbitrage transmission needed
- Provide immediate FX provision to the market
- However, spot FXI are limited by the size of the foreign reserves (when selling)
- In some countries, the spot market might be less liquid than the derivative market

# Spot versus Derivatives?

- Using derivative markets allows the central bank to:
  - Provide an hedge against FX risk
  - Influence derivative market liquidity (improve spot/derivative market arbitrage)
  - Preserve FX reserves if the derivatives are settled in local currency (NDF)
- Example: the use of non-deliverables FX swaps (NDS) by Brazil:
  - Settled in local currency: no impact on foreign reserves
  - Fills market gap in longer-term derivative instruments (serves as risk management insurance)
- Also: Use of forwards, non-deliverables forwards, options, etc.

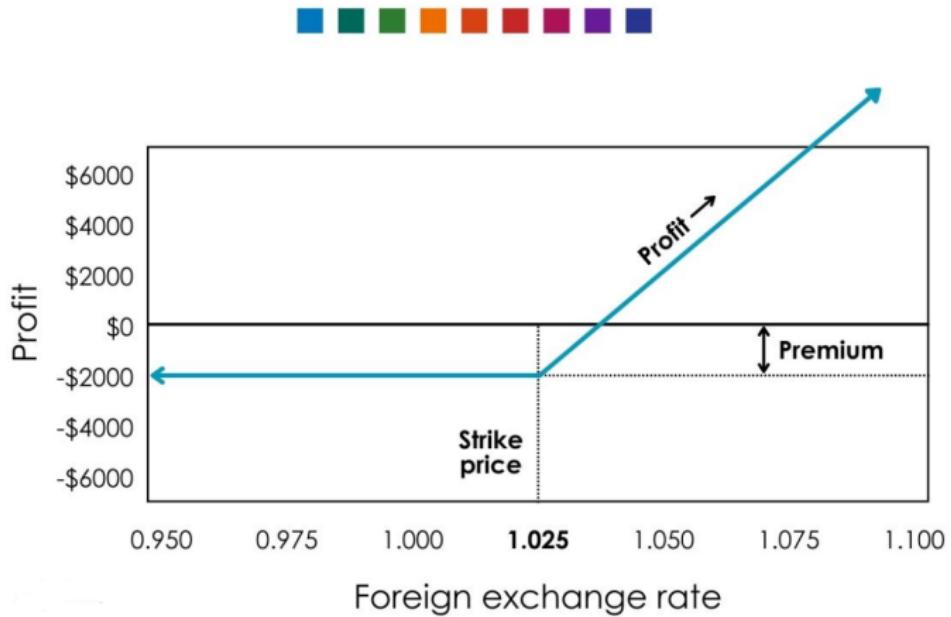
# FX Forwards



Source: Trade Finance Global [Link](#)

# FX Call Options (Protection against Appreciation)

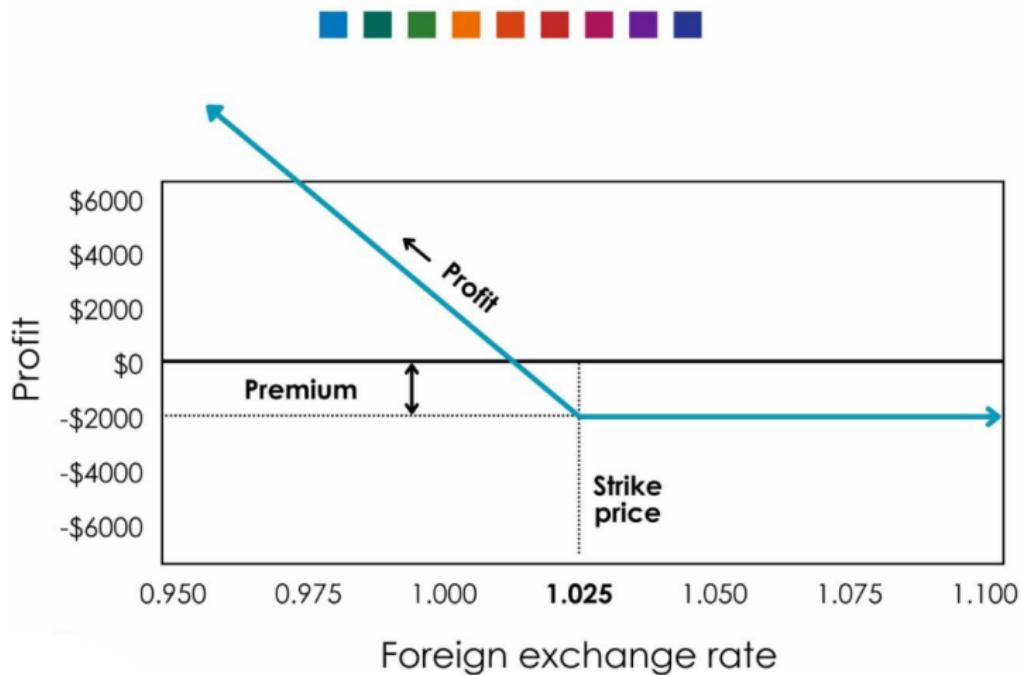
## Profit on a European call option



Source: Trade Finance Global [▶ Link](#)

# FX Put Options (Protection against Depreciation)

## Profit on a European put option



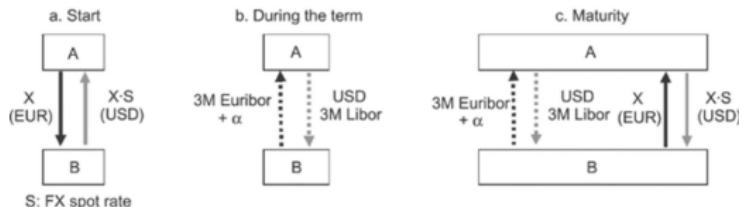
Source: Trade Finance Global [Link](#)

# Forex Swaps and Cross-Currency Basis Swaps

A. FX Swap

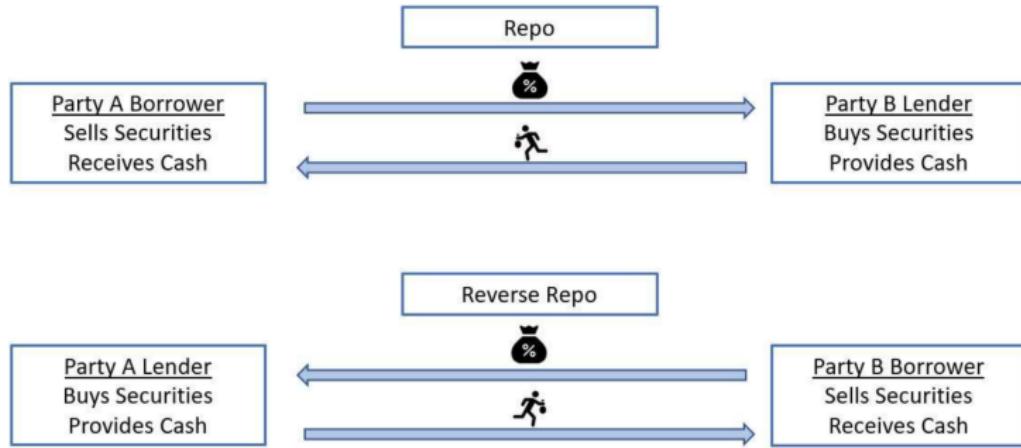


B. Cross-Currency Basis Swap



Source: JFIPM 2008 [Link](#)

# FX Repos and Reverse Repo



Source: Derivative logic [Link](#)

# Spot vs. Derivatives: Intertemporal and Risk Considerations

- **Spot FXI:** provide immediate FX provision
- **Forward FXI:** transfer FX risk immediately
- **Option-based FXI:** provides an insurance against FX risk, that may or may not be exercised
- **Repo and swap-based FXI:** provide FX for the duration of the repo or swap, providing a hedge against maturity mismatches in FX

# Implementation Differences between AE and EME

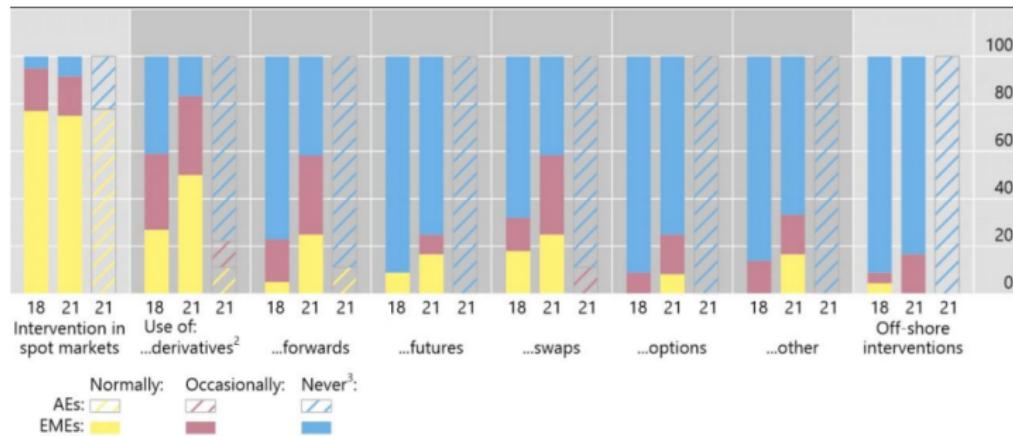
- AEs tend to intervene exclusively in the spot market
- Many EME countries intervene in derivative markets
  - Bank of Thailand used forward market purchases to support the baht in 1997
  - Bank of Mexico sold put options on the USD to accumulate USD reserves in 1990s
  - Other Latin America countries in the 1990s also intervened via derivatives, such as Chile, Brazil, Peru
  - More recently, a growing list of EMEs: Brazil, Colombia, India, Indonesia, Mexico, South-Africa, Thailand
  - First mover: Bank of Spain sold put options on the peseta to fight devaluation pressures in 1993

# Survey of FXI Instruments used by Central Banks

Spot market interventions remain most common but most EME central banks rely also on derivatives<sup>1</sup>

As a percentage of respondents

Graph 4



<sup>1</sup> Based on the responses of nine AE and twelve EME central banks, regardless of whether or not they intervened over the last three years. <sup>2</sup> Use of at least one derivative instrument.

<sup>3</sup> Categories for which a response is lacking are assumed to constitute a "Never".

Sources: BIS surveys on FX intervention 2018 and 2021.

Source: BIS 2021 [Link](#)

# Targeted vs. Open Market Interventions

- In general, FX interventions should be conducted via open-market interventions, in order to:
  - Reduce market distortions
  - Maximize the signaling effect, transparent operations
  - Create an level-playing field for market participants to avoid market discrimination
  - Reduce political pressure and interferences to supply a given participant with FX
- However, even if FX interventions are not targeted, banks take-up is unlikely to be uniform (and this is true for FX facilities too)
- In some very specific circumstances, some systemically important FX players (banks, large importers/exporters) may require targeted interventions

# Communication and Transparency

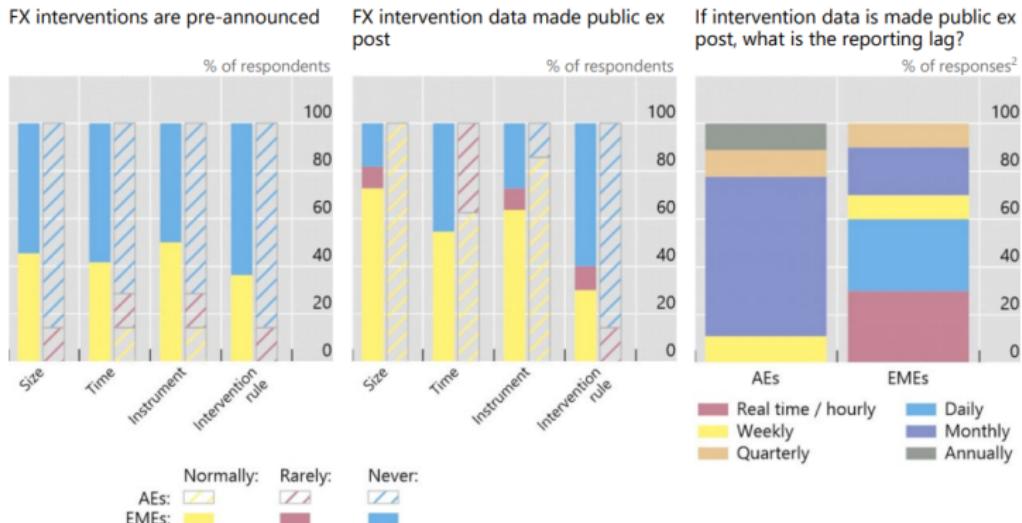
- Little consensus among central banks, in particular on ex-post communication (data, amounts, etc.)
- **Signaling** is an important transmission channel of foreign exchange interventions and can only be achieved with communication and transparency
- The "surprise the market" effect can be detrimental, especially when liquidity is scarce and risk high
  - No evidence in the literature that secret and unexpected interventions are more efficient, after the initial first hours
  - On the contrary, unexpected interventions fade quite fast
  - Seem to impede anchoring FX market expectations and supporting the credibility of the central bank

# BIS Survey on Ex-Post Communication

Data on FX interventions is released mainly ex post<sup>1</sup>

How much information do you provide publicly?

Graph 7



<sup>1</sup> Based on the responses of nine AE and 12 EME central banks. <sup>2</sup> Some central banks reported multiple frequencies.

Source: BIS survey on FX intervention 2021.

Source: BIS 2021 [Link](#)

# BIS Survey on Public Information

## Public information on FX interventions

As a percentage of respondents

Table 1

	Normally		Rarely		Never/no response	
	2018 <sup>1</sup>	2021 <sup>2</sup>	2018 <sup>1</sup>	2021 <sup>2</sup>	2018 <sup>1</sup>	2021 <sup>2</sup>
Does the central bank pre-announce FX interventions?	32	50	0	0	68	50
Latin America	83	100	0	0	17	0
Asia	13	17	0	0	88	83
Other emerging market economies	0	0	0	0	100	100
FX intervention data made public ex post	59	67	5	8	36	25
Latin America	100	80	0	0	0	20
Asia	25	67	0	0	75	33
Other emerging market economies	33	0	33	100	33	0

<sup>1</sup> Based on the responses of 22 central banks. <sup>2</sup> Based on the responses of 12 EME central banks.

Sources: BIS surveys on FX intervention 2018 and 2021.

Source: BIS 2021 [Link](#)

# Publicly Available Intervention Data

Available via the FRED (Federal Reserve Bank of St Louis):

- Australia (1983-2006)
- Germany (1976-1995)
- Italy (1988-1998)
- Japan (1991-2022)
- Mexico (1997-2011)
- Switzerland (1975-2001)
- Turkey (2002-2019)
- United States (1973-2003)

Central bank websites:

- Argentina
- Chile
- Georgia
- Kyrgyz Republic
- United Kingdom

# Technical Issues: Simultaneity

- The decision to intervene is often not independent from movements in exchange rate
  - Most likely to occur in reaction to unwanted exchange rate changes
- The decision to intervene may also be part of a broader set of policy actions (monetary and/or fiscal policy, capital controls), potentially leading to an **overestimation bias for intervention**
- Studies using high-frequency data (daily, intra-daily) maybe be less subject to the **simultaneity bias** but can't assess whether intervention has lasting effects

# Criteria for Success

- FXI should significantly influence either the relative price or the volatility of the currency in the appropriate direction
  - How large? How persistent? What is the counterfactual
- Initial approach: non-parametric test by grouping FXI into "episodes" and test whether the exchange rate movements before/after are consistent with the objectives (Dominguez and Frankel 1993, Fatum and Hutchinson 2003)
  - Concern: timing and duration of intervention episodes are likely to be **endogeneous**
  - According to these (old) studies, interventions are generally effective in moving exchange rate in the appropriate direction

## Recent Results (Fratzscher 2019, 33 countries 1995-2011)

- ① 60% success in the ability to **influence the direction of the exchange rate**
  - Higher if interventions are large and are accompanied by oral intervention
- ② 80% success in **smoothing the path of the exchange rate**
  - Reduction in exchange rate variation in the week after the intervention vs the week before
- ③ 80% success to stability the exchange rate in a narrow band
  - 2% band, during the next two weeks

# Interesting Granular Studies

- **Intraday interventions studies** (BIS 2013) for Chile, Colombia, Mexico, Peru during the GFC
- **Regression discontinuity** (Kuersteiner et al. 2018) on a rule-based intervention Columbia
  - Regression: cut-off for triggering the rule is just met or just missed
  - Idea: variation near the cut-off is almost randomly generated
- **Counterfactual matching approach:** construct a synthetic group as counterfactual
  - Not appropriate for frequent intervention but useful at the event level
  - Counterfactual uses data from other countries, with weights based on the pre-announced co-movement with the currency of interest
  - Problem in the case of a global shock

# Profitability of Interventions

- **Friedman (1953)**: a successful central bank in stabilizing the exchange rate should make a profit at the expense of speculators
  - Suggesting that unprofitable interventions are ineffective
- **Edison (1993)**: they show, however, that profitable interventions may have no influence on exchange rates, suggesting flawed Friedman criteria
- Empirical evidence suggests that profits vary significantly according to the sample periodm but generally, intervention is profitable

# FX Interventions and Capital Flows Management

- Capital flow management (CFM) may increase the efficacy of sterilized FX interventions by reducing foreign and domestic asset substituability
- Firms in EME issue more and more foreign currency debt, while EME sovereign debt is increasingly in local currency (with a larger fraction held by foreigners). Therefore:
  - Currencies and domestic financing conditions are more exposed to swings in capital flows
  - EME may need/want full access to all policy tools given these vulnerabilities
- Complementary or substitutes?
  - FXI is a more flexible tool

# Russian Central Bank Intervention

- Unique type of automated intervention
  - Place limit orders on an electronic order book to set an upper bound on the rouble price of a dollar
  - Effectively, Russia was implementing a crawling band to severely limit the flexibility of the rouble
- Empirical results [▶ Link](#) at high frequency:
  - Russian interventions increased exchange rate volatility for the next few minutes but **lowered** the degree of volatility over the day, compared to non-intervention days
- Case study suggests that countries **with large reserves and capital controls** can implement a stabilizing crawling exchange rate band using strategic limit orders in electronic currency markets

# FX Intervention or Currency Manipulation?

- **IMF:** The IMF Articles of Agreement prohibit countries from manipulating their currency for the purpose of gaining unfair trade advantage
- **US Treasury approach** (Trade Facilitation and Enforcement Act 2015). Currency manipulation criteria:
  - Bilateral trade surplus with the US is at least USD 20 bn
  - Current account surplus of at least 3 percent of GDP
  - One-sided intervention (net purchases of foreign currency) conducted repeatedly and totaling at least 2 percent of GDP over a 12-month period
  - Countries on the "US Monitoring List" if they meet 2 of the 3 criteria: China, Germany, Japan, Korea, Switzerland, India (2018)
- In practice, it is very difficult to assert whether a country is manipulating its currency

# When is Exchange Rate Management Warranted?

- Theory: free-floating exchange rate serves as global automatic stabilizers, when markets function efficiently
  - Currencies weaken when countries face negative demand or supply shocks, supporting competitiveness
- If much of the world experience the negative shock, the stabilization process is less clear-cut
  - No impact on exchange rate if all currencies move in the same direction
  - Currency wars: when many countries try to depreciate their exchange rate

# Global Capital Flows Shocks and Exchange Rate Management

- International capital flows can be disconnected with countries' fundamentals and may warrant exchange rate management
- Switzerland's experience during the euro crisis is an example of this dilemma
  - The Swiss franc appreciated as a safe heaven currency, completely disconnected from Switzerland fundamentals
  - Massive negative effect on Swiss exporters, and the SNB had to engage into interventions
  - Establishment of a floor against the Euro (1.20) ... that became unsustainable when the ECB prepared for the QE

# Can a Country Manipulate its Currency over the Long-Term?

- **If capital is freely mobile**

- Undervalued exchange rate boost exports -> overheat the economy  
-> increases domestic prices
  - Bring the real exchange rate back to an equilibrium value consistent with saving and investment

- **If capital flows are controlled**

- A central bank financing its FX reserves by issuing domestic instruments can force the private sector to increase its net saving
  - Consequently, the domestic interest rate will rise, and it can deviate from the world interest rate due to capital control
  - The real exchange rate will deviate from its past equilibrium
  - Change the balance of saving and investment in the country, potentially weakening its fundamentals

## 1 Conceptual Framework

- Monetary Frameworks
- Goals and Intermediate Objectives
- FX Interventions Typology
- Transmission Channels

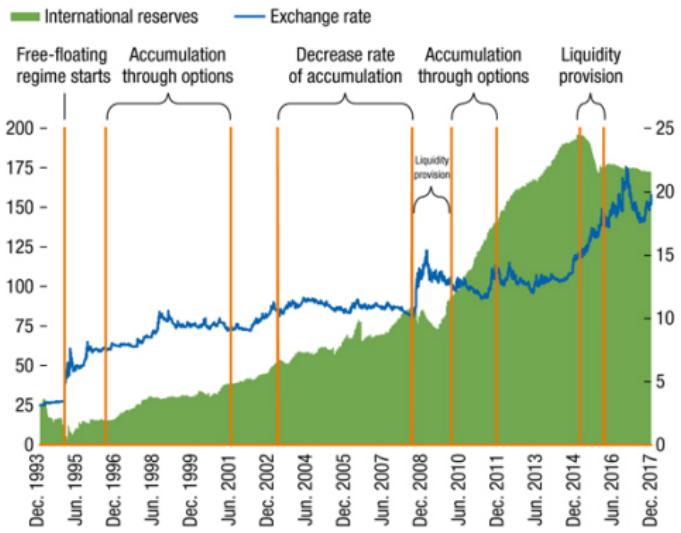
## 2 Implementation

- FXI Timing, Rule vs. Discretion
- FXI Size
- Instruments
- Communication
- Intervention Effectiveness
- FX Interventions and Exchange Rate Management

## 3 Practical Cases

- Mexico
- Brazil
- Colombia
- Peru
- Thailand
- Philippines

# Mexico Path to Free Float Exchange Rate



Source: IMF [▶ Link](#)

# Mexico FX Interventions to Manage FX Reserves

- USD remittances from the Federal Public Entities
  - Especially PEMEX, the national oil company
- When the level of foreign reserves is deemed inadequate, the central bank has resorted to rules-based approaches to buy/sell US dollar from the market with preannounced auction mechanisms, where timing and prices were known in advance
  - Buying USD via the **sale of US dollar put options** to the market via monthly auctions (1996-2001 and 2010-2011) with two requirements
    - ★ The option strike price is the **fix exchange rate determined by the Bank of Mexico on the previous business day**
    - ★ The option can only be executed only when the peso exchange rate of exercise **has appreciated with respect to its 20-day moving average** (meaning buying when USD is cheap)
  - When the level of foreign reserves was deemed too high due to sterilization costs: selling USD via **spot auctions** half of the amount accumulated during the previous quarter

# Mexico FX Sterilized Interventions to Smooth Volatility

- Interventions on the spot market via rules-based auctions
  - ▶ **US dollar auctions with and without minimum bid price**
    - ★ With minimum bid-price, decided on previous business day +2% (bid are only eligible if they are above this price, yet it is a multiple price auction)
    - ★ Without minimum bid-price and without triggering rule. The auctions are interactive, the participants know the bids during the auction and could improve their bid.
  - ▶ Auctions of USD-denominated credit lines offered to banks, which they could on-lend to corporates (USD 3.2 billion in 2009)
    - ★ *The resources came from the swap line with the Fed, not from the BAM reserves themselves.* The BAM still takes only the counterparty risk
    - ★ Limit moral-hazard via an auction-based pricing mechanism, revealing true banks' risks ("*no free lunch*")
- Direct USD sales (discretionary) where the tendered amount and triggers are decided by the BAM FX commission
  - ▶ Including with institutions outside of the country (in 2017)

## Mexico Other FX Instruments

- **Foreign Exchange Hedge Auction Program via NDF Auctions Settled in MXN**
  - The BAM wants to sell foreign exchange hedges to participants, without endangering its own FX reserves
  - Market participants bid for the forward exchange rate they need at the maturity of the contract
    - ★ At the end of contract: if the spot is higher than the assigned forward price (depreciation), the commercial bank makes a profit settled in pesos
    - ★ All ND positions are rolled over until the BAM decides to stop them
    - ★ Note that, even though all transactions are settled in USD, the central bank is short USD. Which is a potential cost (settled in pesos)
- **Flexible credit line with the IMF to supplement current international reserves**
  - Mexico was one of the first three countries to receive an IMF FCL in 2009 when the program was launched
  - Initially around USD 47 bn, then USD 90 bn in 2016

# Mexico Put Options

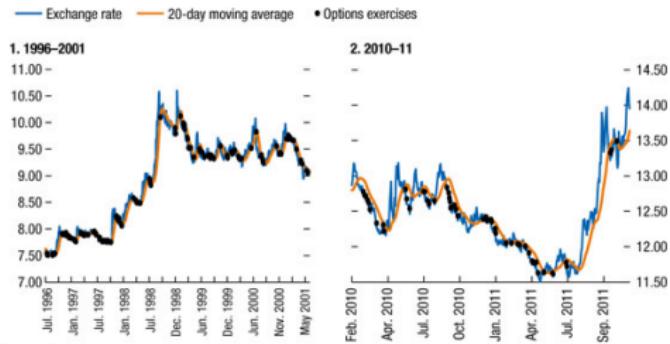


Figure 11.3

Mexican Peso to US Dollar Exchange Rate: Options Exercises, 1996–2001 and 2010–11

Source: IMF [Link](#)

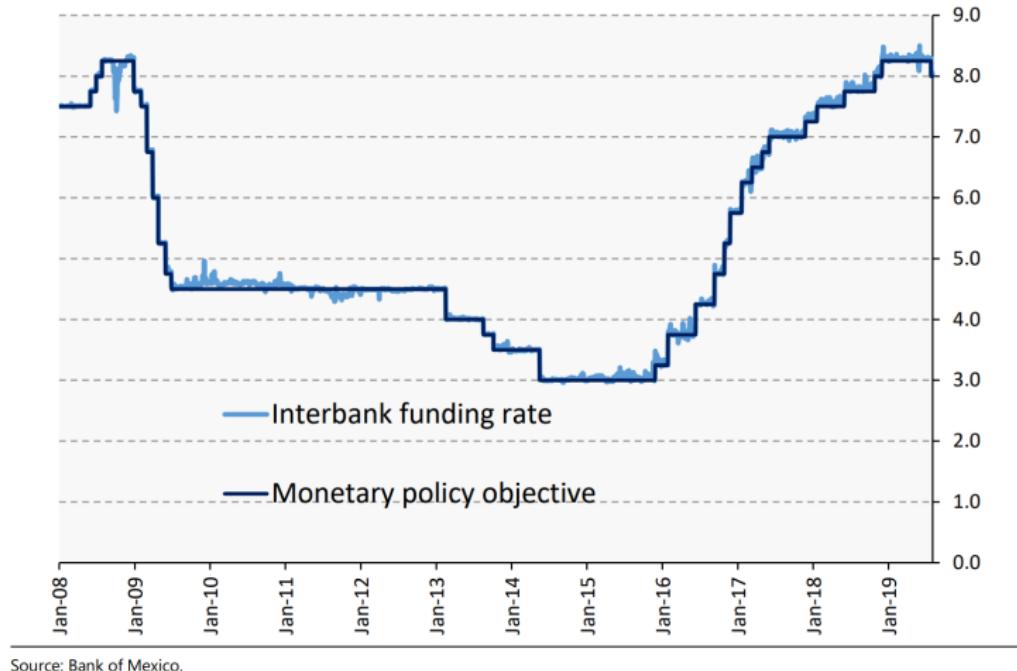
## Mexico FXI Effectiveness

- The BAM interventions framework has been considered by policymakers and the literature as efficient, and without FX target in mind
- Empirical evidence suggest that the central bank has been able to contain extreme volatility episodes
- Also helping to maintain the policy objective, which is to keep the interbank funding rate at the monetary policy objective

# Mexico Interbank Rate

Interbank funding rate and monetary policy objective (%)

Graph 1



Source: Bank of Mexico.

Source: Bank of Mexico and BIS [Link](#)

## Brazil: During GFC

- During the GFC, the Brazilian central bank used a combination of different instruments to stabilize the BRL
  - Swaps
  - Spot market auctions
  - Repo market auctions
  - Trade finance loans
  - Forward market auctions
- Kohlscheen and Andrade (JIMF 2014) find that the currency swaps carried in 2011 Q2-2012 had a significant effect on the BRL/USD

## Brazil (2013-2018)

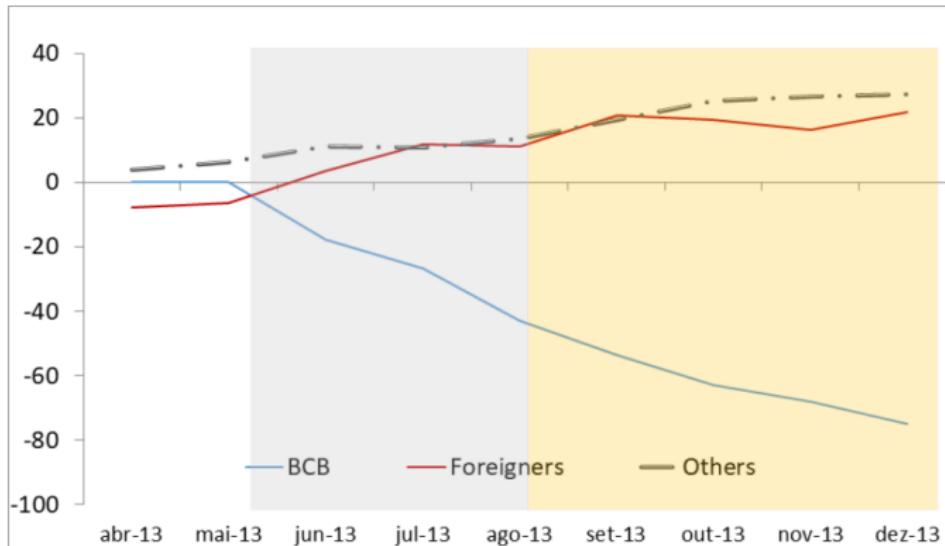
- The BCB implemented the largest ever intervention in the FX derivatives market in August 2013
  - Initially to counter-act capital outflows and the BRL depreciation during the "Taper Tantrum"
- The open position of the BCB in these derivatives summed up to **7% of the Brazilian GDP (30% of the international reserves)** in the peak of the program in 2015
- The intervention program was considered successful and other EME have followed: Mexico (February 2017), Turkey (November 2017)

# Brazil 2013: Hedger-of-Last-Resort

- Due to historical restrictions to buy US dollars in the Brazilian spot market, the country's FX derivative markets became larger than the spot one.
- Intervention program: daily sales of USD 500 million worth of currency non-deliverables forwards
  - USD forwards settled in BRL, also known as BCB swaps, developed by the BCB (the "swaps cambiais")
  - Traded in the local stock exchange ("B3")

# Brazil FX Derivatives Players and their Net Exposures

Figure 2: FX derivatives players and their net exposures.

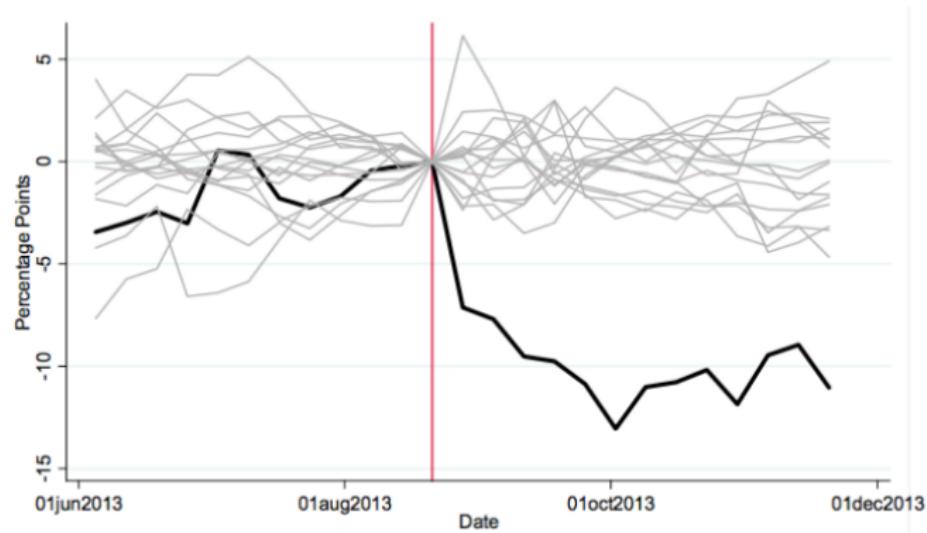


Source: B3. Gray area represents the time window between the tapering speech prior to the swaps program. The yellow area represents the first phase of the program. The values are in billions of BRL.

Source: *Gonzalez, Khametshin, Peydro and Polo (2019)*

# Effects of the August 22 2013 Intervention in the BRL/USD exchange rate

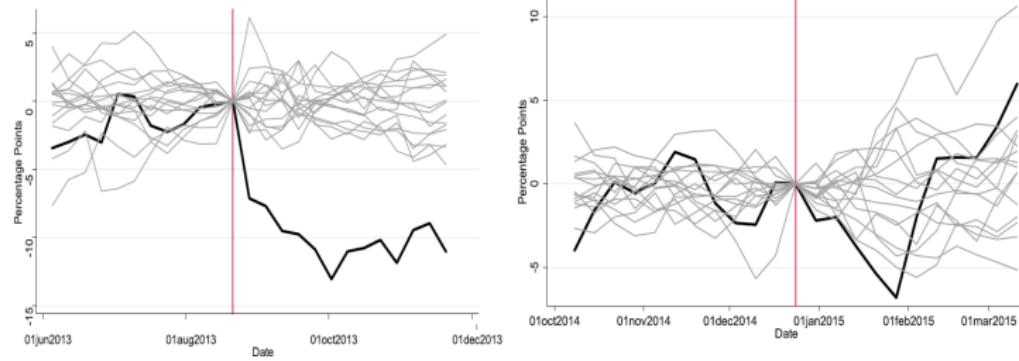
Figure 3: Effects of the Aug, 22 intervention in BRL/USD exchange rate



Source: Chamon, Garcia, and Souza (2017) The thick dark line indicates the gap between the actual BRL and synthetic (in log differences) while the light gray lines indicate the gap for other currencies

Source: Gonzalez, Khametshin, Peydro and Polo (2019)

# Yet the Effect has been Fading Out between 2013 and 2015



Source: *Gonzalez, Khametshin, Peydro and Polo (2019)*

# Colombia Call and Put Options to Hedge Volatility Risk

- Objective: mitigate FX volatility, after the shift to a flexible exchange rate regime in 1998/99 (used to be crawling bands).  
*"Offer to the market hedges against extreme circumstances"*
- Offer **put** (protection against depreciation) and **call** (protection against appreciation) **options**
  - TRM: representative market Colombian peso/US dollar exchange rate
  - Strike prices: +5% Higher (put) or -5% lower (call) than the 20-day moving average of the TRM
  - Threshold takes into account a low probability of activation, due to the +/- 5% limit
  - Amount fixed at USD 180 million then USD 200 million
- Some discretion was applied:
  - When the Colombian peso was weak, the central bank deactivate the put, because the central bank didn't want to buy USD at this price.
  - Added some discretion when high demand (threshold, etc.)

# Colombian Central Bank Foreign Exchange Interventions 1999-2017

Table 9.1.  
Volatility Auctions

Period	Trigger (%)	No. of Obliged Call Auctions	No. of Obliged Put Options	No. of Discretionary Call Options	No. of Discretionary Put Options
Nov. 1999-Oct. 2001	5	0	0	n/a	n/a
Oct. 2001-Dec. 2005	4	2	1	1	0
Dec. 2005-Jun. 2008	2	5	11	4	4
Jun. 2005-Oct. 2008 <sup>1</sup>	n/a	n/a	n/a	n/a	n/a
Oct. 2008-Oct. 2009	5	2	5	3	0
Oct. 2009-Oct. 2011 <sup>1</sup>	n/a	n/a	n/a	n/a	n/a
Oct. 2011-Feb. 2012	4	0	0	n/a	n/a

Source: Central Bank of Colombia.

Note: Trigger refers to the threshold established to activate the auction and needed for the exercise of the auction. n/a = not applicable.

<sup>1</sup>The central bank was buying reserves daily.

Source: Cardozo (2019)

# Colombia: Put Options to Accumulate USD Reserves

- How to accumulate FX reserves at the best price and limiting market impact?
- Following Mexico's experience, the Colombian central bank auctioned these options at the end of each month (1999-2002 and 2003-2008) to banks, financial corporations and the MoF
- USD options with **one-month maturity** and a **strike price equal to the representative market Colombian peso/US dollar exchange rate (TRM)**
- Agents can only exercise the option when the TRM was below the 20-day average
  - The central bank could then avoid buying US dollar when the Colombian peso is weaker than the previous 20 days

# Colombia Put Options to Accumulate USD Reserves

- Suitable approach to accumulate FX reserves while minimizing market impact
- Through these auctions, the central bank bought USD 3.4 billion in 8 years
  - All 49 auctions were oversubscribed, with min/max amount of USD 30 million and USD 250 million

# Colombian Central Bank Foreign Exchange Interventions 1999-2017

■ Discretionary intervention  
■ Volatility options  
— Exchange rate  
■ Foreign exchange competitive auctions (spot purchases)  
■ Options (purchases/sales)  
★ Denotes put auctions not on a monthly basis

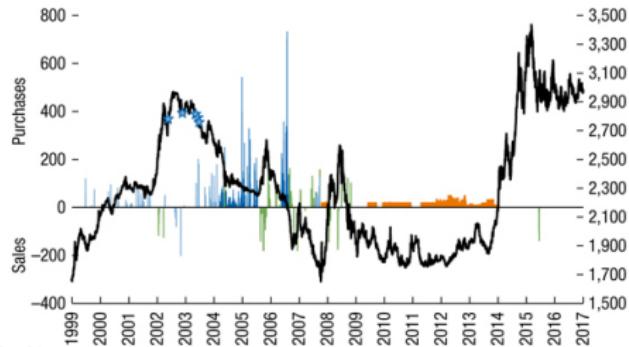


Figure 9.1.

Colombian Central Bank Foreign Exchange Intervention, 1999–2017

(Millions of US dollars, left scale; US dollar/Colombian peso official exchange rate, right scale)

Source: Central Bank of Colombia.

Note: Data are from September of each year.

Source: Cardozo (2019)

# Colombia Selling Reserves for Preserving Financial Stability

- Colombia is an inflation targeter operating a flexible exchange rate regime
- Foreign interventions should therefore be motivated by financial stability concerns
- The operating procedure depends on the type of financial stability threats
  - If financial agents suffer from **closure in FX credit lines**: the central bank intervenes through **FX swaps** and acts as a liquidity provider
    - ★ *FX swaps don't transfer FX risks*
  - If there is no private provision of FX hedge on the market, the central bank steps in and provide **USD non-deliverable forwards**
    - ★ *FX forwards do transfer FX risk*
  - If the foreign reserves are enough, sell spot. If not, sell USD NDF (settled in local currencies)

# Colombia Decision Tree for Selling Reserves

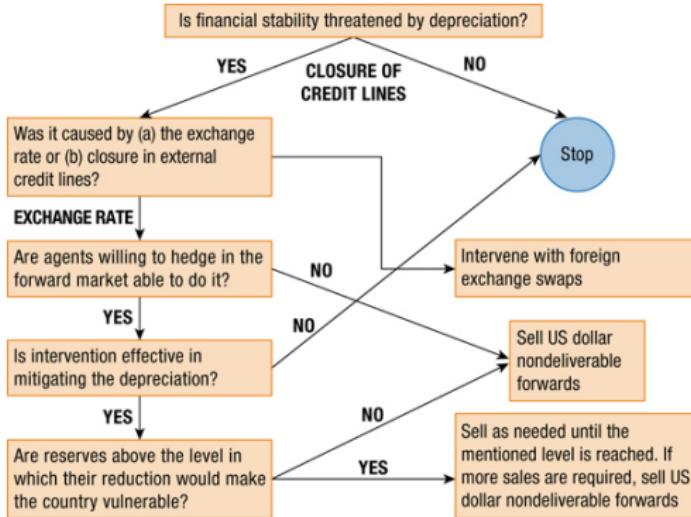


Figure 9.4

Decision Tree for Selling Reserves

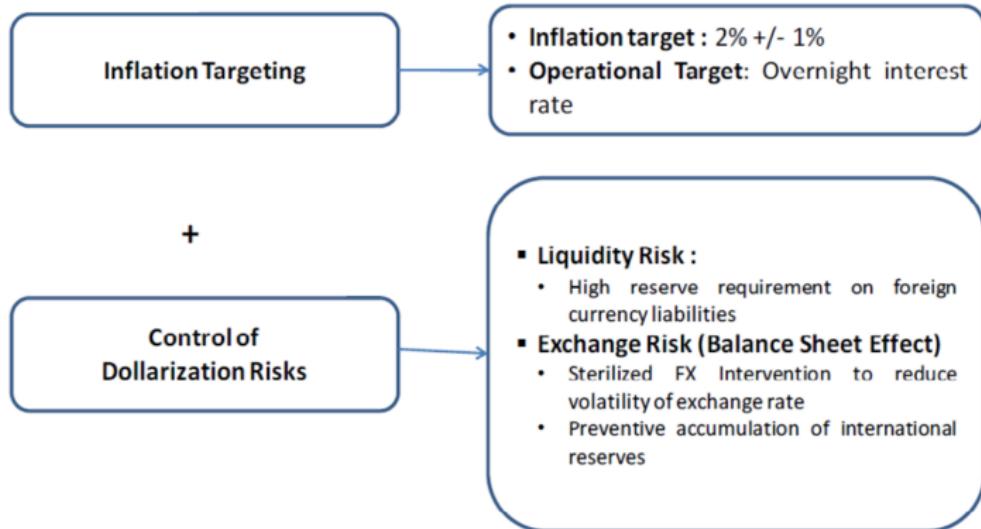
Source: Central Bank of Colombia.

Source: *Central Bank of Colombia*

# Peru Monetary Framework

- *De jure*, the BCRP (the Peruvian central bank) operates an inflation targeting regime with a floating exchange rate arrangement
  - The inflation target is fixed at 2% with a +/- band of 1%
- Yet, because of multiple FX interventions, the IMF has been reclassifying temporarily the exchange rate to crawl-like (with back in forth in 2020 and 2021)
- In effect, the BCRP conducts **very frequent foreign exchange interventions**, as noted in ▸ BCRP study 2019 and ▸ BCRP study 2018 with frequency of interventions between 50 and 188 days (out of 250 business days) depending on the year !
- The main reason is because Peru used to be an **heavily dollarized economy** and FX volatility creates substantial financial stability risks !

# Peru Multiple Objectives



Source: Central Bank of Peru (2018)

# Peru Dollarization Level in Peru

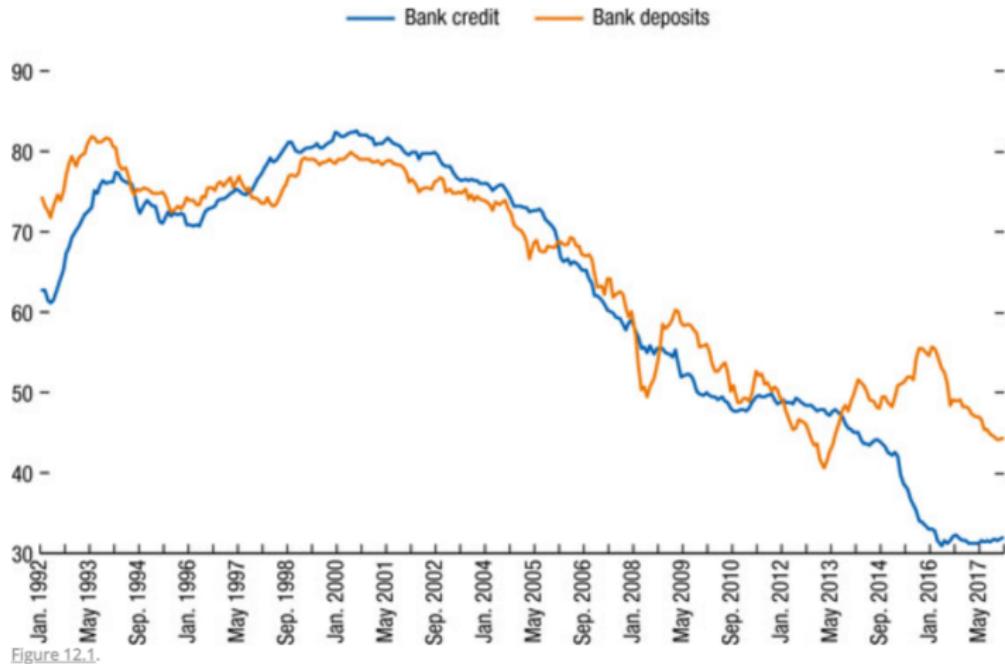


Figure 12.1  
Dollarization of the Banking System, 1992–2017

Source: Central Bank of Peru (2018)

# Peru Macro Risk Management Tools

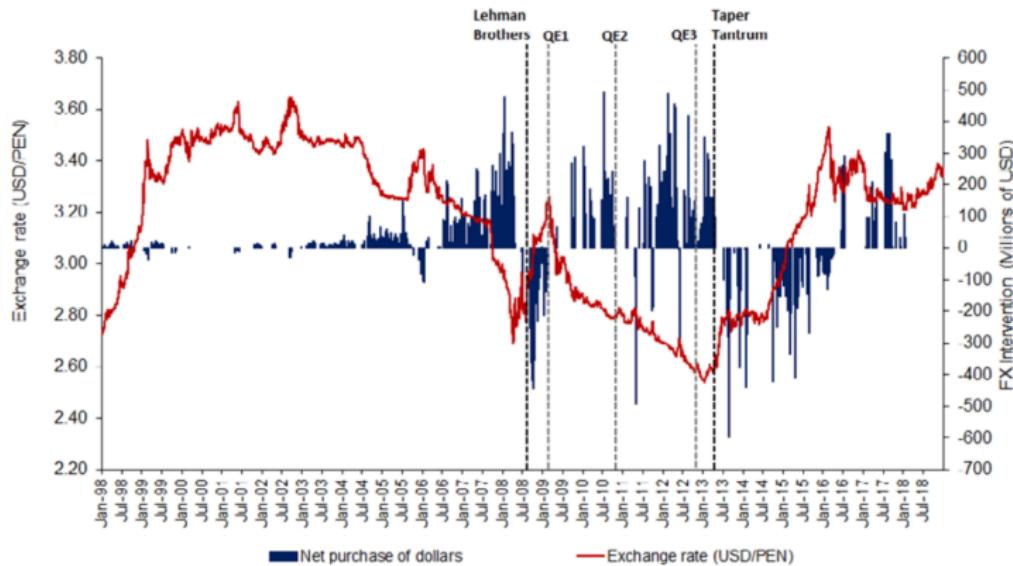
## Macro Risk Management Tools

Types of Policies	Risks Internalizing	Shocks Dampening	Shocks Confronting
High reserve requirements on US dollar liabilities	Yes	Yes	Yes
High international reserves		Yes	Yes
Foreign exchange intervention		Yes	Yes

Source: Central Reserve Bank of Peru.

*Source: Central Bank of Peru (2018)*

# Peru FX Interventions and Exchange Rate



Source: Central Bank of Peru (2018)

# Peru Frequency of FX Interventions

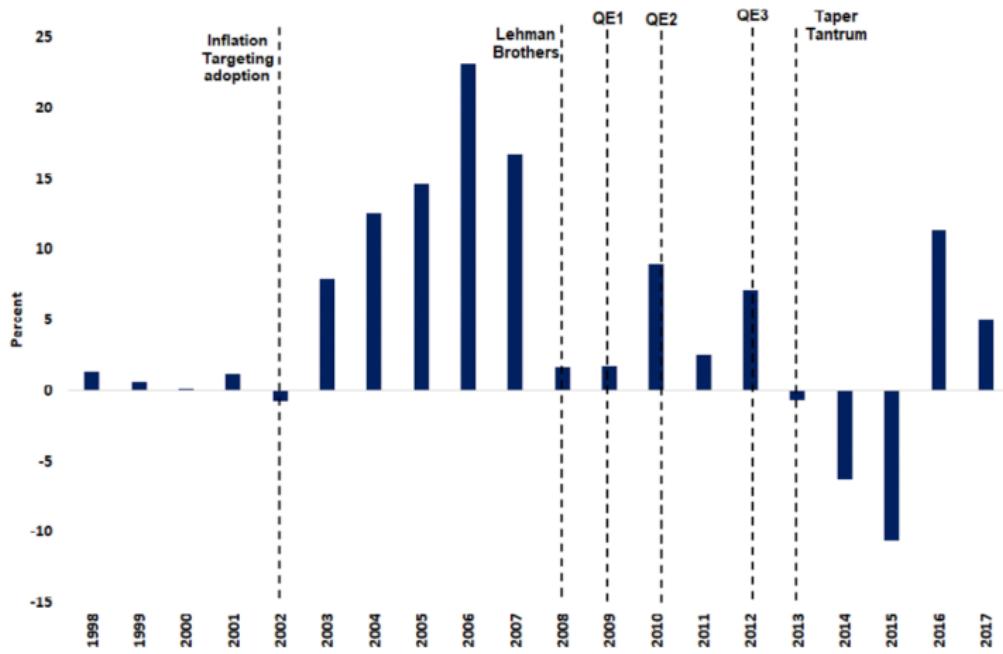
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
<b>Spot</b>														
Number of days	188	109	143	102	32	86	54	164	104	44	98	50	55	4
Volume* (millions USD)	3 560	4 654	10 306	14 712	2 405	8 963	5 929	14 531	10 415	4 248	8 064	3 394	5 246	184
Average (millions USD)	19	43	72	144	75	104	110	89	100	97	82	68	95	46
<b>Forward</b>														
Number of days	15	7	1	20	27	5	23	7	52	96	203	119	26	27
Net balance** (end of period, millions USD)	- 350			- 1 421		160			- 1 113	- 6 468	- 10 029	- 385	- 132	- 502

\* Volume of total intervention (buy plus sell intervention)

\*\* Negative/positive indicates net sale/buy stock position

Source: Central Bank of Peru (2018)

# Peru Size of FXI



Source: Central Bank of Peru (2018)

# Peru Net Purchases of USD

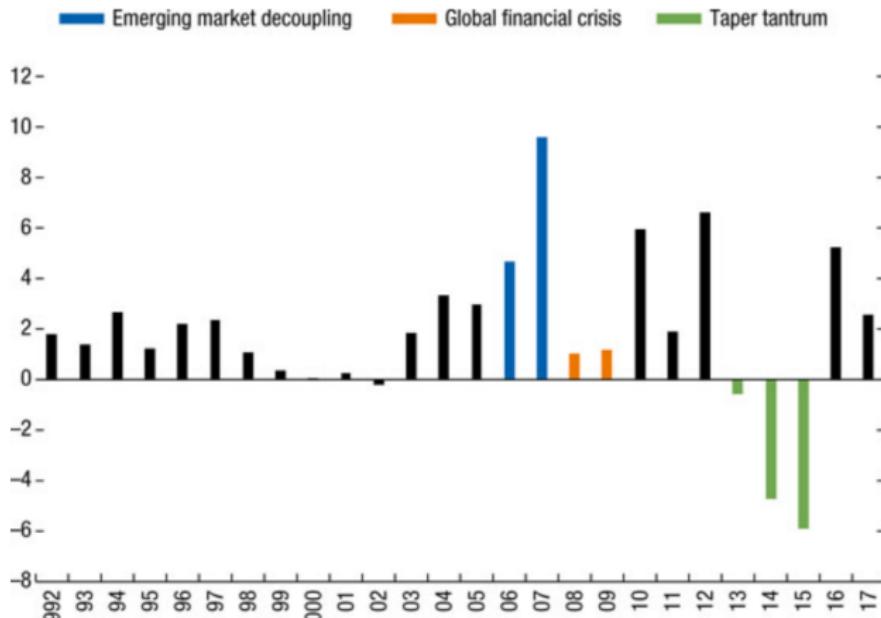


Figure 12.3.

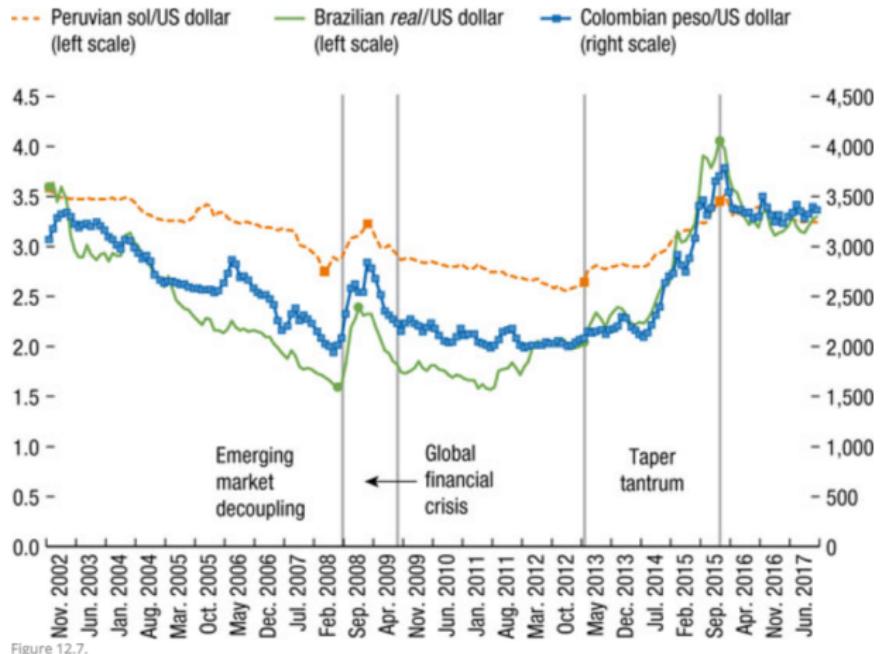
Net Purchases of US Dollars, 1992–2017

Source: Central Bank of Peru (2018)

# Peru Assessing FXI Efficiency

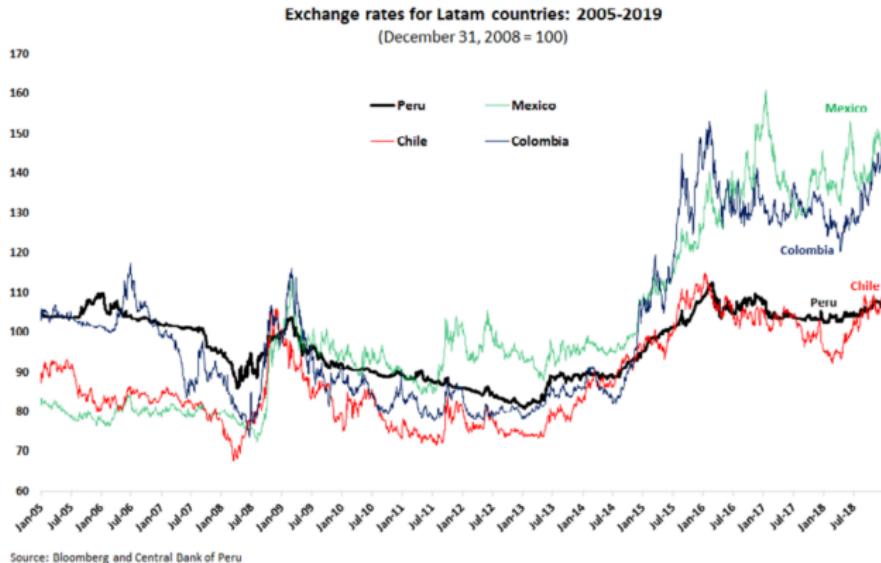
- Because of financial dollarization, the main objective of FX interventions is to prevent FX volatility
- Look at the volatility of the currencies of other countries in the region as a benchmark
- Indeed, Peru did pretty well in mitigating volatility compared to average volatility of LATAM currencies
- It comes at **a cost though**: frequent central bank FX interventions don't provide incentives for the development of the derivatives market in Peru
  - ... forcing the central bank to intervene more often to dampen volatility
- This is why the central bank decided to design **structural policies** to alleviate the financial dollarization problem

# Peru Effectiveness of Interventions



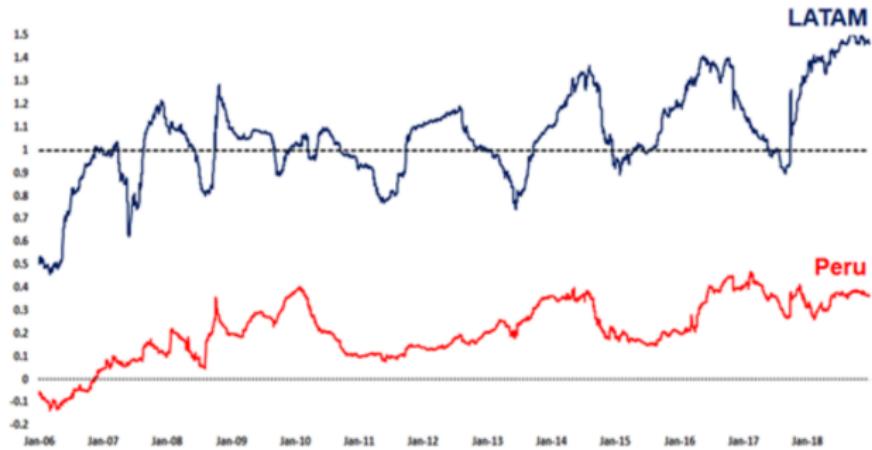
Source: Central Bank of Peru (2018)

# Peru FXI and FX Volatility



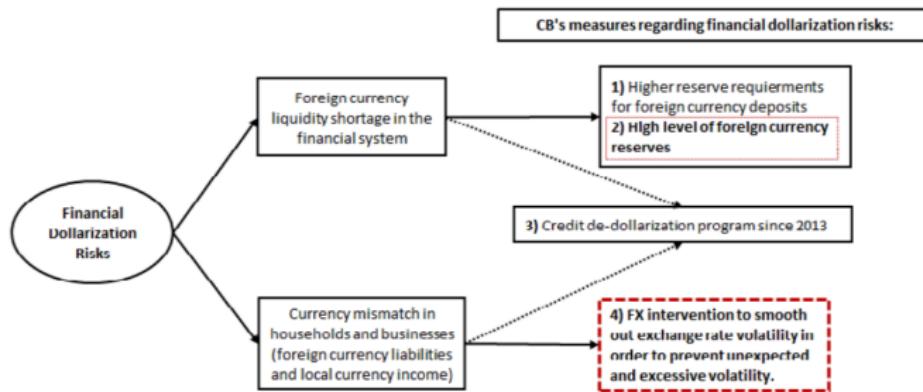
*Source: Central Bank of Peru (2018)*

# Peru FXI to Protect Against Volatility



Source: Central Bank of Peru (2018)

# Financial De-Dollarization: Instruments



Source: Central Bank of Peru (2018)

# BCRP Dedollarization Repos

1

Central Bank		Retail Bank	
International Reserves	Reserve Requirements	Reserve Requirements	Deposits + Net Worth
	Monetary Base (MB)	Other Assets	Foreign Currency (FC) Credit

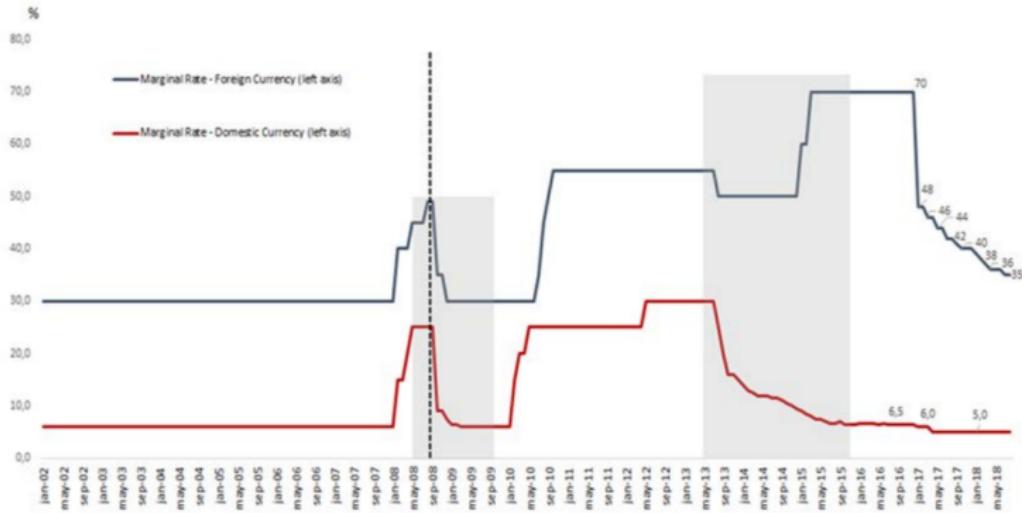
2

Central Bank		Retail Bank	
International Reserves	Reserve Requirements	Reserve Requirements	Deposits + Net Worth
	Monetary Base (MB)	Other Assets	Sols Credit

Substituting FC credit for sols credit results in lower book position for the retail bank.

Central Bank		Retail Bank	
	Reserve Requirements	Reserve Requirements	Other Assets

# Structural Dedollarization: Differentiated RRR



Source: Central Bank of Peru (2018)

# Thailand BOT FXI Objectives

According to the BOT-BIS article [► link](#), the objectives of the BOT are:

- Curtail excessive and persistent volatility
- Discourage speculation
- Deter sharp capital flows
- Not intended to influence the exchange rate level, nor gaining competitiveness

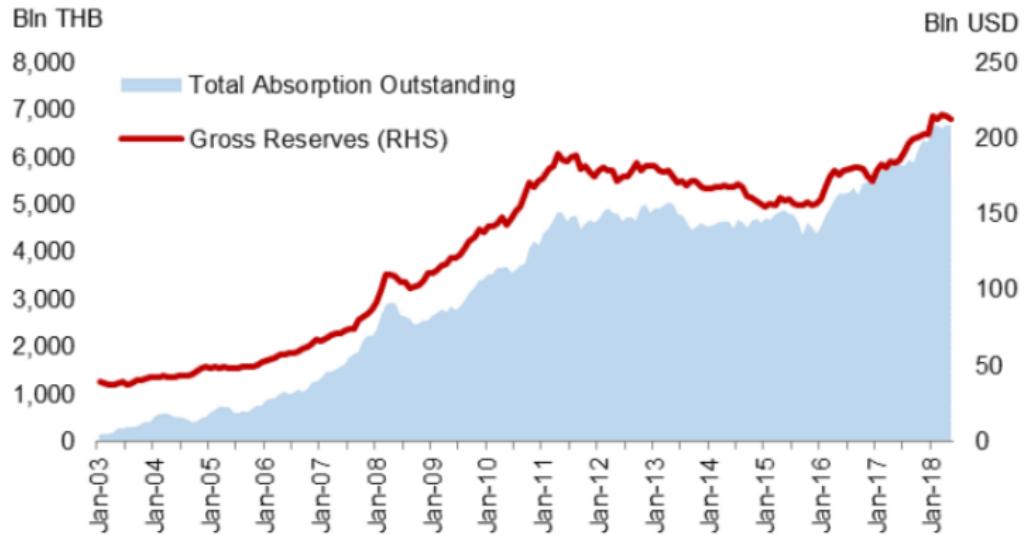
# BOT FXI Implementation

- Uses both verbal and actual interventions
- Discretionary timing based on "market developments and market conditions" (volatility, liquidity, etc.)
  - Looking not only at the spot against USD but also the NEER, the REER and other regional currencies
- Conducted mainly via USD/THB spot on both onshore and offshore markets
- The BOT employs a designated agent to maintain anonymity in the market
  - Cancel the signaling effect
  - Yet the BoT is highly credible, with more than USD 225 bn FX reserves in 2023

# BOT Sterilization

- Main instruments: BOT bills and bonds (54%)
  - Main instrument, supporting market development and curve pricing
  - 14-day to three-year maturity
  - Separate segments with the Ministry of Finance to avoid arbitrages
- Bilateral repurchase operations and deposit facility (30%)
- FX swaps (16%)
  - Absorb THB while injecting USD in up to one-years tenors
  - Mostly used to alleviate USD funding costs in Thailand

# BOT: Total Absorption Instruments Outstanding



Source: Bank of Thailand (2018)

# BOT Communication

- The BOT doesn't announce interventions ex-ante nor ex-post
- Consistent with the market anonymity it is looking for
- Yet, it publishes its level of foreign reserves weekly with one-week lag
- Direct communications regarding the effect of FX policy and market operations are also addressed to key influencers - researchers, private analysts and members of the press -
  - who in turn will make their own communication to the general public

# Philippines FXI Motives

According to the BSP paper in the BIS review [▶ link](#):

- ① Maintain monetary stability
- ② Curb excessive market speculation
- ③ Discourage sharp capital inflows and outflows

# Philippines FXI Implementation

- Discretionary interventions
  - ▶ Decision to intervene may be based on current developments or may call for pre-emptive action
- Intervention in both the spot and the forward market, but mainly in the spot
- Also occasionally uses FX swaps
- No use of capital controls, only market-based instruments

# BSP Communication, FXI Size and Volatility

According to the BSP paper in the BIS review [▶ link](#):

- The BSP never pre-announces its foreign exchange interventions, covert interventions
- "*preliminary evidence suggest that [...] the covert nature of BSP spot market intervention appears to include additional volatility in the exchange rate*"
  - "Market participants may fail to perceive small volumes of BSP interventions"
  - "There are also instances of the markets feeling that the BSP has intervened when it actually has not"
  - "The uncertainty of the FX spot interventions results in differential information set among market participants, generating volatility"