

Foreign Exchange Interventions

Theory and Practice

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Resources

- A textbook presentation of foreign exchange interventions can be found in Sarno and Taylor (2012): [▶ The Economics of Exchange Rate](#)
- 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 Interventions [▶ Link, Popper 2022](#)

1 Conceptual Framework

- Goals and Intermediate Objectives
- Monetary Frameworks
- Types of FX Interventions
- Transmission Channels

2 Implementation

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

3 Practical Cases

- Mexico
- Brazil
- Colombia

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*

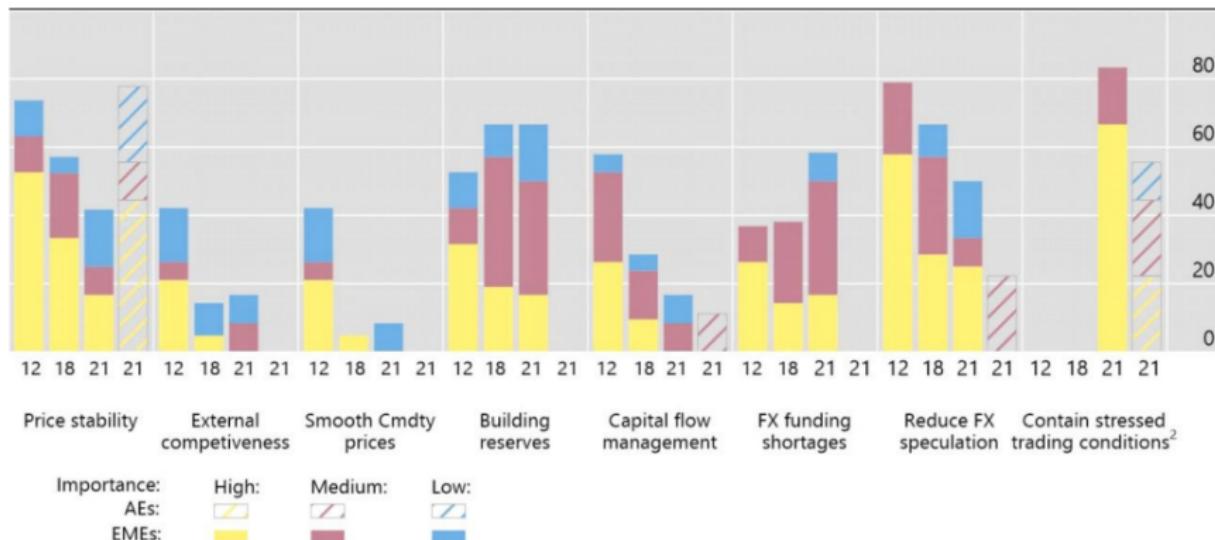
FXI Main Goals for Central Banks

- **Price stability**
 - When large exchange rate movements pass-through inflation, generating temporary shocks
- **Financial stability**
 - Calm "disorderly market conditions"
 - 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
- **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



¹ 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. ² "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](#)

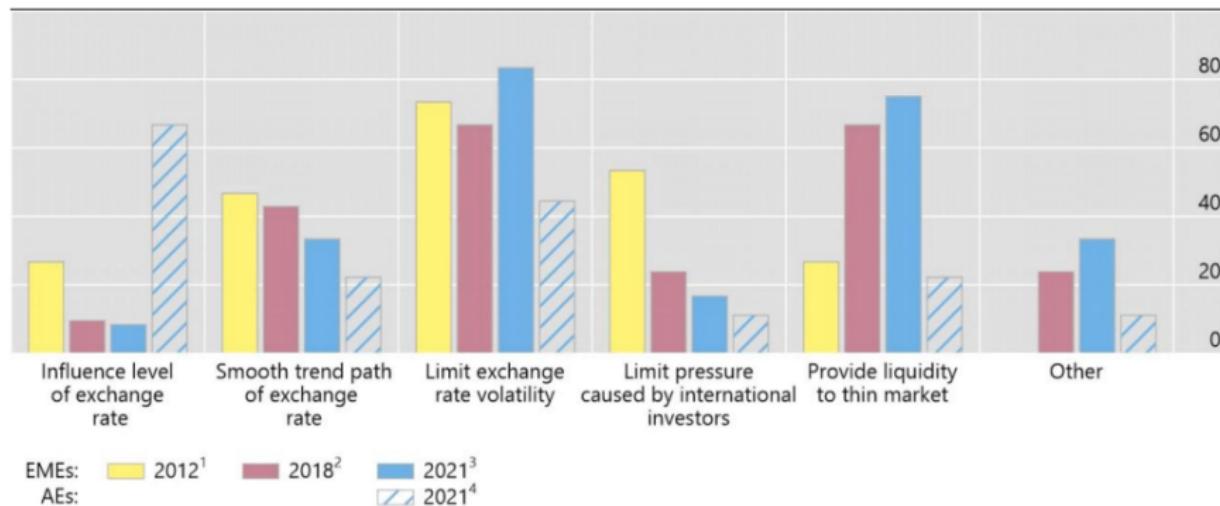
FXI Intermediate Objectives

- **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.
 - Can derail the transmission of monetary policy
- Provide liquidity to think market
- **Influence the level of exchange rate**
- Smooth the trend path of exchange rate
- Limit pressure caused by international investors

Survey: FXI Intermediate Objectives for Central Banks

As a percentage of respondents

Graph 3



EMEs: ¹ 15 central banks. ² 19 central banks. ³ 12 EME central banks. ⁴ 9 AE central banks.

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

Source: BIS 2021 [Link](#)

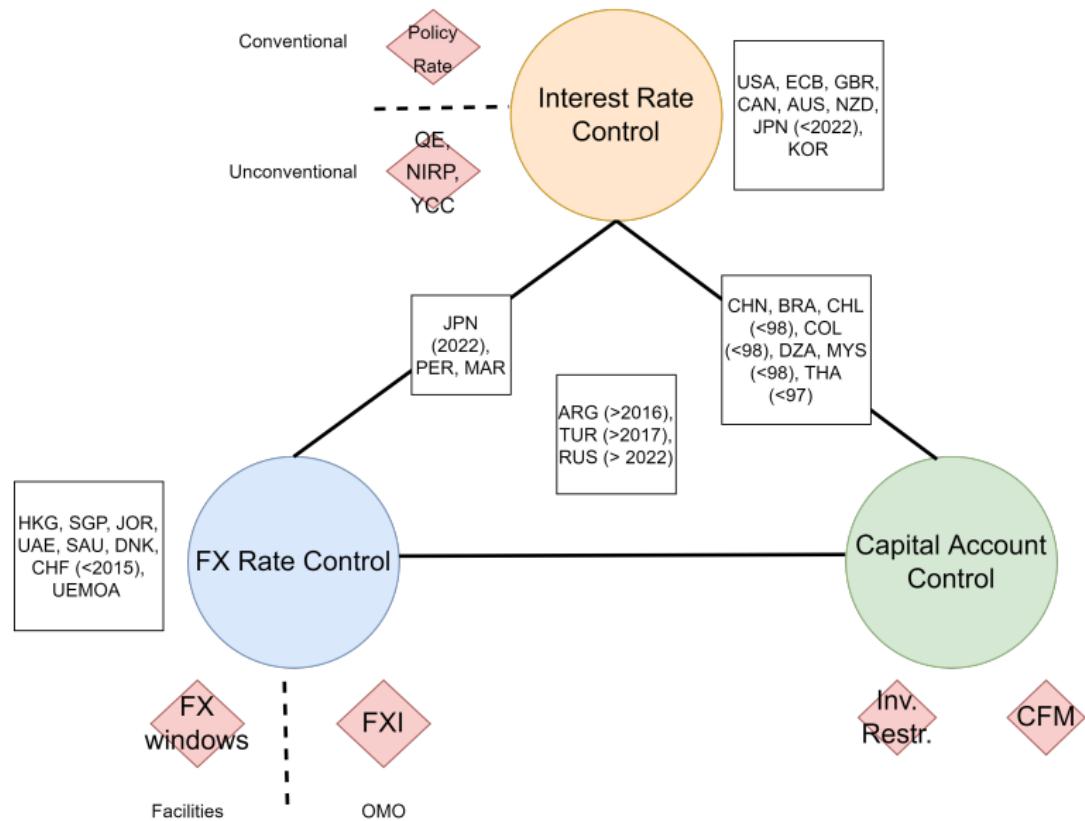
The Negative Impacts of FX Interventions

- **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 solving some of these issues*

FXI Interventions Should be Consistent with the Monetary Framework

- **Inflation targeters and monetary base 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*
- **Hard-peg and currency board** regimes usually conduct FX operations via FX windows, at 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
 - Often, conflict between *de-jure* and *de-facto* monetary objectives

Monetary Frameworks and Trilemma



Types of FX Interventions

There are two types of foreign exchange interventions:

① Non-sterilized operations

- 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 operations

- 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) issuance of 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

Liabilities to deposit money banks (banks' reserves)

Capital and revaluation account

- In red: Autonomous Factors
- In green: Policy Position
- In blue: Other Items

Can All Countries Sterilize?

- In practice, it may be difficult to offset fully the effect of FX interventions
 - Countries with under-developed financial markets might not offer enough assets for the central bank to sterilize
 - Second-round effects of central bank sterilization can dampen
 - ★ *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, East-Asian central banks often use FX swaps to sterilize
 - ★ Purchasing FX on the spot
 - ★ Swap by selling FX spot, buying FX in the future

The Costs of Sterilization

- **Fiscal cost**
 - Depends on the interest rate differential between domestic and foreign assets
 - Balance the cost of the conduct of monetary policy with the monetary policy mandate. Important to be consistent, even if it implies costs 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
 - ★ This is a form of financial repression, and is not advised...
- **Valuation risk**
 - If foreign reserves grow too much, they 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

Transmission Channels

FX interventions influence the exchange rate through two main channels:

- ① Signaling channel
 - Signaling future monetary policy stance
 - Signaling future exchange rate and 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 policy intentions
- As long as the **central bank is credible**, the signal can influence the exchange rate

Signaling and Transparency

- If interventions convey information, why do some central banks continue to keep them secret, even ex-post?
 - Threat for the credibility if the intervention is unsuccessful?
 - "Wants to keep control", tradition of secrecy
 - Political repercussions?
- Rather than conducting FX interventions, why not announcing direct monetary policy changes (e.g. a change in the policy rate)?
 - Mussa (1981): "FX interventions may be more credible because it forces the central bank to put money where its mouth is"
 - In small economies with limited transmission of monetary policy, the exchange rate channel is often the most efficient one

The Portfolio Rebalancing Channel

- Key assumptions of the portfolio rebalancing channel for sterilized FX interventions:
 - 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
- 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**

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

Countries, and in particular EMEs, face implementation issues when framing their FX interventions strategy

- Does intervention affect the credibility of inflation-targeting?
- Should intervention be discretionary or follow rules?
 - If rules, what kind of rules?
- 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?

Different Approaches to Intervention

- **Brazil:** discretionary operations, reported one week after since 2008.
 - In 2013-2015, daily sales of NDF contracts
- **Chile:** pre-announced daily purchases of USD 50m with a discretionary intra-day timing
- **Colombia:** 3-minute Dutch auction (descending price) of sales of USD, 20m per day
 - discretionary timing: auctions announced in advance, unsold dollars are carried forward the next day
- **Mexico:** Auctions of USD with a minimum price, 3 times daily at pre-announced times and daily amounts (up to 2016)
 - Bids made public at the end of each auction (auctions last 5 minutes)
 - In 2017, new auctions of NDF that pay in pesos
- **Peru:** Discretionary operations, announced at start of intervention trades, amounts published daily at market close

Instruments for FX Interventions

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

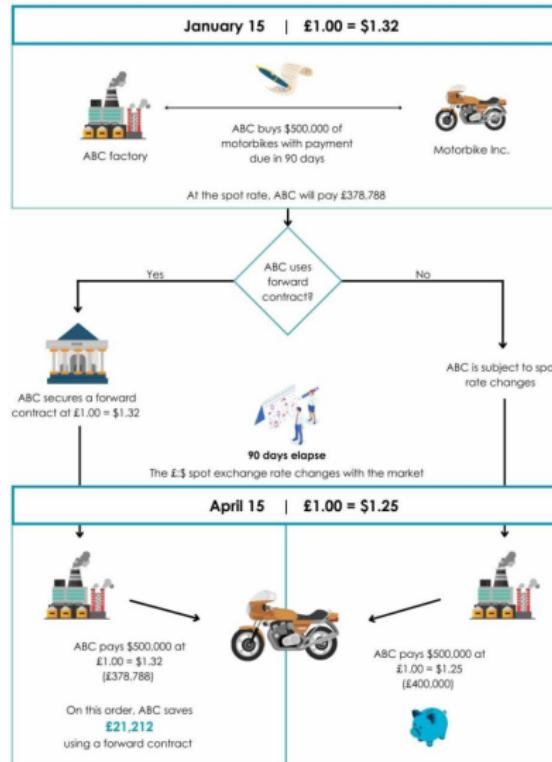
Spot versus Derivatives?

- Using derivative markets allows the central bank to:
 - Provide hedges against FX risk
 - Influence derivative market liquidity (improve spot/derivative market arbitrage)
 - May limit the use of 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 Spot

- Standard transaction on the spot market
- Direct impact on the exchange rate, no arbitrage transmission needed
- Provide immediate provision
- Limited by the size of the foreign reserves when selling
- In some countries, the spot market might be less liquid than the derivative market

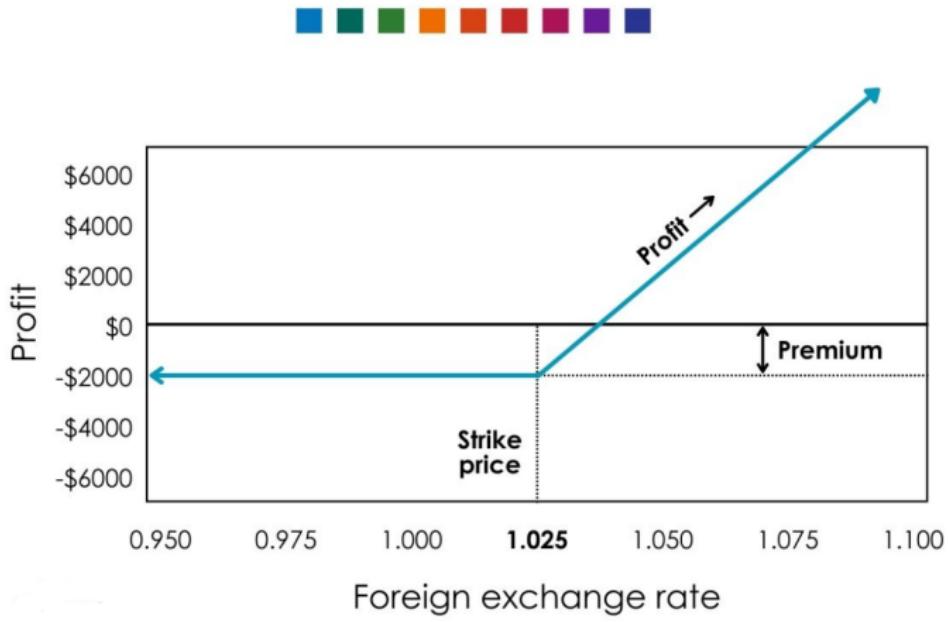
FX Forwards



Source: Trade Finance Global [Link](#)

FX Call Options (Protection against Appreciation)

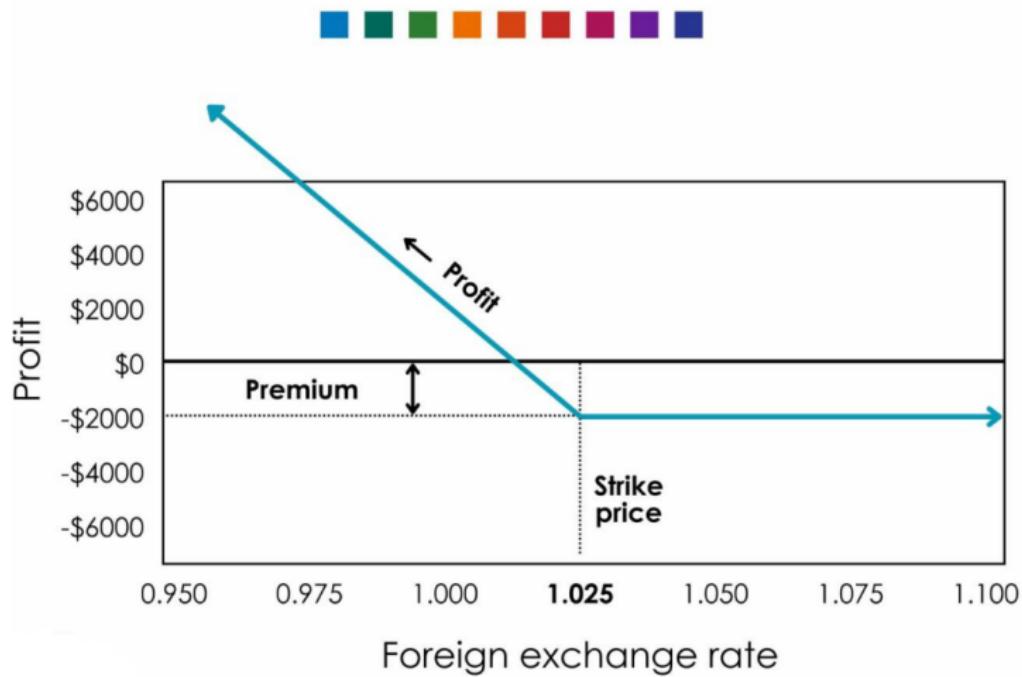
Profit on a European call option



Source: Trade Finance Global [Link](#)

FX Put Options (Protection against Depreciation)

Profit on a European put option



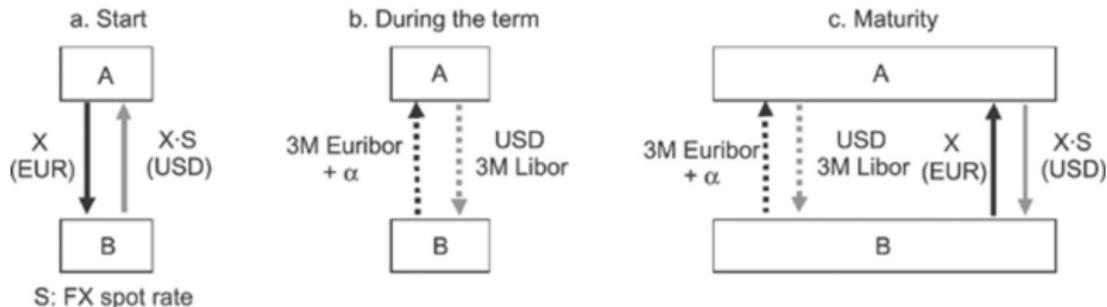
Source: Trade Finance Global [Link](#)

Forex Swaps and Cross-Currency Basis Swaps

A. FX Swap

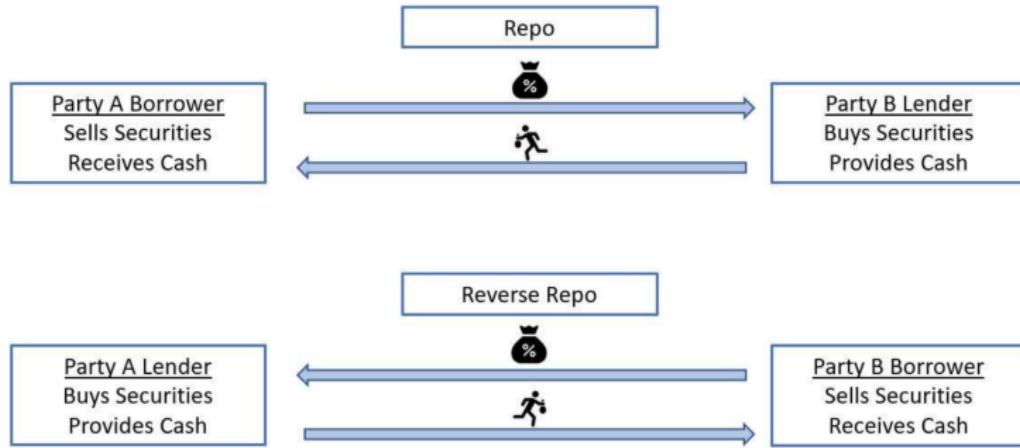


B. Cross-Currency Basis Swap



Source: JFIPM 2008 [Link](#)

FX Repos and Reverse Repo



Source: Derivative logic [Link](#)

Spot vs. Derivatives: Intertemporal Considerations

- **Spot FXI:** provide immediate FX provision
- **Forward FXI:** provide FX at a pre-defined future point in time
- **Option-based FXI:** provide FX during a certain, pre-specified period, in particular turbulent times
- **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

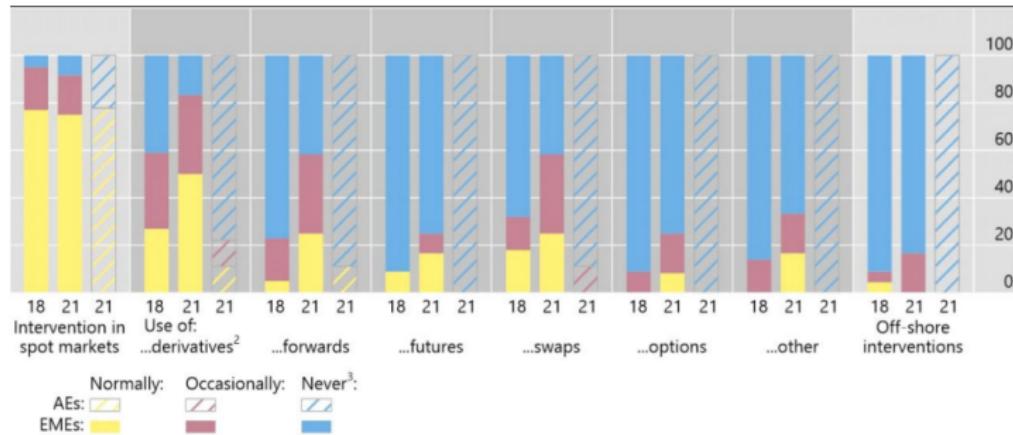
- AEs tend to intervene exclusively in the spot market
- Many EME countries intervene in derivative markets
 - First mover: Bank of Spain sold put options on the peseta to fight devaluation pressures in 1993
 - Bank of Thailand used forward market purchases to support the baht in 1997
 - Bank of Mexico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

Survey of FXI Instruments used by Central Banks

Spot market interventions remain most common but most EME central banks rely also on derivatives¹

As a percentage of respondents

Graph 4



¹ Based on the responses of nine AE and twelve EME central banks, regardless of whether or not they intervened over the last three years. ² Use of at least one derivative instrument. ³ 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](#)

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
 - Maximize signaling channel, help agents forming their expectations
 - Immune to political pressures
 - Depending on the set-up might give room to speculators

Rule vs. Discretion

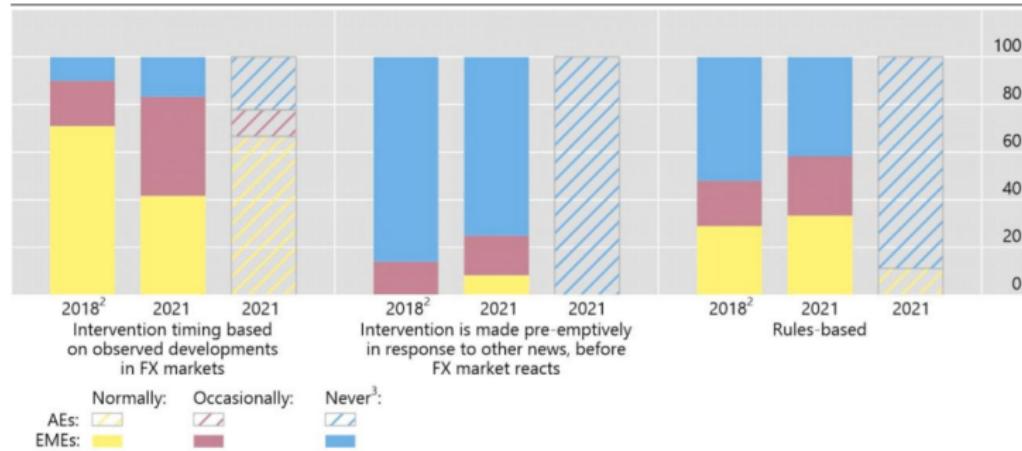
- Countries that have implemented rules-based interventions:
 - Mexico, Chile and Columbia: rules-based programs of pre-announced daily purchases/sales of FX
 - Czech Republic and Russia used to have "automatic interventions"
- Evidence from the Czech National Bank [▶ Link](#) "automated interventions" 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 developments¹

As a percentage of respondents

Graph 5



¹ 2018: based on the responses of 21 EME central banks; 2021: based on the responses of nine AE and 12 EME central banks. ² Answers from one central bank corresponds to 2017. ³ 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
- Operations 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 rule 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)
 - Calibrate as percent of daily FX market turnover
 - Assess the liquidity conditions and the FX market impact

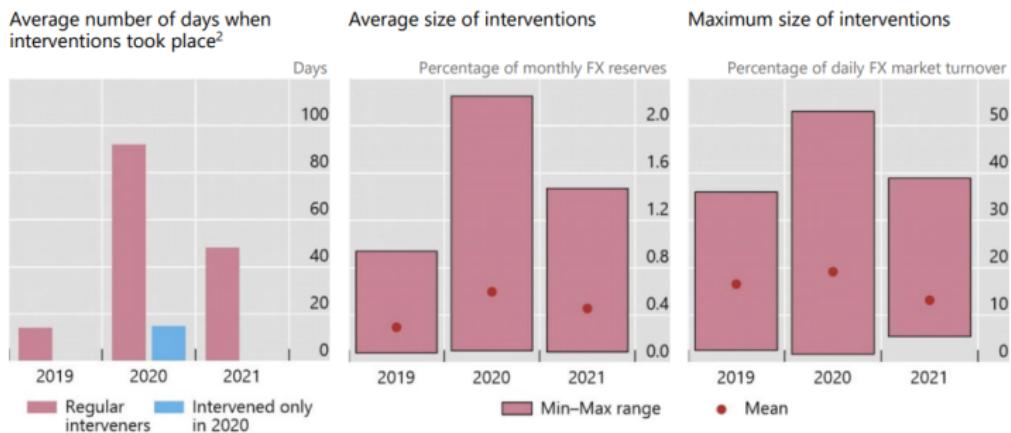
Orders of Magnitude

- The BIS has conducted a survey of central banks interventions in 2021 ([▶ Link](#))
- On average, cumulated FXI intervention 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 shock¹

Graph 1



¹ Based on the responses of EME central banks that reported non-zero values (eight). ² 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](#)

Targeted vs. Open Market Interventions

- Systematically important banks may require targeted FX provision under specific circumstances
- Even if FX provision facilities are not "targeted", bank take-up is unlikely to be uniform
- Issues:
 - Potential market distortions and market discriminations among institutions
 - Political pressures
- Open-market more transparent and less distortive

Communication and Transparency

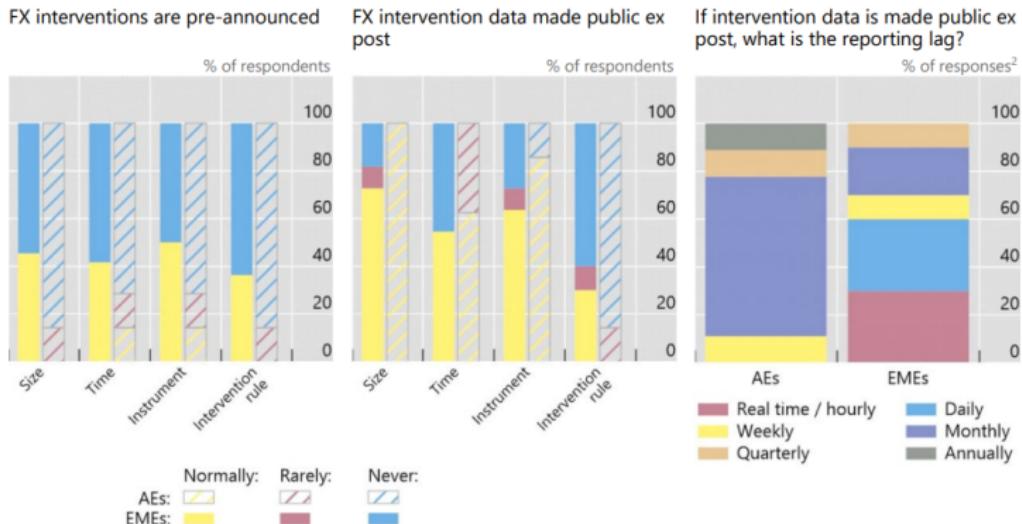
- Little consensus among central banks, in particular on ex-post communication (data, amounts, etc.)
- **Signaling** is an important transmission channel of foreign exchange interventions and can only be achieved with communication and transparency
- The "surprise the market" effect can be detrimental, 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 post¹

How much information do you provide publicly?

Graph 7



¹ Based on the responses of nine AE and 12 EME central banks.

² 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 ¹	2021 ²	2018 ¹	2021 ²	2018 ¹	2021 ²
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

¹ Based on the responses of 22 central banks. ² 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

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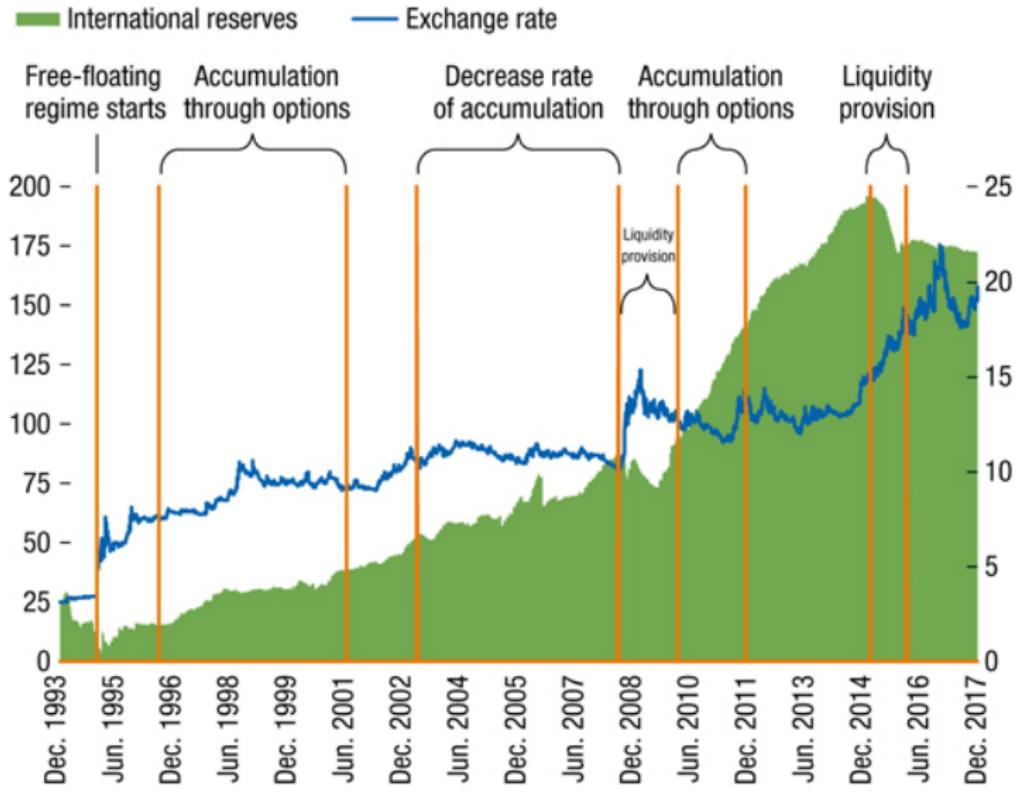
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Mexico Path to Free Float Exchange Rate



Source: IMF [Link](#)

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

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)

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

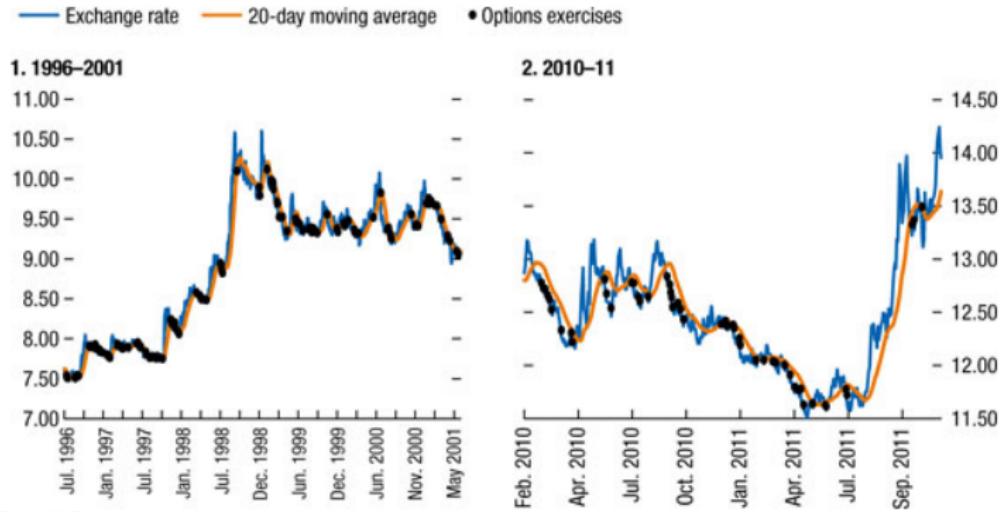


Figure 11.3.

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

Source: IMF [Link](#)

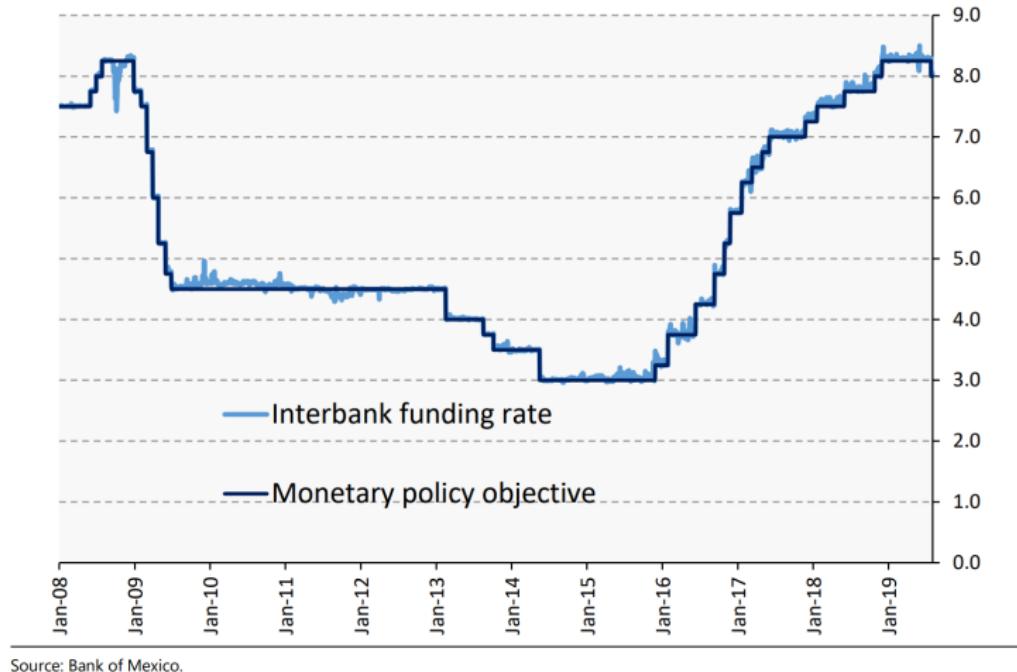
Effectiveness

- 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)

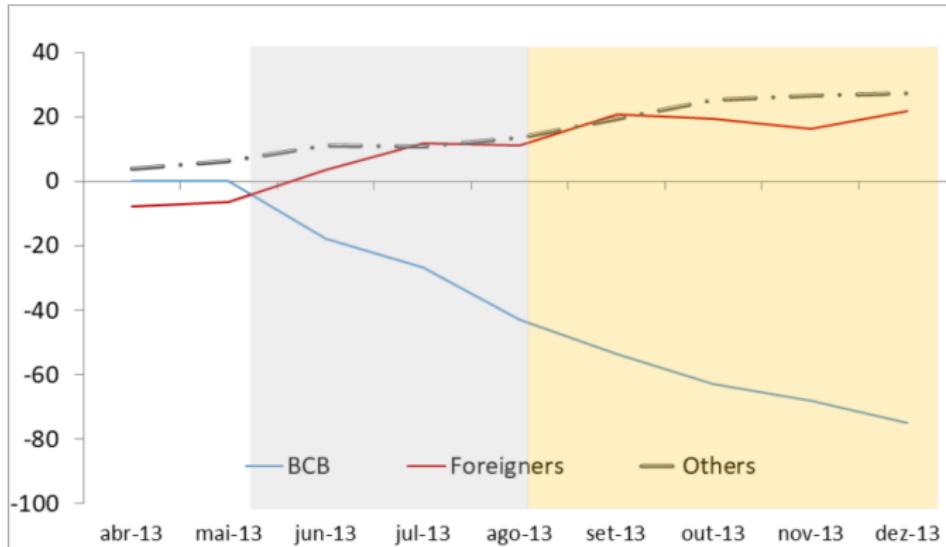
- The BCB implemented the largest ever intervention in the FX derivatives market in August 2013
 - Initially to counter-act capital outflows and the BRL depreciation during the "Taper Tantrum"
- The open position of the BCB in these derivatives summed up to **7% of the Brazilian GDP (30% of the international 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")

FX Derivatives Players and their Net Exposures

Figure 2: FX derivatives players and their net exposures.

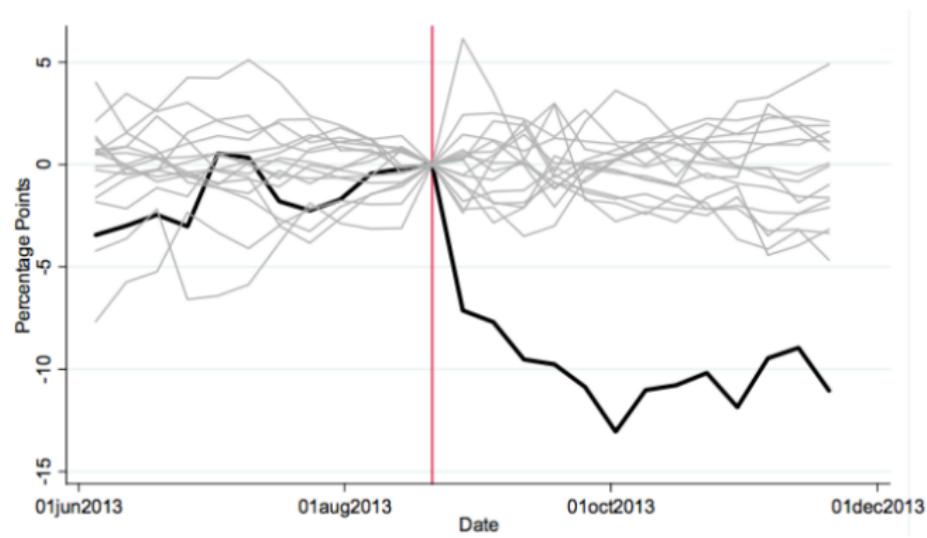


Source: B3. Gray area represents the time window between the tapering speech prior to the swaps program. The yellow area represents the first phase of the program. The values are in billions of BRL.

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

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

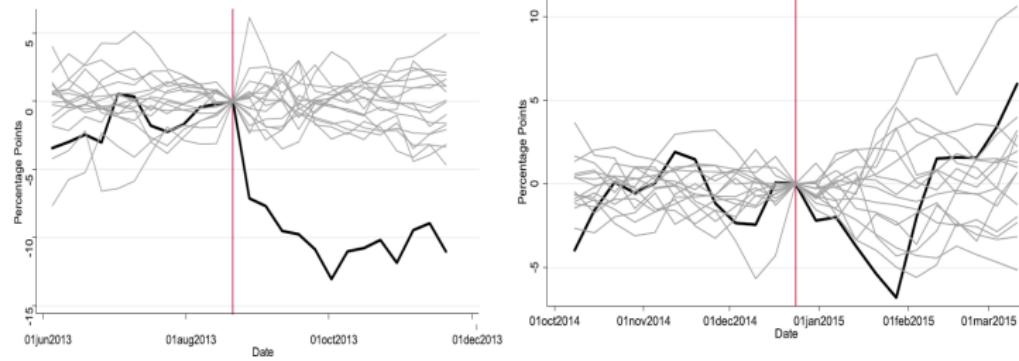
Figure 3: Effects of the Aug, 22 intervention in BRL/USD exchange rate



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 ¹	n/a	n/a	n/a	n/a	n/a
Oct. 2008–Oct. 2009	5	2	5	3	0
Oct. 2009–Oct. 2011 ¹	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.

¹The 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

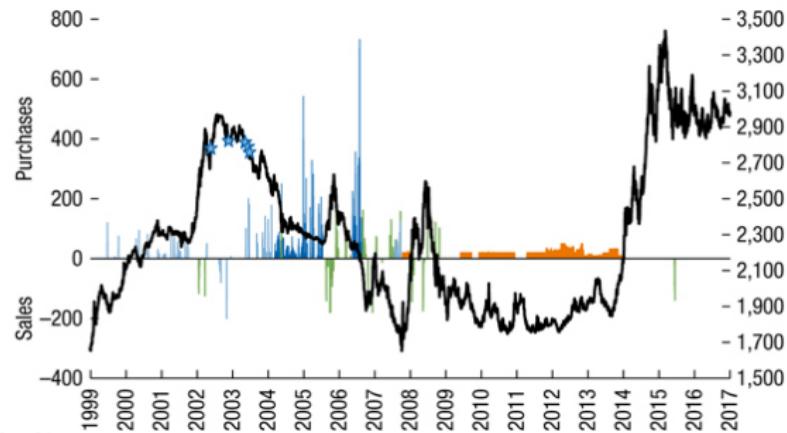


Figure 9.1.

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)

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)

Decision Tree for Selling Reserves

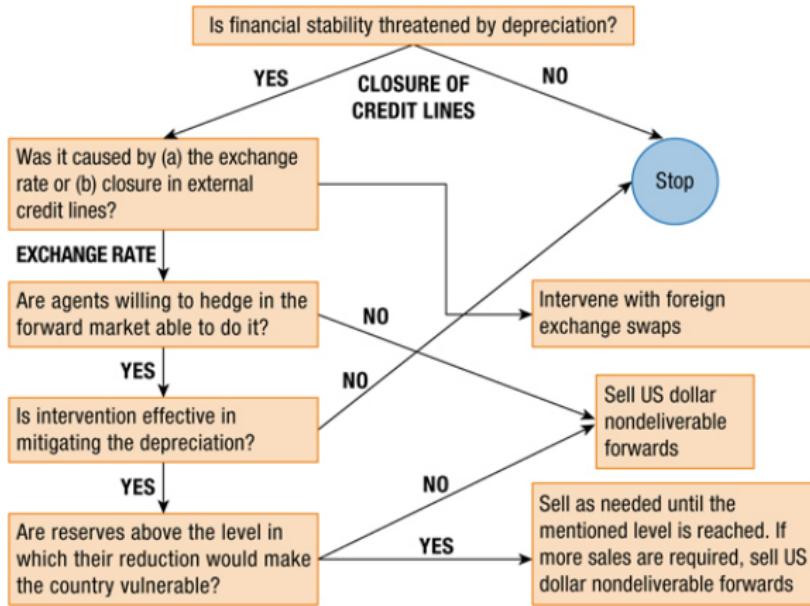


Figure 9.4.

Decision Tree for Selling Reserves

Source: Central Bank of Colombia.

Source: Central Bank of Colombia