APPENDIX A

Optimal Reserves Calculations

A.1 Country Classification

Throughout Chapter 2, countries are classified into four groups according to their monetary regimes: Established Inflation Targeters (EITs), Recent Inflation Targeters (RITs), Intermediate Exchange Rate Regimes (IERs), and Fixers (FIXs).

Established Inflation Targeters (Established IT) are economies that have had an inflation targeting regime for 15 or more years: Brazil, Chile, Colombia, Mexico, and Peru.

The Recent Inflation Targeters (Recent IT) comprise countries that have recently adopted an Inflation Targeting regime: Costa Rica, Dominican Republic, Guatemala, Jamaica, Paraguay, and Uruguay.

The countries classified as Inflation Targeters are also classified as Floating or Free Floating in IMF (2016), (except Costa Rica, the Dominican Republic, and Jamaica). In these economies, the exchange rate moves relatively freely. Still, there may be exchange rate interventions.

In countries classified as Intermediate and Fixers, the monetary authorities manage the exchange rate of the domestic currency vis-à-vis another currency or basket of currencies.

The intermediate group consists of Argentina, Bolivia, Guyana, Haiti, Honduras, Nicaragua, Suriname, and Trinidad and Tobago. Venezuela was excluded due to lack of comparable data.

Finally, Fixers are either dollarized or have a hard-peg to the U.S. dollar. This group includes The Bahamas, Barbados, Ecuador, El Salvador, and Panama. The last three countries are dollarized; they use the U.S. dollar as their domestic currency without a separate legal tender. Given the methodology adopted, it is not possible to estimate optimal reserve holdings for this group of countries.

A.2 Methodology and Data for Calculations of Optimal Reserves

The methodology to estimate the level of optimal international reserves follows Calvo, Izquierdo, and Loo-Kung (2013). This methodology specifies the probability of a Sudden-Stop (SS) event as a function of international reserves (IR), the government deficit (GD), the

current account balance (CA) and the level of gross domestic liability dollarization (DLD). The same variables are used to estimate the cost, as a percentage of GDP, of a sudden stop. This framework assumes that the opportunity cost of holding reserves is the return differential between the country's external debt and U.S. Treasury bills. This differential is also known as the sovereign spread.

The level of reserves that minimizes the total expected cost for the sovereign is then calculated; it is the cost of a sudden stop times its probability plus the opportunity cost of holding reserves.

$$\min_{IR} Prob_{SS}(IR,CA,GD,DLD) \times Cost_{SS}(IR,CA,GD,DLD) + IR \times Spread$$

The estimate made by Calvo, Izquierdo, and Loo-Kung (2013) with data on macroeconomic fundamentals is used to find the optimal reserve holdings for each country for each year from 2005 until 2018. See Calvo, Izquierdo, and Loo-Kung (2013) for a full description of the methodology.

The sample includes data for 16 Latin American countries. Due to methodological limitations, dollarized economies are excluded. The results for countries in the other three groups are presented where data are available.

Gross Domestic Liabilities Dollarization (DLD) data on GDP in current local currency comes from World Development Indicators (WDI). Deposits included in broad money, transferable deposits included in broad money, and liabilities to non-residents are from International Financial Statistics of International Monetary Fund. DLD is calculated as a sum of foreign liabilities and the deposits in foreign currency to total deposits ratio, weighted by the nominal GDP.

The deposits in foreign currency to total deposits ratio is calculated using data from each central bank. General government net lending/borrowing as a percentage of GDP and total reserves excluding gold in current U.S. dollars are from the World Development Indicators of the World Bank. The dataset is in annual frequency from 2005 to 2023. In the case of emerging markets with EMBI spread, namely, Argentina, Brazil, Chile, Colombia, Dominican Republic, Jamaica, Mexico, Peru, and Uruguay, we use the average from 2005 to 2018 of EMBI Global Diversified Index. For the rest of the countries, (i.e., Bolivia, Costa Rica, Guatemala, Honduras, Nicaragua, and Paraguay) the average from 2005 to 2018 of the EMBI Aggregate is employed.

References

Calvo, G. A., A. Izquierdo, and R. Loo-Kung. 2013. "Optimal Holdings of International Reserves: Self-Insurance against Sudden Stops." *Monetaria* [Centro de Estudios Monetarios Latinoamericanos] 1(1) January–June: 1–36.

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