Annex 1. Estimation of Impacts Using Local Projections

The Local Projections (LP) framework is flexible enough to accommodate a panel structure and does not constrain the shape of the impulse response functions and is thus less sensitive to misspecification. Auerbach and Gorodnichenko (2013), Jordà and Taylor (2016), Ramey and Zubairy (2018), as well as Born, Müller, and Pfeifer (2019) among others, also rely on local projections while analyzing fiscal policy. Their focus, however, is on the effects of fiscal policy changes on economic activity.

The benchmark specification for different horizons $(h = 0,..,30)$ in days is as follows:

$$r_{i,t+h} - r_{i,t-1} = \alpha_{i,h} + \gamma_{t,h} + \beta_h D_{i,t} + \delta X_{i,t} + \varepsilon_{i,t+h}, \qquad (1)$$

where $r_{i,t+h}$ denotes the EMBIG sovereign spreads in basis points; $D_{i,t}$ is a dummy variable representing the onset of a fiscal consolidation announcement, taking the value of 1 in the day of the announcement and zero otherwise; and *h* denotes the time horizon considered.[1] $X_{i,t}$ denotes a vector which contains seven lags of daily changes in EMBIG spreads. The specification also includes country ($\alpha_{i,h}$) and time ($\gamma_{t,h}$) fixed effects to capture time-invariant country features and shocks that are common across countries (such as changes in U.S. interest rates, for example), respectively. The impulse responses are constructed based on the estimated β_h coefficients at each horizon. The confidence bands are based on the respective estimated standard errors.

Another advantage of the LP method in estimating the effects of fiscal consolidations is its flexibility in dealing with non-linearities and state dependency (Ramey and Zubairy, 2018). Hence, in addition to the benchmark regression presented in Equation (1), the chapter explores specifications that condition the response of spreads on the following scenarios: (i) the consolidation announcements are made in episodes of high fiscal stress (when the EMBIG spread levels are high) and (ii) when a country was under an IMF supported program. The typical state-dependent specification will take the following form:

$$\begin{aligned} r_{i,t+h} - r_{i,t-1} = {} & S^j_{i,t-1}\left[\alpha^j_{i,h} + \gamma^j_{t,h} + \beta^j_h D_{i,t} + \delta^j X_{i,t}\right] + \\ & \left(1 - S^j_{i,t-1}\right)\left[\alpha^j_{i,h} + \gamma^j_{t,h} + \beta^j_h D_{i,t} + \delta^j X_{i,t}\right] + \varepsilon_{i,t+h}. \quad (2) \end{aligned}$$

The indicator variable $S^j_{i,t-1}$ takes the value of 0 or 1 depending on the statedependency *j* being considered, with $j = \{scenario\ (i), scenario\ (ii)\}$. For scenario (i), $S^{level}_{i,t-1}$ takes the value of 1 if the EMBIG spread is at or above the 75th percentile of the sample distribution (420 basis points). In scenario (ii), $S^{IMF}_{i,t-1}$ takes the value of 1 if the country is under an IMF supported program. Given that countries could put in place adjustment programs before IMF support, the indicator variable also takes the value of 1 for the year before the board approval date of the IMF program.

As discussed in the text, the fiscal announcement dates come from David, Guajardo, and Yépez (2019). The chapter uses daily data for sovereign bond spreads for 11 Latin American and Caribbean economies between January 3, 2000, and December 31, 2018, using the JP Morgan's Emerging Market Bond Index – Global database.[2] This spread is measured by an index that includes sovereign and quasi-sovereign

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[1]For the analysis using annual data, the dummy $D_{i,t}$ takes the value of one in the year of the announcement and the horizon (h) is equal to three years.

[2]See footnote 6 for country coverage.

(guaranteed by the sovereign) instruments that satisfy certain liquidity criteria in their trading. The spread of an instrument (bond) is calculated as the premium paid by an emerging market over a U.S. government bond with comparable maturity features. A country's spread index is then calculated as the average of the spreads of all bonds that satisfy the inclusion criteria, weighted by the market capitalization of the instruments. One of the benefits of such an index is that the time series are continuous, without breaks as bonds mature. Only stripped spreads are used, which excludes collateral and guarantees from the calculation. The data is retrieved from Datastream. The IMF program dates are obtained from the IMF's Monitoring of Fund Arrangements (MONA) database. Real GDP and debt-to-GDP ratios are obtained from the IMF's World Economic Outlook (WEO) database.

Annex 2. Estimation using a Panel VAR

Following Burnside, Eichenbaum, and Fisher (2004); and Cavallo (2005), the fiscal announcement dates are embedded in a VAR model. The model for a panel of 11 EMDEs (PVAR) consists of three variables: the fiscal consolidation announcement dates; EMBIG spreads; and an index of economic activity. All variables are included at a monthly frequency. The fiscal consolidation announcements enter the system as a dummy variable that equals one in the month of the announcement. The EMBIG spreads are the average over the month. For the index of economic activity, monthly industrial production or other economic activity volume indicators are used.[1] All economic activity indicators are seasonally adjusted and obtained from Haver Analytics.

Following Blanchard and Perotti (2002), it is assumed that output or other variables of interest react immediately to fiscal policy shocks, whereas fiscal policy does not react on impact to other shocks in the system. This identifying assumption is the standard Cholesky decomposition with the fiscal policy variable ordered first in the VAR. It is usually justified by delays in the legislative system that would prevent the contemporaneous reaction of fiscal variables. This timing restriction is more plausible at a monthly frequency considered here. It is important to note that endogeneity concerns might still not be fully addressed by this restriction given the well-documented procyclicality of fiscal policy in EMDEs (Frankel, Végh, and Vuletin, 2013) i.e. announcements could be motivated by persistently deteriorated economic conditions. Nevertheless, most of these effects should be captured through the dynamics in the system, even if the reaction within the month of the announcement is restricted.

To fix ideas, the panel VAR system can be written as (abstracting from the country-specific intercepts) as:

$$\begin{pmatrix} 1 & 0 & 0 \\ \alpha_{i,2,1} & 1 & \alpha_{i,2,3} \\ \alpha_{i,3,1} & \alpha_{i,3,2} & 1 \end{pmatrix} \begin{pmatrix} D_{i,t} \\ \Delta r_{i,t} \\ \Delta y_{i,t} \end{pmatrix} = \sum_{j=1}^{p} A_{i,j} \begin{pmatrix} D_{i,t-j} \\ \Delta r_{i,t-j} \\ \Delta y_{i,t-j} \end{pmatrix} + \begin{pmatrix} \varepsilon_{i,t}^{1} \\ \varepsilon_{i,t}^{2} \\ \varepsilon_{i,t}^{3} \end{pmatrix} \quad (1)$$

where $D_{i,t}$ are the fiscal announcement dates, $\Delta r_{i,t}$ is the monthly change in EMBIG spreads, and $\Delta y_{i,t}$ is the log change in the monthly economic activity indicator. The lag length is denoted by *p*. The structural shocks are denoted by $\varepsilon_{i,t}^{k}$ with $k \in [1, 2, 3]$. The fiscal consolidation announcement shock is denoted by $\varepsilon_{i,t}^{1}$.

Conceptually, fiscal announcements affect output directly in two ways: contemporaneously through $\alpha_{i,3,1}$ and dynamically through the relevant coefficients in the $A_{i,j}$ matrices. But there are also indirect effects of fiscal actions to the extent that fiscal announcements move spreads contemporaneously (through ai,2,1) and in turn spreads impact output (through $\alpha_{i,3,2}$). Moreover, spreads can serve as a propagation mechanism for fiscal shocks if they respond to fiscal announcements at any horizon and the coefficients for lagged values of spreads in the output equation are significant.

The objective of this empirical framework is to statistically isolate the role of changes in sovereign spreads in mitigating the effects of fiscal consolidation announcements on economic activity. To do so, a similar strategy as Bachmann and Sims (2012) is employed to "shut off" the indirect channels described

[1]With the exception of Jamaica, for which a monthly interpolation of the quarterly GDP series is used.

previously. In practical terms, this is done by constructing a hypothetical impulse response of output to a fiscal consolidation announcement by holding the changes in EMBIG spreads fixed at zero at all forecast horizons.[2] Using this "counterfactual" analysis the hypothetical response of output is compared to the baseline response, hence quantifying how important are changes in sovereign borrowing costs as a transmission mechanism of fiscal consolidation announcement shocks.[3]

While the timing assumption that government consolidation announcements do not react within a month to changes in sovereign spreads or output is sufficient to identify $\alpha_{i,2,1}$ and $\alpha_{i,3,1}$, an additional restriction is required to identify $\alpha_{i,3,2}$ and $\alpha_{i,2,3}$. Hence $\alpha_{i,2,3}$ is set to zero, which amounts to using a Cholesky decomposition of the system, with the changes in the EMBIG spreads ordered second and output ordered third. This in turn means that $\varepsilon_{i,t}^{2}$ and $\varepsilon_{i,t}^{3}$denote a sovereign spread shock and a residual output shock, respectively.

The chapter has highlighted the importance of initial conditions, mainly the level of EMBIG spreads or IMF program support, in analyzing the effects of fiscal consolidation announcement. A similar analysis is performed by allowing the coefficients in the $A_{i,j}$ matrix to vary depending on the level of spreads and on whether a consolidation announcement was done under IMF program support.

Impulse responses are estimated for the full empirical distribution of EMBIG spread levels. Each equation of the system is estimated using ordinary least squares (OLS), allowing for country fixed effects with 6 lags, following the Schwartz Criterion. As the impulse responses are non-linear functions of the OLS estimates, the procedure employs Runkle (1987) bootstrapping method to adjust for the fact that the data is in a panel format and to make use of the interaction terms.[4]

[2]This approach is similar to the methodology used, for example, by Bernanke et al. (1998), Sims and Zha (2006), and Kilian and Lewis (2011) to understand the role of the systematic component of monetary policy in the transmission of shocks.
[3]See David, Guajardo, and Yépez (2019) for additional details on the counterfactual construction.
[4]See Towbin and Weber, 2013 for a discussion of the algorithm for statistical inference in PVARs with interaction terms.