Online Annex[1]

Online Annex 1.1. Data

Online Annex 1.1. Forecasting Net International Investment Positions

This box presents a vector autoregression (VAR) framework to forecast a country's net international investment position (NIIP) for two illustrative cases: Spain and the United Kingdom. In doing so, it helps to inform the countries' external sustainability. The framework allows for forecasts of the NIIP conditional on future values of relevant variables obtained outside the VAR model itself and can take into account possible uncertainty around these conditioning variables.

Conceptually, the change in a country's NIIP is mainly determined by two channels: financial returns and trade balances (Adler and Garcia-Macia 2018). The financial returns channel depends on the level and composition of a country's international investment position and the rates of return on assets and liabilities, while the trade channel corresponds to the direct effect of net exports on the NIIP. Net exports depend on, among other things, the exchange rate.

To incorporate these determinants, based on Blanchard and Das (2017), the VAR includes the following seven variables: net exports, foreign assets, and liabilities (all relative to GDP), GDP growth, the nominal exchange rate, and the returns on foreign assets and liabilities. Algebraically, the reduced-form VAR is specified as:

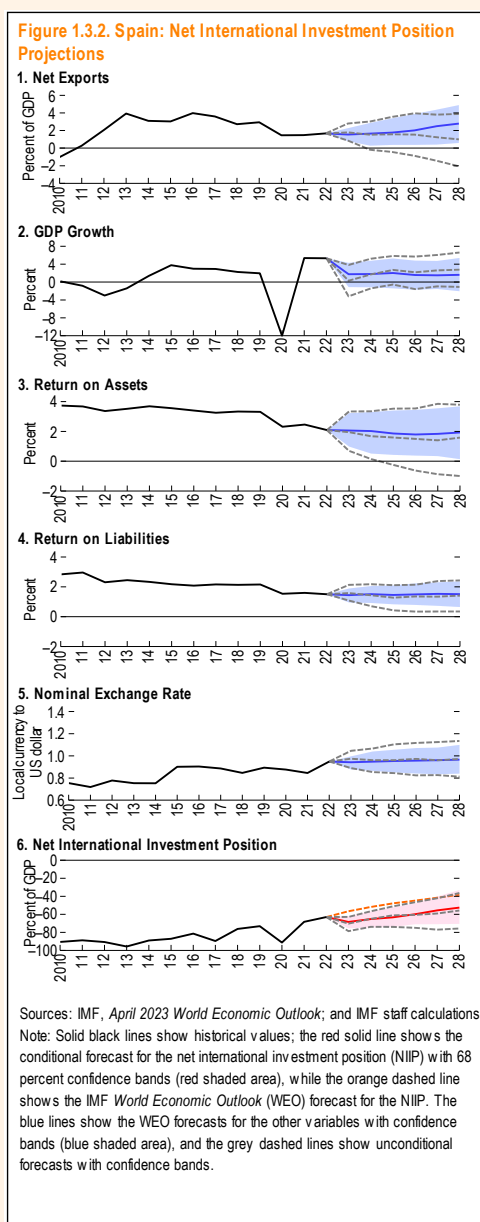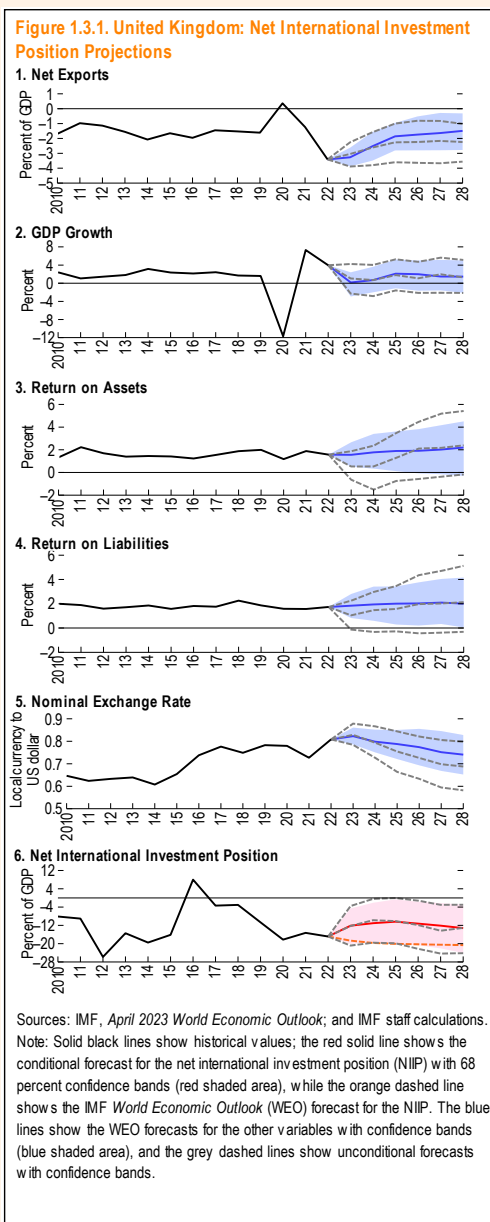$$y_t = \alpha + A_1 y_{t-1} + A_2 y_{t-2} + u_t$$

in which $\mathbf{y}_t$ is a vector of the variables listed above, α is a constant, and u_t are the residuals. The estimated coefficients, A_1 and A_2, are used to produce unconditional forecasts. The VAR is estimated using annual data from 1979 to 2021 for Spain and the United Kingdom. To generate the conditional forecasts, we follow the methodology in Antolín-Díaz, Petrella, and Rubio-Ramírez (2021) and rely on the April 2023 *World Economic Outlook* (WEO) forecasts of net exports, growth, the exchange rate, and returns on assets and liabilities.[1] The 68 percent confidence bands of conditional forecasts mostly fall within the 68 percent confidence bands of unconditional forecasts (Figures 1.3.1 and 1.3.2). A key assumption worth pointing out is that the model assumes no structural breaks in the economic relationships over both the historical and the forecast horizon.

For the United Kingdom, the conditional VAR forecast shows an increase of the NIIP from its 2022 level of –17 percent of GDP to –10 percent of GDP in 2025. Thereafter, the NIIP decreases slightly to –13 percent of GDP in 2028, remaining above its 2022 level. The NIIP improvement is driven by a slight increase in the forecasted return on assets compared with the return on liabilities, a forecasted depreciation of the pound in 2023 that slowly reverts in the years thereafter, and a persistent increase in net exports.[2] However, this forecast comes with considerable uncertainty, placing the NIIP in the range of –25 to –5 percent of GDP in 2028. The WEO-projected NIIP values for 2028 (about –20 percent) fall in the lower half of the 68 percent interval of the conditional VAR forecast.

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Online Annex 1.1 *(continued)*

For Spain, the conditional VAR forecast shows an improvement of the NIIP from –63 percent of GDP in 2022 to about –50 percent of GDP in 2028. The WEO-projected NIIP values of –40 percent of GDP in 2028 is somewhat higher than, but not statistically different from, the VAR forecast. The NIIP deteriorates initially in 2023, before increasing persistently through 2028. The increase is mostly driven by the trade channel: among other factors, the forecasted value of the euro, which is persistently lower compared with the value during the last 10 years, that results in persistent positive net exports over the forecast horizon. In addition, positive growth over the full forecast horizon increases the NIIP via the effect on its denominator, GDP.

Figure 1.3.1. United Kingdom: Net International Investment Position Projections

1. Net Exports
2. GDP Growth
3. Return on Assets
4. Return on Liabilities
5. Nominal Exchange Rate
6. Net International Investment Position

Sources: IMF, *April 2023 World Economic Outlook*; and IMF staff calculations.
Note: Solid black lines show historical values; the red solid line shows the conditional forecast for the net international investment position (NIIP) with 68 percent confidence bands (red shaded area), while the orange dashed line shows the IMF *World Economic Outlook* (WEO) forecast for the NIIP. The blue lines show the WEO forecasts for the other variables with confidence bands (blue shaded area), and the grey dashed lines show unconditional forecasts with confidence bands.

Figure 1.3.2. Spain: Net International Investment Position Projections

1. Net Exports
2. GDP Growth
3. Return on Assets
4. Return on Liabilities
5. Nominal Exchange Rate
6. Net International Investment Position

Sources: IMF, *April 2023 World Economic Outlook*; and IMF staff calculations.
Note: Solid black lines show historical values; the red solid line shows the conditional forecast for the net international investment position (NIIP) with 68 percent confidence bands (red shaded area), while the orange dashed line shows the IMF *World Economic Outlook* (WEO) forecast for the NIIP. The blue lines show the WEO forecasts for the other variables with confidence bands (blue shaded area), and the grey dashed lines show unconditional forecasts with confidence bands.

[1] *Conditional forecasts* for the NIIP can be estimated by having the VAR pin down a mix of future shocks ($u_{T+1,T+h}$, in which T corresponds to the end of the sample and h to the forecast horizon) that produce the WEO projections and allow for uncertainty surrounding them while deriving the statistical properties of the shock mix from the distribution of historical data.

[2] An increase in the nominal exchange rate (local currency per US dollar) corresponds to a depreciation.