GUIDELINES FOR THE PREPARATION OF THE MACROECONOMIC SCENARIO (MONETARY-FINANCIAL SECTOR)

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November 13, 2020

ISSN 2683 -9598

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Abstract

This document is an extension of the Macro-Fiscal Consistency Scheme (MFCS), described in the Guidelines for the preparation of the macroeconomic scenario, published in February 2020, with emphasis on the relation between monetary-financial sector variables and the rest of the variables of the economy.

The purpose of this document is to outline the main methodological aspects and the technical tools used for the construction of the monetary-financial variables, which comprises the MFCS.

The goal is to deepen the analysis of the MFCS and to enhance the technical quality of the short, medium, and long term projections prepared by the OPC.

Introduction

The relation between macroeconomic and fiscal variables, in the short, medium, and long term, makes macroeconomic scenarios preparation a valuable tool for public budget analysis.

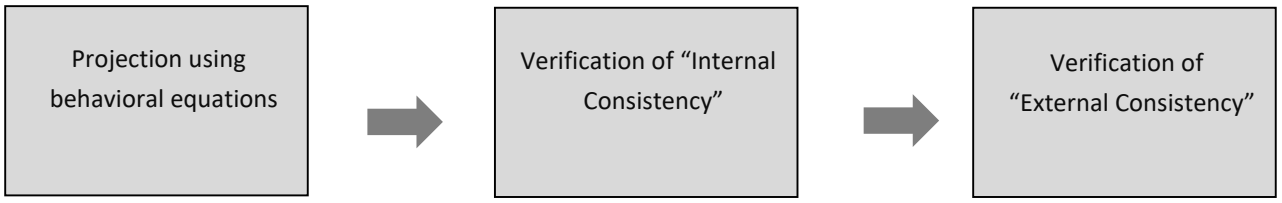
Thus, an analysis that considers this interaction will allow us to evaluate the degree of consistency, in macroeconomic terms, of the different scenarios that project variables such as the Product Growth Rate, the inflation rate, and the exchange rate, as well as the ones related to fiscal aggregates.

The purpose of this document is to expand the Macro-Fiscal Consistency Scheme (MFCS), proposed in a previous publication[1], focusing on the monetary-financial sector variables. A better understanding of the relation between these variables (which are part of the Macroeconomic Module) and those of the Fiscal and Financial Modules will allow refining the MFCS analysis.

The document is divided into three sections. The first section describes the behavioral equations used to estimate the trends of the monetary-financial variables. The second section introduces an accounting-type scheme, which allows verifying the feasibility of the projections resulting from the previous section with the rest of the variables that are part of the Macroeconomic Module (analysis called "external consistency"). Finally, it is evaluated whether the projections arising from the Macroeconomic Module together with those arising from the Fiscal and Financial Module are consistent in terms of general equilibrium (analysis called "internal consistency").

This document is of a purely methodological nature and seeks to establish a more advanced, although not definitive, version of the general guidelines for the preparation of macro-fiscal scenarios. This methodology is under permanent review and is prepared with a degree of flexibility that allows for possible reformulations and re-estimates if necessary.

Graph 1. Development of the variables of the monetary-financial sector



SOURCE: Own elaboration

Behavioral equations

This section describes the behavioral equations used for the formulation of forecasts of the monetary policy rate, monetary aggregates, the variation in the nominal exchange rate, price variability rate and the dynamics of both loans and deposits in the financial system.

The equations are estimated from econometric models that analyze the effect of a given monetary policy setting on the components of Aggregate Demand.

[1] See: https://www.opc.gob.ar/escenario-macroeconomico/lineamientos -para-la-elaboracion -del-escenario macroeconomico/ .

The outcome of these theoretical-econometric approaches results from a set of exogenous macroeconomic conditions which follow the "no policy change"[2] criterium.
The data used in the calibration of the coefficients of the equations were compiled from information published by the National Institute of Statistics and Census (INDEC), the Central Bank of Argentina (BCRA), the Ministry of Economy and international organizations.

Monetary Policy Rate

To estimate the nominal interest rate that the monetary authority establishes as a reference to carry out its monetary policy, the formulation known as Taylor Rule[3] for open economies is used. By the Taylor Rule, the interest rate varies according to the shocks of the price variability rate, the deviation of the economy's output from its potential and the variation in the real exchange rate, based on the following specifications:

$$i_t = \delta_0 + \delta_1 \pi_t + \delta_2 y_t \quad + \delta_3 rer_t + \delta_4 rer_{t-1} + \delta_5 i_{t-1} + \varepsilon_t \qquad (1)$$

Where i is the benchmark nominal interest rate of the monetary authority, π is the price variability rate, yt is the deviation of output from its long-term trend, $rert$, is the logarithm of the real exchange rate and $rert$-1 is the first lag of the previous variable; and εt the error component. The specification is estimated through ordinary least squares with monthly values as of August 2016.[4]

Exchange Rate Regime

The exchange rate regime adopted has a strong impact on the implementation of monetary policy. Under a crawling peg regime, the monetary authority maintains a target parity through direct intervention (buying/selling foreign currency in the exchange market) or indirect intervention (using interest rate parity, imposing exchange controls, restrictions on foreign currency activity, or through the intervention of public institutions). Under a managed floating regime, the monetary authority intervenes in the foreign exchange market, but without committing to a specific evolution of the exchange rate.
Thus, the greater the commitment of the Central Bank to maintain a certain level of exchange rate, the lesser the degree of freedom for monetary policy.
The different configurations of the exchange rate regime have implications for the selection of variables that will be used to define the behavioral equations that will integrate the monetary-financial sector of the MFCS. Thus, under a floating exchange rate regime, the central bank's commitment to maintain a given level of the exchange rate will be greater than that of the floating exchange rate. So, under a managed floating regime, the control of the monetary policy rate would become more significant.

[2] This criterion refers to the practice, adopted by other Legislative Budget Offices in other countries, which considers that the economic policy configuration in force at the time of making the projections will remain invariant in the future.
[3] For a more detailed description of this formulation see Taylor John (2001): "The role of the Exchange rate in monetary policy rules", American Economic Review Papers and Proceedings, 91, pp 263 -67.
[4] Although the specification considered achieves good adjustment criteria, obtaining generally satisfactory out-of-sample projections, the usefulness of this type of formulation is centered on the subsequent consistency analysis.

Monetary Aggregates

To estimate the monetary aggregates, the specification that defines the real money demand equation is used:

$$\ln(MR)_t = \beta_0 + \beta_1 \ln(RY) + \beta_2 \ln(IBR) + \varepsilon_t \quad (2)$$

Where MR is for the broader deflated monetary aggregate, RY for real product, IBR for the interbank interest rate, which is closely related to the monetary policy rate, and εt for the error component. The specification is estimated through ordinary least squares with monthly values as of March 2004.

Money multiplier

From the estimate of the broadest monetary aggregate, the remaining monetary aggregates are approximated from the estimates of the money multiplier and the velocity of money.

The traditional approach assumes a constant money multiplier that allows the monetary authority to set an objective level of Monetary Base to control the money supply. If the money multiplier keeps a stable trend, a first estimate of the Monetary Base (BM) can be made, given the projection of the broader monetary aggregate[5]. So, the Monetary Base is related to the monetary aggregates through the money multiplier (m):

$$m = MR/BM \quad (3)$$

Variation in nominal exchange rate

Under a given monetary policy configuration, the variation in nominal exchange rate is estimated based on the projected evolution of the real exchange rate, the inflation rate (whose behavioral equations were defined in the document mentioned in the Introduction), and the inflation rate of the countries that are main trading partners (obtained from estimates made by various international organizations).

$$TCN = \left[\frac{(1+TCR)*(1+IPC)}{(1+IPC*)}\right] - 1 \quad (4)$$

Where TCN is the nominal exchange rate, TCR is the real exchange rate, IPC is the variation rate of the Consumer Price Index and $IPC*$ is the variation rate of trading partner prices.
In parallel, the estimation of the interest rate path allows us to evaluate the financial consistency of non-arbitrage using the uncovered interest rate parity according to the following relation:

$$s_{t+\Delta} - s_t = \alpha + \beta(i - i^*)_t + \varepsilon_t \quad (5)$$

Where s is the nominal exchange rate, i the nominal benchmark interest rate, $i*$ the international interest rate, α represents the risk premium (reflecting differences in credit and liquidity risk

[5] Significant changes in the financial system can generate variations in the money multiplier. Situations of this nature should be considered when analyzing the results of this behavioral equation.

gaps) [6], and εt is the error component. The statistical exercises take monthly values starting in August 2016 and are estimated by ordinary least squares.

Inflation rate

To perform a consistency analysis between the long-term estimate of the inflation rate coming from the real sector of the Macroeconomic Module, two additional methods are introduced that include, on the one hand, the relation between the inflation rate, the expected inflation rate, and the GDP gap, and, on the other hand, the long-term relation between the growth rate and the evolution of the monetary aggregates.

In the first case, the econometric exercise is carried out based on a behavioral equation with an adapted version of the augmented Phillips Curve[7]. The specification is estimated by means of ordinary least squares, while the statistical exercises take monthly values from May 2016 onwards.

$$\pi_t = \theta y_t + \lambda\pi^e + (1-\lambda)\pi_{t-1} + \varepsilon_t \quad (6)$$

$$\pi^e = \alpha + \beta(1-\lambda)\pi_{t-1} + \varepsilon_t$$

Where yt is the gap between actual product and potential product, πt is the current inflation rate, πt-1 the first lag, πe the expected rate, and εt the error component.

In the second case, the long-term relation between the inflation rate and the gap between the variation rate of the broader monetary aggregate (mr) and the real rate of GDP growth (g) is evaluated.

$$\pi = mr - g \quad (7)$$

Under the quantitative theory of money, the price level in an economy is determined by the money supply [8]. In practice, only long-run empirical exercises account for such a relation since variations in the velocity of money are usually low.

Loans and Deposits

The short-term dynamics of loans is estimated by means of an ARIMA model taking the best specifications considering stationarity, seasonality, and differences in the series, among others. The dynamics of domestic and foreign currency loans are estimated independently, with the best specifications to date, the ARIMA (1,1,2) (1,0,1) [12] (equation 8) for loans in pesos and ARIMA (0,1,0) (equation 9) for loans in dollars.

$$(1-\phi_1 B)(1-\Phi_1 B^{12})(1-B)\mathrm{P}_{MN,t} = (1-\theta_1 B-\theta_2 B^2)(1-\Theta_1 B^{12})\varepsilon_t \quad (8)$$

$$(1-B)\mathrm{P}_{ME,t} = \varepsilon_t \quad (9)$$

[6] The uncovered parity theory of interest rates assumes that the economy is operating under a flexible exchange rate regime, perfect and predictable capital mobility, and consistent expectations of exchange rate variation.

[7] For more information, see: Inachard, Olivier (2016) "The Phillips Curve: back to the 1960's?", American Economic Review

[8] The theory starts from the quantitative equation ($MV = PY$) where M is the quantity of money, V is the velocity of money circulation, P is the price level and Y is the real product. Assuming constant velocity, there is a proportional link between the real money supply and real product, showing that any variation in the quantity of money responds to a proportional ratio of the nominal variation of the product.

Where PMN stands for the domestic currency loans, PME,t the foreign currency loans, B is the retroactive exchange operator, ϕ and θ the parameters that belong to the autoregressive and moving average part of the model, and εt is the error component.

With the same logic, the behavioral equations for domestic and foreign currency deposits are determined. The best specification for domestic currency deposits is ARIMA (0,2,2) (0,0,2) [12] (equation 10) while the best specification for foreign currency deposits is ARIMA (3,1,1,) (0,0,1) [12] (equation 11).

$$(1 - B - B^2)\mathrm{D}_{MN,t} = (1 - \theta_1 B - \theta_2 B^2)(1 - \Theta_1 B^{12} - \Theta_2 B^{12})\varepsilon_t \quad (10)$$

$$(1 - \phi_1 B_1 - \phi_2 B_2 - \phi_3 B_3)(1 - B)\mathrm{D}_{ME,t} = (1 - \theta_1 B)(1 - \Theta_1 B^{12})\varepsilon_t \quad (11)$$

Where DMN refers to domestic currency deposits, DME,t to foreign currency deposits, B is the retroactive exchange operator, ϕ and θ the parameters of the autoregressive and moving average part of the model, and εt is the error component.

Internal consistency scheme

This section introduces the "internal" consistency scheme that evaluates the forecasts obtained from the behavioral equations, both those detailed in this document and those described in the original document referred to in the Introduction.

We have chosen to call it internal because the analysis is carried out within the sectors that make up the macroeconomic module.

First, a simplified version of the balance sheet of the consolidated financial system is constructed, which follows the traditional canonical accounting scheme.[9]

Table 1. Simplified Consolidated Financial System Balance Sheet

ASSETS

- *Net Foreign Assets (NFA)*
- *Net Domestic Assets (NDA):*
    - *Net Domestic Credit (NDC):*
        - *Credit to Government (CPubS)*
        - *Credit to Private Sector (CPS)*
    - *Other Net Assets (ONA)*

LIABILITIES

- *Monetary Aggregates (M1, M2, M3)*

SOURCE: Own elaboration

[9] See "Financial Programming and Policies" of the IMF Institute for Capacity Development https://www.imf.org/en/Publications/WP/Issues/2016/12/30/A -Modelo -de -programación -financiera -2631.

Secondly, the link between the estimated variables of the monetary-financial sector, those of the external sector and those of the real sector is analyzed. Thus, the monetary aggregates (M1, M2, M3) must be consistent with Net External Assets (NEA), which arise from the estimation of the Balance of Payments, and with Credit to the Private Sector (CPS), which arises from the estimate of Private Investment.

Put in other words and as an example, the estimate of Credit to the Private Sector must grow at a rate in accordance with the nominal growth of the Product or the Private Investment arising from the real sector and, at the same time, must be consistent with the interest rate estimate arising from the monetary-financial sector.

Once the previously mentioned validations have been carried out, the external consistency of the scheme can be verified. This requires involving the projections obtained from the Fiscal and Financing Modules. According to the accounting scheme used, once the monetary aggregates, the CPS and the NFA are determined, the " residual" to be verified is the credit to the public sector (CPubS).

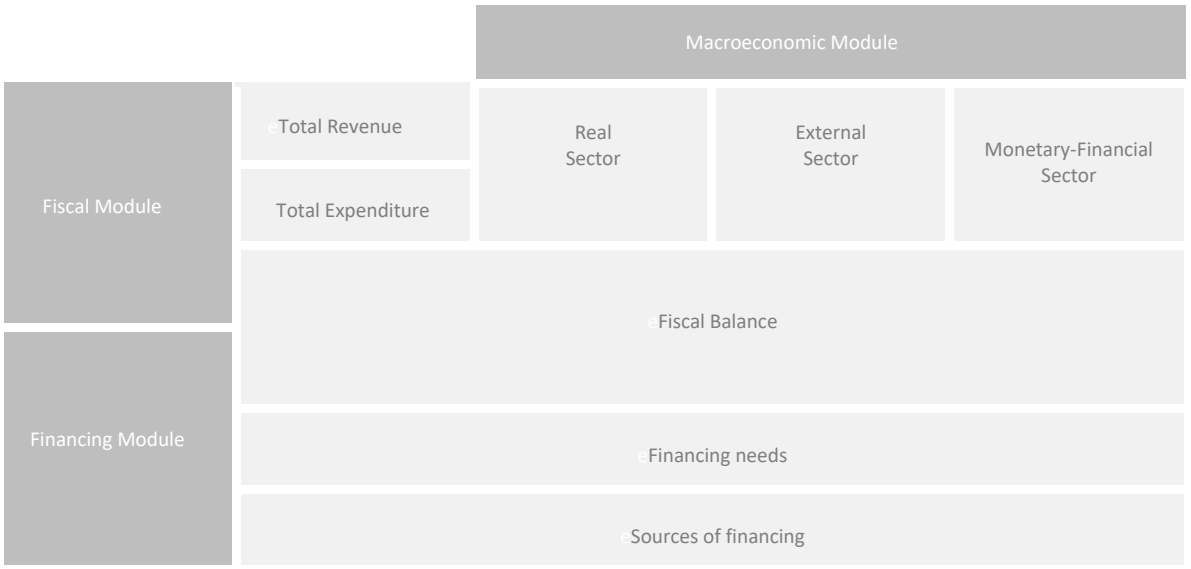
External consistency scheme

This section describes the procedure used to verify the consistency between the monetary-financial sector variables, obtained through the previous behavioral equations and which passed the internal consistency analysis (within the macroeconomic module), and the variables that are projected in the Fiscal and Financing Modules.

The Fiscal Module analyzes the historical behavior of fiscal revenues and primary government expenditure to make projections of the primary fiscal balance. This balance must be consistent with the macroeconomic variables from the Macroeconomic Module. The Financing Module analyzes the financial needs arising from the previously projected primary fiscal balance and the financial program derived from the maturity profile of the outstanding debt. .

The financing needs of the public sector will have, as a result, sources of financing that, through the iteration of the previous process, will determine the degree of consistency of the macro-fiscal scenario proposed.

Graph 2. Macro-fiscal consistency scheme (ECM-F)



SOURCE: Own elaboration

OPC Publications

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