Central Bank's Profit and Loss Statement and transfers to the Government

April 2019

BANCO DE MÉXICO

Outline

Introduction

- By Law, Banco de México must transfer its annual net profits to the Federal Government. In particular, there are two Articles in Banco de Mexico's Law that regulate this transfer[1]:

    - **Article 53**.- Banco de México shall, whenever possible, preserve the real value of the sum of its capital plus its reserves and increase that value in line with the increase of the real gross domestic product. Banco de México may only set up reserves in addition to what is stipulated in this article, when they arise from the revaluation of assets, or so agreed with the Ministry of Finance.

    - **Article 55**.- Banco de México will be a non-profit institution and must transfer to the Federal Government the full amount of its profit once reserves stipulated in this Law are set up, provided that this does not imply the reduction in reserves arising from the revaluation of assets. The transfer shall be made no later than April of the fiscal year immediately following that corresponding to the profit.

- Based on these articles, Banco de México takes the following steps every year to determine the transfer to the Government:

    - Determine the net profit of the year. If negative, no transfer to the Government.
    - If there are still profits, then use the profit or part of the profit to constitute capital reserves to preserve the real value of the sum of its capital plus its reserves.
    - If there are still profits, then the Board of Governors decides the amount that should be used to constitute reserves for the revaluation of assets (RRA). These reserves shall be used to face future losses arising from the revaluation of assets.
    - If there are still profits, the full amount is transferred to the Government.

- The most challenging part is to determine the amount of reserves for the revaluation of assets (RRA). The rest of the presentation focuses on the way a central bank could calculate the adequate stock for those reserves.

1/ The articles written here are a translation of those found in Banco de México's Law, that is only available in Spanish. For legal purposes, the Spanish version is the only official document.

Introduction

- In order to decide the amount that should be constituted as RRA, the central bank could take into account two different approaches:

    1. The capital of the central bank is subject to the variations of financial variables such as interest rates and exchange rates. Therefore, **the amount of RRA should serve as an insurance against potential losses stemming from the variation of those financial variables**.

    2. The main source of profits (or losses) of a central bank of an emerging market, comes from the revaluation of the exchange rate. The bigger the depreciation of the exchange rate, the bigger the profit of the central bank (note that international reserves are valued in local currency, while international reserves are invested in foreign currency). Some central banks do not transfer profits stemming from the revaluation of the exchange rate based on the argument that those profits are unrealized. However, in a small open economy like Mexico with a positive interest rate differential against developed economies, it could be argued that the exchange rate has a natural long-term trend to depreciate. Therefore, profits that come from a depreciation consistent with the long-term trend of the exchange rate, could be considered as realized, and therefore could be subject to be transferred to the Government. **Under this approach the amount of RRA should serve as an insurance against losses stemming from an appreciation that takes the exchange rate back to its long-term trend**.

- In Mexico, it is very important to have an adequate stock of RRA to face such potential losses as **the Federal Government has no legal obligation to recapitalize the central bank**.

- Before explaining with detail these two possible methodologies, the following section simplifies the balance sheet of the central bank in order to better understand the drivers of profits and losses, and **to set a simple accounting identity that can be used to calculate the RRA under the first methodology**.

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Central Bank Balance Sheet

- A simplified version of the Central Bank Balance Sheet can be useful to explain the main factors behind its potential profits and losses:

Simplified Central Bank Balance Sheet

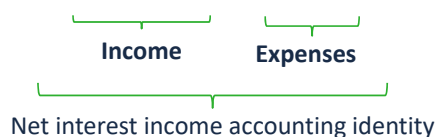| Assets	Liabilities
e IR	M
	O
	K

Where:

e = Nominal exchange rate (domestic currency per USD)
IR = International reserves in USD
M = Bills and coins in circulation
O = Other liabilities bearing interest
K = Capital

- The net interest income **(NII)** of the central bank can be obtained by applying the yield associated to each item of the Balance Sheet. The following identity reflects this net income:

Item	Yield
IR	r^*
M	0
O	i
K	0

$$NII = e \cdot IR \cdot r^* - O \cdot r \qquad (1)$$

Income   Expenses

Net interest income accounting identity

Where:
r^* = External interest rate
r = Domestic interest rate = r^* + d
d = Interest rate differential

- NII is usually negative as the interest rate generating income from de assets is exceeded by that paid on the liabilities of the Central Bank (**cost of carry***) and the high percentage of interest bearing liabilities.

*This is true for the majority of emerging economies, where domestic interest rates are usually higher than those of hard currencies in which international reserves are invested.

Net interest income, seigniorage and cost of carry

- From the simplified Balance Sheet, the following accounting identity can be derived:

$$\underbrace{e \cdot IR}_{\text{Assets}} = \underbrace{M + O + K}_{\text{Liabilities + Capital}} \qquad (2)$$

- Combining identity (1) with identity (2), we get a more **economically intuitive accounting identity** for **NII**:

$$-O = M + K - e \cdot RI \qquad (2')$$

$$NII = e \cdot IR \cdot \boldsymbol{r^*} - O \cdot (\boldsymbol{r^* + d}) \qquad (1)$$

$$NII = \underbrace{M \cdot (r^* + d) + K \cdot (r^* + d)}_{\substack{\text{Seigniorage} \\ \text{opportunity cost concept}[1]}} \underbrace{- d \cdot e \cdot IR}_{\text{Cost of carry}} \qquad (3)$$

$$\underbrace{\qquad\qquad\qquad\qquad}_{\text{Income}} \quad \underbrace{\qquad\qquad}_{\text{Expenses}}$$

- Identity (3) shows how the **seigniorage is an implicit element of the NII.**

1/ As defined by Schobert 2001, Flandreau 2006 and Buiter 2007, among others. Seigniorage are the Central Bank's savings for avoiding the issuance of interest baring liabilities to finance its assets. Therefore, seigniorage is approximated as the stock of the monetary base times a domestic interest rate.

Net interest income, seigniorage and cost of carry

- In practice, for the case of Mexico, most of the times the cost of carry of international reserves has more than compensated the seigniorage income.

Seigniorage income and International Reserves Cost of Carry
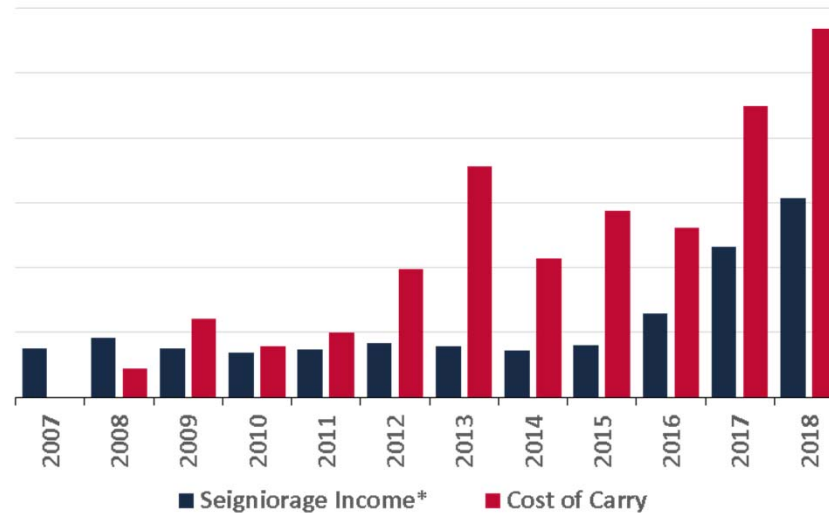
* According to the definition provided by Schobert 2001, Flandreau 2006 and Buiter 2007, among others.

P&L from exchange rate revaluation

- The **NII** is not the only component that explains the profits and losses of the central bank. From the simplified version of the Central Bank Balance Sheet, it can be shown that as international reserves are converted into the domestic currency, changes in the exchange rate have a direct impact on the **P&L** of the central bank ($\Delta e \cdot IR$).

- Profits or losses that come from exchange rate revaluation are negligible over periods with exchange rate stability. However, during unstable periods with large domestic currency depreciation, capital gains on international reserves valuation can be sizable. Likewise, in years with domestic currency appreciation, important capital losses are faced.

- This underscores the need to develop a methodology to determine capital reserves taking into account the changes of the exchange rate.

Profit and Loss Statement

- Taking into account both the **NII** and the profits and losses from exchange rate changes, the total **P&L** of the central bank can be summarized in the following identity :[1]

$$P\&L= \underbrace{\Delta e \cdot IR}_{\text{Exchange rate revaluation}} + \underbrace{M \cdot r + K \cdot r - d \cdot e \cdot IR}_{\text{Net interest income}} \qquad (4)$$

- From this simplified identity, it is clear that the total **P&L** of the central bank depends on the exchange rate and on interest rates (both domestic and external).

- As it will be seen in the next section, the total **P&L** can be simulated by taking into account multiple scenarios for those financial variables.

1/ For simplicity, identity (4) assumes that operational expenses are equal to zero.

Outline

1	Introduction
2	Central Bank Balance Sheet and Profit and Loss Statement
3	Determination of reserves for the revaluation of assets
4	Final remarks

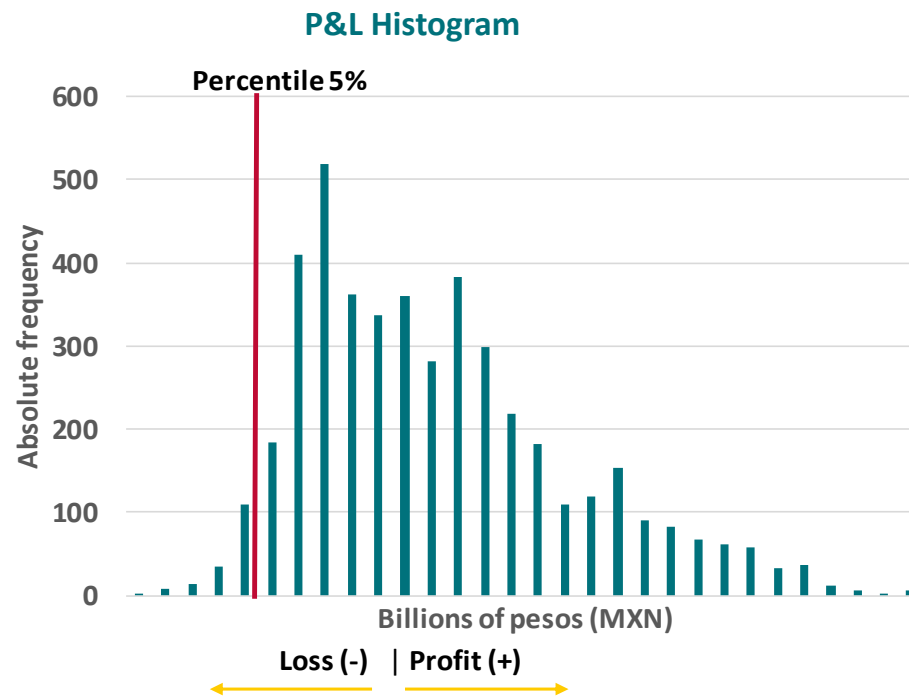# Historical VaR

- As already mentioned, two alternative methodologies could be used to determine the adequate amount of RRA:

    I. The first alternative follows a **Historical Value at Risk (VaR)**[1] approach to estimate the *P&L* identity (4) under different scenarios for the financial variables that affect the *P&L*. Under this approach, one can find extreme values that would lead to the biggest losses with a significance level of 5%. The target would be to have an RRA that would cover these potential losses for a one year horizon. More specifically:

    - The yearly changes of the three financial variables that explain the *P&L* of the central bank can be Monte Carlo simulated using historical data (i.e. 10,000 simulations or less, depending on the available data).
    - For each simulation of those financial variables, a *P&L* for the fiscal year can be estimated. Then it is possible to obtain as many simulations of the *P&L* as the number of simulations you have for the financial variables.
    - Finally, from the historically simulated *P&L* it is possible to obtain an empirical distribution. From that distribution it is possible to obtain the potential loss with a 5% significance level (the fifth percentile of the distribution).
    - This loss represents the needed amount of *RRA* to insure the Central Banks' Capital.

- It is worth mentioning that this level of *RRA* required is independent from the actual P&L outcome. It only indicates the adequate amount of reserves a central bank should have to face potential losses. Whether the central bank has a profit to constitute that reserve is irrelevant for the analysis.

1/ It is worth mentioning that unlike a traditional VaR approach, the Historical VaR applies a combination of historically observed annual changes in the exchange rate and interest rates. Under a traditional VaR approach extreme changes for each of these variables are calculated in an independent manner regardless whether or not those combinations have been observed historically.

Historical VaR

- Graphically, the histogram for the simulated P&L of the central bank could look like this. The amount of RRA should be equal to the loss indicated at the percentile 5%.

P&L Histogram

Exchange Rate Long-Term Trend

- As already mentioned, two alternative methodologies could be used to determine the adequate amount of **RRA**:

  II. Under the second approach, the amount of **RRA** should serve as an insurance against losses resulting from an appreciation that takes the exchange rate back to its long-term trend. As a result, exchange rate changes that take it above its **long-tem trend** are considered to be reversible and therefore the **RRA** should have enough resources to protect the central bank against those potential losses. To estimate such long-term trend a Tail Corrected Hodrick-Prescott filter can be used (TCHP).[1]

- With this methodology if the actual exchange rate (FX^{act}) is above its long-term trend (FX^{TCHP}), the desired level for the RRA is calculated in the following way:

$$RRA_t = IR_t(FX_t^{act} - FX_t^{TCHP}) \qquad (5)$$

Fix Exchange Rate
(MXN per USD)

—FIX exchange rate   —Long-term trend [1]
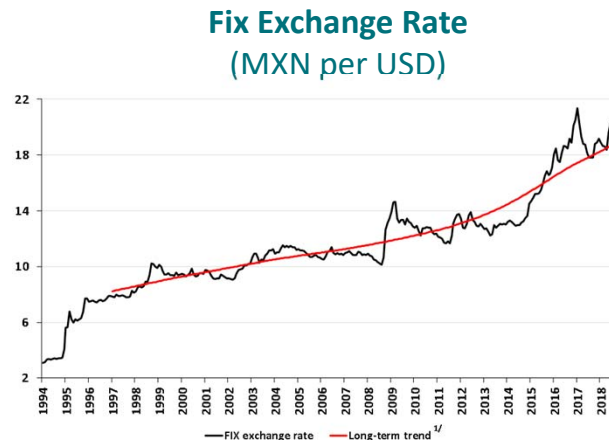
1/ TCHP as developed by St-Amant y van Norden (1997).

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Final Remarks

- It is desirable to have a set of rules to determine the level of the Reserve for the Revaluation of Assets (***RRA***) that protects the Central Bank's Capital from potential Capital Losses arising from assets' devaluation. The current regulation is not clear on how the central bank has to decide the level of those capital reserves.

- Once the level of RRA is decided and once it is covered, the remaining profit (if any) must be transferred to the Government.

- The methodologies presented here are simple exercises to facilitate the decision of the Board on how much of the profits should be destined as ***RRA***. However, the Board of Governors has no obligation to strictly base its decision on these methodologies.

Annex: Bibliography

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