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Benchmarking Central Banks in Latin America, 1990-2010

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Abstract

This benchmarking exercise analyzes the effectiveness of central banks in Latin America between 1900 and 2010, considering the monetary authority's primary and secondary functions in the countries in question, after briefly examining the evolution of the work of international central banks. The relevant indicators are selected, specified, and studied in order to assess these institutions' performance: lower inflation, greater credit availability for the private sector, lower financial intermediation margins, less fluctuation in the real exchange rate, and various foreign reserve objectives. Objective functions are established that are measured against available official information. Finally, central banks are ranked according to indicators and selected objective functions.

Key words: central bank, benchmarking, effectiveness, monetary policy, Latin America, indicators.

JEL Classification: E58, E63, L25, N26.

Introduction

Benchmarking is a method of analyzing and evaluating business practice that can provide useful economic information. It is an important means of analyzing a specific process within many companies and organizations, and it also enables a given organization to compare itself to its counterparts in other markets or countries. Several analytical variants exist, but generally one begins with a comparative analysis of results before tackling the processes that explain them. On the whole, this involves comparing results and identifying performance

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gaps; then an analysis must be made of the processes that explain them, before defining the actions required to improve an organization's performance from a comparative perspective.

Nothing prevents benchmarking from being used to assess the results of how economic policy in general, or a specific one such as monetary policy, is being managed. Therefore, it is a viable method of analyzing the performance of some institutions such as Latin America's central banks, which essentially share the objective of achieving low inflation, even though they each have different additional functions. The basic rules for these institutions are often stipulated in each country's constitution and in other specific laws resulting from consensus or majority views on the issue, historical experience, and, of course, international pressure.

Two essential institutions for any country's macroeconomic management are the ministries of economy and/or finance, since they are in charge of fiscal policy; the central bank is also important due to its handling of monetary and financial policy and, in addition, in some circumstances, exchange rate policy. This trilogy of policies under the responsibility of these two institutions is not the only one, but the three are the most important, although we should add instruments of direct control[1] and mechanisms for institutional change (Kirschen, 1978).[2] Therefore, macroeconomic stability and economic growth depend largely, though not exclusively, on the effectiveness of both institutions in carrying out their respective functions.

This article aims to undertake a benchmarking analysis on the performance of Latin American central banks to assess their effectiveness in performing their primary function, as well as some of their secondary objectives. This evaluation is conducted by analyzing specific indicators and a combined objective function that seeks to study the performance level of the monetary authority as a whole. Through this analysis, one can establish a ranking that measures these institutions' regional performance. In order to achieve these objectives,

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[1] This refers to establishing controls on foreign trade, exchange, and immigration; price and salary controls or management; and other regulations of the domestic economy.

[2] Intended to cause aggregate or macroeconomic effects, particularly modifications to subsidy systems, taxation, credit systems, and systems of direct control that directly affect production conditions, changes to competitive conditions, modifications in company senior management's level of influence, changes to the level of participation of public property in various economic activities, the creation of new national institutions, and the participation in creating international institutions.

we must determine the principal and secondary functions of Latin American central banks. The central banks' most salient indicators must then be established in order to carry out the measurement by indicator and jointly establish the overall ranking and make our respective comments.

This study consists of three sections and a set of conclusions. The first section briefly looks at how central banks' core practices have evolved internationally in order to define their primary and secondary functions according to their respective regulatory frameworks. This section defines what will need to be evaluated. The second section establishes the components of the benchmarking analysis and proposes measurement criteria by principal indicator and as a whole. And the third section gives the results by indicator, including a combined evaluation and ranking based on the selected criteria.

However, the proposed benchmarking analysis for central banks does have limitations: it is an approach that seeks to measure their effectiveness (meeting objectives) assuming that countries share criteria, something that is not necessarily the case. The evaluation does not set out to assess efficiency. The evaluation criteria are restricted to the available standard information, avoiding complex formulae based on each country's specific policies. The relationship between inflation and growth is not evaluated in the short, medium, and long terms, because nowadays these central banks are not explicitly or directly concerned with economic growth, except in order to maintain price stability. Neither does the study evaluate responses to particular financial crises, nor internal processes that explain why one central bank is more or less successful than another, nor the activities required to improve their performance.

Functions of the monetary authority

The debate about central banks' role, functions, and operating mechanisms globally has changed over the years. In the 1970s it centered on the suitable growth of monetary variables; in the 1980s, it was about efforts to reduce inflation. Since the 1990s, the emphasis has been on increasing central banks' institutional independence and on the issue of inflation targets (Bernanke and Mishkin, 1997). Indeed, this latter point —with central banks committing to adopt price stability as monetary policy's main objective— is becoming the general framework because it has the advantage of being more transparent, enhancing accountability, and offering a longer term perspective. However, much debate

still surrounds the effectiveness of inflation targets; even though they contribute to the goal of maintaining and keeping inflation low, many countries have achieved this same objective without applying this measure. Also, despite being non-essential, its implementation tends to relax concerns relating to supply-side shocks on the real results of the economy (Angeriz and Arestis, 2009).

Blinder (2004) indicates that in recent years, central bank procedures have quietly undergone a silent revolution. This can be explained firstly by greater transparency in operations and in information transmitted to the markets, a sign of increasingly open societies; secondly, by the fact that individual decision-makers have gradually been replaced by committees who make collective decisions, thus ensuring a better risk assessment; and thirdly, because of the changing relationship with markets: whereas before markets simply received instructions, now they are now being listened to, and their advice is even being heard. Although it is positive that more information is being gathered, central bankers must remain on guard and not forget that although a committee's decision is better than an individual's, this so-called herd behavior does not offer any guarantees. We must parse all the available information to find which is appropriate and useful for decision-making. Finally, the monetary authorities must not renounce their role as leaders of financial markets, since monetary policy is a public policy and as such pertains to the state. A synthesis of former standard practices of central banks faced with the international financial crisis can be read in Ball (1999) and in Clarida, Galí, and Gertler (1999).

However, in terms of the traditional division between positive and normative economics, the recent international financial crisis is affecting how central bank's functions are defined. Borio (2011) points out the many doubts and few certainties surrounding its role. As well as needing to safeguard price stability, it cannot abdicate its responsibility for creating financial stability and raising a greater awareness of the global dimensions of its duties. Beyond that, however, no agreement exists about how far monetary policy must go to incorporate considerations of financial stability, both in the increase of risks and in the materialization of financial difficulties that threaten the independence of central banks. In a similar vein, Eichengreen *et al.* (2011) point out that central banks must go beyond their traditional emphasis on achieving low inflation in order to adopt the explicit objective of ensuring financial stability. Therefore, macroprudential tools must be used, together with monetary policy, to achieve this goal. These authors also call for the creation of an international monetary

policy committee, composed of representatives of the main central banks, to submit regular reports to world leaders on the global consequences of these institutions' various policies. Furthermore, they clearly state that monetary policy is only one element of the political response, which cannot be effective unless other policies (such as the fiscal, structural regulation of the financial sector) work together.

Despite these discussions, Latin America's central banks maintain the traditional mandates established since the 1980s and 1990s, and despite the fact that more recently the U.S. Federal Reserve and the central banks of Japan and Switzerland are applying expansive monetary policies to avoid deflation and the real appreciation of their respective currencies. In this regard, all the political constitutions of Latin American countries explicitly refer to their monetary authorities, except for that of Costa Rica, which makes monetary and credit regulation subject to its Legislative Assembly with the opinion of the corresponding agency (see Table 1). In El Salvador, it is the monetary authority's obligation to provide information about its activities to the legislative assembly. Argentina and Uruguay essentially just establish the type of institution and basic functions of the central bank. In other countries, such as Bolivia, Brazil, Chile, Colombia, Guatemala, Ecuador, Honduras, Paraguay, Peru, the Dominican Republic, and Mexico, the main functions are described in greater detail. In the case of Venezuela, the central bank is assigned the exclusive and obligatory role of controlling the national government's monetary affairs.[3]

Apart from in Brazil, every respective organic law indicates that the monetary authority's main role is to uphold the value of the national currency and to ensure its stability and buying power. In the Dominican Republic and Uruguay, monetary policy is described as being relevant for national development and as a contributor to growth and job-creation objectives, respectively. In Chile, it has different objectives, including that of contributing to the operation of the domestic and international payments system. In Costa Rica and Venezuela, the aim is to ensure the national currency's domestic and international stability. Honduras refers to maintaining its currency's domestic and international value and enhancing the operation of its payments system. Paraguay not only seeks price stability but also to improve the effectiveness and stability of the financial system. Brazil is an interesting case, because it includes the formula-

[3] This study does not analyze the evolution of these functions over time.

tion, implementation, monitoring, and control of monetary policy, currency, and credit. Finally, Guatemala seeks to encourage monetary, exchange rate, and credit conditions that promote general price stability.

The various countries' organic laws stipulate the monetary authorities' principal and secondary functions (see Table 1), such as regulating the amount of money and credit, as well as setting monetary, financial, and banking standards. This also includes the supervision of the financial and payment system, such as in Brazil, a country which, along with Chile, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Nicaragua, Peru, and Venezuela, particularly focuses on the design and administration of exchange rate policy and the management of foreign reserves, although this function is shared by all monetary authorities.

In Latin America, all central banks are autonomous except for Brazil, where it remains linked to the Ministry of Finance, despite the fact that it cannot loan money to the public treasury. In every other country the central bank is autonomous, autarkic, or a privileged institution dedicated to public service, such as in Honduras. In most cases it falls under the control of the political Constitution, its respective organic law, and norms as established by its Board of Directors.

Benchmarking, variables, and combined analysis

Benchmarking is a systematic and continuous process to evaluate products, services, and work processes of organizations acknowledged as representing best practices, in order to make organizational improvements (Spendolini, 1994). Other authors consider it a methodology and rigorous means of identifying, based on a comparative analysis, the key areas in which an organization must make improvements and excel. Its relevance applies to all companies and organizations because they must all be directed with a strategic and competitive vision (Valls, 1999).

Spendolini (1994) refers to at least three major types of benchmarking analysis: 1) internal, to compare similar activities across different locations, operating units, and countries; 2) competitive, to evaluate direct competitors who sell to the same client base, and 3) functional, to analyze organizations recognized as leaders in terms of their products, services, and processes. The benchmarking analysis process has five stages: selecting the object of the benchmarking; forming a team; defining resources and partners for the process; compiling and analyzing information; and, finally, identifying possible improvements to products and

TABLE 1

Latin American central banks: Functions and degree of autonomy

Countries	*Political constitution**	*Principal purpose of the specific law***	*Secondary functions***	*Degree of autonomy***
Argentina	Congress can establish and regulate a federal bank empowered to issue currency (Art. 75)	Preserve the currency's value (Art. 3)	Control the amount of money and credit; issue monetary, financial, and banking norms (Art. 3)	State autarky, controlled by provisions of its organic charter and other corresponding legal norms (Art. 1)
Bolivia	The central bank operates under public law, with its own legal capacity and control over its own resources (Art. 327). Operational functions (Art. 328)	Ensure stability of currency's domestic buying power (Art. 2)	Formulate monetary and exchange rate policies, and banking, credit, and financial intermediation (Art. 3)	Autarkic implementation of functions, with decision-making powers (Art. 1)
Brazil	Issues currency, prohibited from lending to the treasury, may buy and sell treasury instruments to control monetary supply or interest rate (Art. 164)	Formulate, implement, follow up, and control monetary policy, currencies and credit (Art. 2)	International economic relations, regulation, organization, and supervision of the national financial system and payment system (Art. 2)	Federal autarky linked to Ministry of Finance (Art. 1)
Chile	Autonomous central bank, with control over its own resources, with a technical remit, and operating under its own organic law (Art. 97)	Monetary stability and operation of international and domestic payments (Art. 3)	Regulate the amount of money and credit; dictates monetary, credit, financial, and exchange rate norms (Art. 3)	Constitutionally autonomous, technical remit, with its own legal capacity, and subject to its own set of legal rules (Art. 1)
Colombia	Legal status established under public law, with administrative, asset-related, and technical autonomy, subject to its own set of legal rules (Art. 371)	Maintain the currency's buying power (Art. 2)	Issue currency, ensure normal operation of domestic and international payments, design and management of exchange rate policy, foreign reserve management (Art. 4 and 5)	Legal status established under public law, constitutional authority, subject to own legal rules, with administrative, asset-related, and technical autonomy (Art. 1)
Costa Rica	No explicit reference. Monetary and credit regulation subject to the legislative assembly prior consultation with the corresponding agency (Art. 85)	Maintain the national currency's domestic and international stability (Art. 2)	Promote economic growth, avoid inflation, make good use of foreign reserves, efficient domestic and international payments (Art. 2)	Autonomous under public law, with its own legal capacity and control over its own resources (Art. 1)

Table 1, continuation...

Countries	*Political constitution**	*Principal purpose of the specific law***	*Secondary functions***	*Degree of autonomy***
Dominican Republic	The regulation of the financial and monetary system is under the remit of the Monetary Board, the Central Bank's ruling body (Art. 223)	Maintain price stability, the essential basis for the country's economic development (Art. 2)***	Ensure compliance with conditions of liquidity (solvency and management). Ensure the normal operation of the financial system (Art. 2)	Autonomous Monetary Board to regulate the monetary and banking system, as the Central Bank's ruling body (Art. 3)
Ecuador	The Central Bank is a legal entity under public law that is organized and operates subject to legislation (Art. 303)	Ensure currency stability (Art. 1)	Implement, control, and apply monetary, financial, credit and exchange rate policy (Art. 2)	Legal entity under public law, responsible for its technical and administrative management and control over its own resources (Art. 1)
El Salvador	The Central Bank must report to the legislative assembly about its work (Art. 131)	Ensure currency stability (Art. 3)	Promote and maintain monetary, exchange rate, credit, and financial conditions for economic stability (Art. 3)	Autonomous, technical public institution, with its own legal capacity and control over its own resources. Subject to its own organic law (Art.1)
Guatemala	Monetary, banking, and financial activities will be organized under the central banking system (Art. 132)	Support monetary, exchange rate, and credit conditions for general price stability (Art. 3)	Issue currency, maintain suitable level of liquidity in the banking system, receive reserve funds from banks and legal deposits, and manage foreign reserves (Art. 4)	Autonomous decentralized agency with its own legal capacity, control over its own resources, entitled to acquire rights and contract obligations (Art. 2)
Honduras	The state, through the Central Bank of Honduras, will formulate and develop the country's monetary, credit, and exchange rate policy (Art. 342)	Maintain the domestic and international value of the national currency and support operation of payment system (Art. 2)	Formulate, develop, and implement the country's monetary, credit, and exchange rate policy (Art. 2)	Privileged public service institution that will be subject to this law and the regulations issued by its Board of Directors (Art.1)
Mexico	The Central Bank has autonomy in its functions and its administration (Art. 28)	Seek the stability of the currency's buying power (Art. 2)	Regulate currency issuance and circulation, exchange rates, financial services and intermediation, and payments system (Art. 3)	Autonomous legal entity under public law in exercising its functions and in its administration that will be subject to its organic law (Art. 1)

Nicaragua	The Central Bank is the state regulatory body for the monetary system (Art. 99)	Stability of the national currency and the normal development of domestic and international payments (Art. 3)	Determine and implement monetary and exchange rate policy, in coordination with government economic policy (Art. 4)	Technical body with its own legal capacity and resources. Subject only to its organic law (Art.1)
Paraguay	Technical body with exclusive power to issue currency (Art. 285)	Preserve and ensure currency stability, promote effectiveness and stability of financial system (Art. 3)	State's banker and financial agent, foreign reserve administrator, and state's economic advisor (Art. 4)	Administrative, asset-related, and regulatory autonomous autarky subject to the constitution and its laws (Art. 1)
Peru	The Central Bank is a legal entity under public law. Autonomous within the framework of its organic law (Art. 83)	Preserve monetary stability (Art. 2)	Regulate currency and credit in the financial system, manage foreign reserves, and report on national finances (Art. 2)	Legal entity under public law, with autonomy within the framework of its organic law. Own resources. (Art. 1)
Uruguay	Autonomous and with the authority and attributes defined by the law approved by majority in congress (Art. 196)	Price stability, contributing to growth and employment objectives (Art. 3)	Regulate the operation and supervision of the payments and financial system, promoting solidity, solvency, and development (Art. 3)	Technical, administrative, and financial autonomy under the terms of the constitution and its organic law (Art. 1)
Venezuela	Exclusive and compulsory compliance with monetary affairs under national control (Art. 318)	Price stability, preserving the domestic and international value of the currency (Art. 5)	Formulate and execute monetary policy, participate in the design and implementation of exchange rate policy, regulate credit and interest rate (Art. 7)	Autonomy to formulate and implement policies within its area of competence (Art. 2)

Notes: */ Articles that refer to the respective country's political constitution.
**/ Articles that refer to the articles of the central banks' organic laws in the respective countries.
***/ Article that refers to the Monetary and Financial Law, governed by the Monetary Board, the Central Bank's ruling body.
Source: Compiled by author based on each country's regulatory framework.

processes (Spendolini, 1994). Watson (1995) establishes four stages: determining what to compare and against whom; carrying out primary and secondary research; analyzing information, including the identification of performance gaps; and finally, adapting, improving, and implementing best practice.

No bibliography exists on the evaluation of central banks. However, Ochoa and Schmidt-Hebbel (2006) make an international comparative analysis for Chile's central bank, evaluating both its efficiency and its transparency, including the communication of information about how it manages foreign reserves, the quality of reports on monetary policy, and the production and dissemination of research papers. The efficiency of monetary policy circumscribes how results are assessed, based on four indicators: 1) deviation of inflation from objective or target levels; 2) evaluation of the contribution of the product's stability policy by correlating the deviation from the benchmark interest rate (deviation of the interest rate and its average value or tendency) and the product gap (difference between the effective Gross Domestic Product [GDP] and a measurement of full employment or its tendency); 3) analysis of monetary policy's contribution to reducing the combined volatility both of the product and of inflation, and 4) the monetary authority's contribution to macroeconomic performance, in accordance with the qualitative surveys drawn up by the World Economic Forum and the Institute for Management Development.

After analyzing the functions of Latin America's monetary authorities and the availability of information, five indicators were chosen to evaluate the performance of the aforementioned institutions: low inflation, greater availability of credit for the private sector, lower financial intermediation margins, less variation in the real exchange rate, and accumulation of foreign reserves in accordance with two criteria specified below. The most important of these variables that appears in the current regulations involves the lowest possible inflation, except in the case of Brazil. No comparison is made between the effective and the target inflation rate, because only six countries operate using this system (Roger, 2010): Brazil, Chile, and Colombia (since 1999), Mexico (since 2001), Peru (since 2002), and Guatemala (since 2005). Neither is there standardized information about the levels of debt issued by the various central banks.

Table 2 shows that the selected indicators are explicitly based on the legislation of the different countries in question, although in other cases this reference is only implicit. Strictly speaking, all monetary authorities with the exception of Brazil could be evaluated in terms of seeking lower inflation, achieving a greater

availability of credit, and pursuing lower financial intermediation margins. Fewer regulations show up for indicators of real exchange rate stability and of foreign reserve levels, but they are part of current practice in most Latin American central banks. In this study, we have applied broad criteria, because excluding these variables would rule out a more complete assessment of the compared performance of these institutions. If it were to be rigorous, the study would have to adhere solely to the contents of the respective norms.

Table 2
Selected indicators applicable for each monetary authority

Countries	*Lower inflation*	*More credit available for private sector*	*Lower financial intermediation margin*	*Les variation in real exchange rate*	*Accumulation of foreign reserves in accordance with specific criteria*
Argentina	✓	✓	✓	-	-
Bolivia	✓	✓	✓	✓	-
Brazil	-	✓	✓	-	-
Chile	✓	✓	✓	✓	-
Colombia	✓	✓	-	✓	✓
Costa Rica	✓	✓	-	-	✓
Ecuador	✓	✓	✓	✓	-
Dominican Republic	✓	-	✓	-	-
El Salvador	✓	✓	✓	✓	-
Guatemala	✓	✓	-	✓	✓
Honduras	✓	✓	-	✓	-
Mexico	✓	✓	✓	✓	-
Nicaragua	✓	-	-	✓	-
Paraguay	✓	-	✓	-	✓
Peru	✓	✓	✓	-	✓
Uruguay	✓	-	✓	-	-
Venezuela	✓	✓	-	✓	-

Source: Compiled by author based on each country's regulatory framework.

For inflation, two average price indexes were chosen based on December-December figures. This produced the average annual inflation rate for the analysis period. The formulation of the index relating to this ($IR\pi$), which is useful to compare the inflationary performance of Latin America's various economies, is noted as an equation [1] using the standard formula of the human develop-

ment indicators (HDI).[4] The numerator for each year comprises the difference between the selected country's effective inflation, minus the lowest inflation observed in the group of economies being analyzed. The denominator includes the entire sample range, comprising the difference between the maximum and minimum inflation of the comparison group. Unlike the HDI, the best value is the one closest to zero; the worst is that closest to one.

$$RI\pi = \frac{\pi_{effective} - \pi_{minimum}}{\pi_{maximum} - \pi_{minimum}} \quad [1]$$

The second indicator to be considered is the financial intermediation margin (*fim*), understood as the difference between annual average asset rates (*lr*) and average borrowing rates for the same period (*br*) of the equation [2]. Then if inflation is subtracted from both variables, the expression remains unchanged. In equation [3] the financial intermediation margin index (*fimIR*) is shown as a similar expression to equation [1], in which the lower value for the index is best and a value of one corresponds to the economy with the highest financial intermediation margin.

$$fim = lr - br \quad [2]$$

$$fimIR = \frac{fim_{effective} - fim_{minimum}}{fim_{maximum} - fim_{minimum}} \quad [3]$$

Real exchange rate stability is the third indicator. In some countries, but not in others, this is considered a policy objective. In the case of the former, the monetary authority was advised to help maintain its stability, neither raising nor lowering the rate in order to avoid harming international commercial and financial operations. A simple means of measuring the real bilateral exchange rate was proposed, because a multilateral measurement would require detailed information that is unavailable. The real exchange rate (*rer*) is determined by the effective average exchange rate over the period (*aer*), the United States' foreign inflation (π_e) and domestic inflation (π_i) according to equation [4]. If

[4] United Nations Development Program (PNUD). *Human Development Report 2007-2008*.

domestic inflation is greater than foreign inflation, supposing constant exchange rate parity, the national currency appreciates in value, causing a negative trade balance and reducing the country's competitiveness. Also, domestic inflation could neutralize a nominal depreciation in the national currency.

$$rer = \frac{aer\left(1+\frac{\pi_e}{100}\right)}{1+\frac{\pi_i}{100}} \quad [4]$$

To evaluate the variability of the real exchange rate, a simple criterion has been applied for the percentage deviations of the real exchange rate (*rerd*) regarding the average of the period under analysis, shown in equation [5]. This index is then used to determine the relative index of the percentage deviations of the real exchange rate (*rerRI*) as a similar expression to the equation [1], where the lower value for the index is best, while the value one relates to the economy with greater percentage deviations in the real exchange rate. It should be noted that in the equation [6], all deviations are being considered in absolute terms, since the aim is to minimize the positive and negative variations of the real exchange rate.

$$rerd = \left[\left(\frac{rer}{\frac{\Sigma_1^n rer}{n}}\right)-1\right]100 \quad [5]$$

$$rerRI = \frac{\left|rerd_{effective}\right|-\left|rerd_{minimum}\right|}{\left|rerd_{maximum}\right|-\left|rerd_{minimum}\right|} \quad [6]$$

The fourth indicator to be considered is the domestic credit provided to the private sector by the banking system, which consolidates the information of the monetary outlook, including the central and commercial banks. Most monetary authorities must seek suitable levels of liquidity for the financial system to help boost the performance of the productive apparatus. In this case, whoever provides the best levels of credit to the private sector in terms of GDP scores highest.

The construction of the index on private sector credit (*pscRI*) is noted as an equation [7] that uses the standard formula shown above. For each year, the numerator comprises the difference between the credit level in relation to the selected country's effective GDP, minus the credit level in relation to the lowest GDP of the selected group of countries. The denominator refers to the entire range of the sample that comprises the difference between the credit level with regard to the maximum and minimum GDP of the comparison group.

$$pscRI = \frac{\frac{psc}{GDP}_{effective} - \frac{psc}{GDP}_{minimum}}{\frac{psc}{GDP}_{maximum} - \frac{psc}{GDP}_{minimum}} \qquad [7]$$

The monetary authorities' accumulation of foreign reserves is the last indicator taken into consideration. This is a controversial issue, since it is not set out as an explicit objective in many countries, though obviously the level of foreign reserves is an indicator of the country's solvency and can be used to evaluate the ability to fulfill daily commitments involved in foreign trade and service and capital accounts. Similarly to the availability of domestic credit in the banking system's private sector, reserves must be understood in the context of each country's GDP.

We propose two options: in the first, the foreign reserves index rewards whoever accumulated more reserves in terms of GDP ($frRI_1$) of equation [8]. The more foreign reserves the better; in the second, another index is created on foreign reserves in terms of GDP ($frRI_2$) with an optimum value equivalent to 15% of the same indicator, according to Chilean authorities (IMF, 2011), derived from the 10% proposed by Jeanne and Rancière (2006) for 34 middle-income economies in the period 1980-2003. In this case, the closer to the optimum amount, the higher the ranking, whereas being below (with insufficient foreign reserves) or above the optimum amount (with surplus reserves that can produce greater maintenance costs and less availability of domestic credit) lowers the ranking. A recent discussion of this issue can be read in Alarco (2011).

$$frRI_1 = \frac{\frac{fr}{GDP}_{effective} - \frac{fr}{GDP}_{minimum}}{\frac{fr}{GDP}_{maximum} - \frac{fr}{GDP}_{minimum}} \qquad [8]$$

In order to obtain the second indicator on foreign reserves, the target value of 15% (0.15) must be subtracted and all the other components expressed as an absolute value. A smaller difference between optimal effective reserves minus the minimum reserves makes for a higher ranking. On the other hand, with a larger difference of the numerator, we move away from the optimum levels by default and by exceeding the optimum levels, as expressed in equation [9].

$$frRI_2 = \frac{\left|\left|\frac{fr}{GDP}_{effective} - 0.15\right| - \left|\frac{fr}{GDP}_{minimun} - 0.15\right|\right|}{\left|\left|\frac{fr}{GDP}_{maximum} - 0.15\right| - \left|\frac{fr}{GDP}_{minimun} - 0.15\right|\right|} \qquad [9]$$

On the basis of the above formulae, we compare results for five indicators that evaluate the presence of lower inflation, lower financial intermediation margins, less variability of the real exchange rate, great availability of credit for the private sector from the banking sector, and an accumulation of foreign reserves in two different ways: through the maximization and less deviation from the target value. A target function is proposed —a linear one in this case— that integrates the above indicators in a single one with specific weighting factors. Inflation is supposed to be the most important indicator with a weighting of 50%, while the other four have a weighting of 12.5%.[5] The highest ranking is obtained when the value of the weighted indicator is zero; the lowest when it is one. However, there are some variables where the best value is one, in which case the following formula must be applied in addition: $1 - V_i$. Equations [10] and [11] relate to the objective function considering the two variants relating to foreign reserves.

$$O_1 = 0.5RI\pi + 0.125fimRI + 0.125rerRI + 0.125(1 - pscRI) + 0.125(1 - frRI_1) \qquad [10]$$

$$O_2 = 0.5RI\pi + 0.125fimRI + 0.125rerRI + 0.125(1 - pscRI) + 0.125(1 - frRI_2) \qquad [11]$$

[5] In fact, the weightings could change, but lower inflation is clearly the main assessment criteria for Latin American central banks.

The calculation of the above indexes requires standardized information on an international level and data was primarily sourced from the International Monetary Fund (IMF). For the first indicator, the annual average consumer price index was considered, using data from the IMF's *World Economic Outlook* (WEO) database, which then gave the annual average inflation. The second indicator relates to the banking system's financial intermediation margins, sourced from the IMF's *International Financial Statistics* (IFS). The average active interest rate for the private sector is known as the lending rate. In some countries, other benchmark indicators are considered by default, such as in Costa Rica, where it is known as the *Comm. lending rate*, and in Guatemala, the *Maximum comm. BK lending rate*. The average borrowing rate for the private sector is known as the *deposit rate*. Where it does not exist, such as Brazil, Ecuador, Mexico, and Uruguay, the term *time deposit rate* is used. In Guatemala it is referred to as the *maximum deposit rate*.

The third indicator relates to the index on the real exchange rate and for that purpose it was necessary to consider the annual average nominal exchange rate of each country per U.S. dollar, using IFS data. The aforementioned information was used for the national average inflation, and the United States' GDP deflater, using data from the Bureau of Economic Analysis (BEA) *National Economic Accounts*.

Information from the final credit balances at the end of each IFS fiscal year was needed to construct the indicator on the banking system's domestic credit for the private sector. This variable used the series resulting from the consolidated financial statements of the central bank and banking institutions formed as *depository corporations*. This information is expressed in each country's national currency, which was converted to dollars at the exchange rate at the end of the period. To calculate this indicator, data was needed from each country's nominal GDP in dollars, provided by the World Bank's *World Data Bank*, which includes the *World Development Indicators* (WDI) database.

Finally, the monetary authority's information on foreign reserves is used for foreign reserve indexes, comprising the portfolio of international assets and liabilities and gold valued at 35 SDR/ounce (SDR stands for Special Drawing Rights). This information is provided in SDR and is converted into dollars at the exchange rate of each currency at the end of the period provided by the IFS. The aforementioned nominal GDP in dollars is the other variable needed to calculate this indicator.

All of the above information relates to the 1990-2010 period, processed annually. However, for purposes of clarity, the information relating to 1990-1999 is grouped together. Unfortunately, information for all the countries during the

period analyzed is incomplete. Financial margins correspond to 1997-2010; the real exchange rate, to 1995-2010; and the domestic credit made available by the banking system for the private sector, to 2001-2010. Obviously, in the case of some countries and for particular years, this information needed to be complemented with sources that were essentially national and in some cases international.

Results by criterion and integral analysis

Tackling inflation is the most important objective for Latin American central banks. Table 3 shows the evolution of average inflation for 1990-2010, showing annual values, except for 1990-1999, in which the information is presented as an average for the entire period.[6] During the 1990s, all countries struggled with inflation, in particular Brazil, Venezuela, Peru, Uruguay, and Ecuador. Some were affected to a certain extent: Argentina, Colombia, Costa Rica, Honduras, Mexico, Nicaragua, and Paraguay. The least affected were Bolivia, Chile, El Salvador, Guatemala, and the Dominican Republic. In the first ten years of the twenty-first century, inflation rates have been markedly lower than during the previous decade. The countries with the highest inflation rates were Venezuela, Ecuador,[7] the Dominican Republic, and Costa Rica. Those ranking in the middle were Argentina, Bolivia, Brazil, Colombia, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, and Uruguay. The countries with the lowest inflation rates were Peru, Chile, and El Salvador.

Table 4 shows the results of applying equation [1] from the previous section. The results fluctuate between zero and one, with zero referring to the economy with the lowest annual average inflation compared to the other countries in the sample. The value one refers to the country with the highest inflation during the year or during the 1990-1999 period. Interestingly, the best performing countries in terms of inflation were El Salvador from 1990 to 1999, Argentina from 2000 to 2001, Peru in 2002, El Salvador in 2003, Chile in 2004, Peru from 2005 to 2007, Mexico in 2008, and El Salvador from 2009 to 2010. Brazil ranked lowest between 1990 and 1999, Ecuador in 2000 and 2001, Argentina in 2002, Venezuela in 2003, the Dominican Republic in 2004, and Venezuela again between 2005 and 2010.

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[6] The equation $\sqrt[n]{\frac{V_n}{V_i}}$ is applied on the indices of average annual inflation.

[7] Notable on account of being a dollarized economy.

TABLE 3
Annual average inflation, 1990-2010
(percentage variation)

Country	*1990-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	15.84	–0.94	–1.07	25.87	13.44	4.42	9.64	10.90	8.83	8.59	6.27	10.60
Bolivia	8.65	4.60	1.60	0.92	3.34	4.44	5.40	4.28	8.71	14.01	3.35	2.50
Brazil	202.29	7.06	6.84	8.43	14.78	6.60	6.88	4.20	3.64	5.67	4.90	5.00
Chile	8.99	3.84	3.57	2.49	2.81	1.06	3.05	3.39	4.41	8.72	1.68	1.40
Colombia	18.95	9.22	7.97	6.35	7.13	5.91	5.05	4.30	5.54	7.00	4.20	2.30
Costa Rica	14.68	10.96	11.26	9.17	9.45	12.32	13.80	11.47	9.36	13.43	7.84	5.70
Dominican Republic	9.62	7.72	8.88	5.22	27.45	51.46	4.19	7.57	6.14	10.65	1.44	6.30
Ecuador	33.18	96.10	37.70	12.60	7.90	2.74	2.10	3.30	2.28	8.40	5.16	3.56
El Salvador	8.05	2.27	3.75	1.87	2.12	4.45	4.69	4.04	4.58	7.26	0.43	1.20
Guatemala	10.85	5.98	7.29	8.13	5.60	7.58	9.11	6.56	6.82	11.36	1.86	3.90
Honduras	16.99	11.02	6.49	7.66	7.65	8.05	8.85	5.62	6.91	11.46	8.67	4.70
Mexico	17.27	9.49	6.37	5.03	4.55	4.69	3.99	3.63	3.97	5.13	5.30	4.24
Nicaragua*	18.14	7.07	5.99	3.75	5.30	8.47	9.60	9.14	11.13	19.83	3.70	5.50
Paraguay	12.46	8.98	7.27	10.51	14.22	4.33	6.81	9.59	8.13	10.15	2.59	4.70
Peru	37.51	3.88	2.02	0.16	2.26	3.66	1.62	2.00	1.78	5.79	2.94	1.50
Uruguay	34.54	4.76	4.37	13.97	19.38	9.16	4.70	6.40	8.11	7.88	7.06	6.70
Venezuela	41.21	16.21	12.53	22.43	31.09	21.75	15.96	13.65	18.70	30.37	27.08	29.10

Note: */ Relates to 1995-1999.
Source: Compiled by author based on IMF international financial statistics.

TABLE 4
Annual average inflation rate

Country	*1990-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	0.0401	0	0	1	0.391	0.067	0.56	0.763	0.417	0.137	0.219	0.337
Bolivia	0.0031	0.057	0.069	0.03	0.042	0.067	0.263	0.195	0.409	0.352	0.109	0.047
Brazil	1	0.082	0.204	0.321	0.437	0.11	0.367	0.188	0.11	0.022	0.168	0.136
Chile	0.0048	0.049	0.12	0.091	0.024	0	0.1	0.119	0.155	0.142	0.047	0.007
Colombia	0.0561	0.105	0.233	0.241	0.173	0.096	0.239	0.197	0.222	0.074	0.142	0.039
Costa Rica	0.0341	0.123	0.318	0.35	0.253	0.223	0.849	0.813	0.448	0.329	0.278	0.161
Dominican Republic	0.0081	0.089	0.257	0.197	0.874	1	0.179	0.478	0.258	0.219	0.038	0.183
Ecuador	0.1294	1	1	0.484	0.2	0.033	0.033	0.111	0.029	0.13	0.177	0.085
El Salvador	0	0.033	0.124	0.066	0	0.067	0.214	0.175	0.165	0.084	0	0
Guatemala	0.0144	0.071	0.215	0.31	0.12	0.129	0.522	0.391	0.298	0.247	0.054	0.097
Honduras	0.046	0.123	0.195	0.292	0.191	0.139	0.504	0.31	0.303	0.251	0.309	0.125
Mexico	0.0475	0.107	0.192	0.189	0.084	0.072	0.165	0.139	0.129	0	0.183	0.109
Nicaragua	0.0519*	0.083	0.182	0.14	0.11	0.147	0.557	0.613	0.552	0.582	0.123	0.154
Paraguay	0.0227	0.102	0.215	0.403	0.418	0.065	0.362	0.651	0.375	0.199	0.081	0.125
Peru	0.1516	0.05	0.079	0	0.005	0.052	0	0	0	0.026	0.094	0.011
Uruguay	0.1364	0.059	0.14	0.537	0.596	0.161	0.215	0.377	0.374	0.109	0.249	0.197
Venezuela	0.1707	0.177	0.351	0.866	1	0.411	1	1	1	1	1	1

Note: */ Refers to period between 1995-1999.
Source: Compiled by author based on IMF international financial statistics.

The results shown in Table 4 give the ranking for each year, with each economy able to be evaluated in comparative terms. A country's higher ranking may equally be the result of its actions or the deteriorating conditions of the other countries it is being compared against. A lower ranking may also be the result of the specific country's failed policies and external circumstances in the specific country and the improvement of other countries. If ranking highly, countries must continue apace with the other members of the group in order to preserve their position.

Table **5**
Country ranking by average annual inflation index

Country	*1990-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	8	1	1	17	12	5	15	15	14	8	13	15
Bolivia	2	5	2	2	4	6	9	7	13	15	7	5
Brazil	17	8	10	11	14	10	11	6	3	2	10	10
Chile	3	3	4	4	3	1	3	3	5	9	3	2
Colombia	12	12	13	8	8	9	8	8	7	4	9	4
Costa Rica	7	14	15	12	11	15	16	16	15	14	15	12
Dominican Republic	4	10	14	7	16	17	5	12	8	11	2	13
Ecuador	13	17	17	14	10	2	2	2	2	7	11	6
El Salvador	1	2	5	3	1	7	6	5	6	5	1	1
Guatemala	5	7	12	10	7	11	13	11	9	12	4	7
Honduras	9	15	9	9	9	12	12	9	10	13	16	9
Mexico	10	13	8	6	5	8	4	4	4	1	12	8
Nicaragua	11*	9	7	5	6	13	14	13	16	16	8	11
Paraguay	6	11	11	13	13	4	10	14	12	10	5	9
Peru	15	4	3	1	2	3	1	1	1	3	6	3
Uruguay	14	6	6	15	15	14	7	10	11	6	14	14
Venezuela	16	16	16	16	17	16	17	17	17	17	17	16

Note: */ Refers to the period between 1995 and 1999.
Source: Compiled by author based on IMF international financial statistics.

Table 5 shows how much each individual country's ranking changes over time. During the analysis period, especially between 2000 and 2010, Argentina is first as well as last in the inflation ranking. Bolivia, Brazil, Ecuador and Peru manage to climb to first or second place in the inflation rankings. Very few economies hold their position over time. Chile is one country that has maintained a high

ranking since 1990, and Peru since 2000. Venezuela, followed by Costa Rica, occupies the last position between 2000 and 2010. In 2010, Honduras and Paraguay tie for ninth place.

Table 6 shows the differential between the banking system's lending and borrowing rates as reported by the IMF. In this case, a higher value means a less favorable situation, since the differential is the result of high lending rates, low borrowing rates or the combination of both. In Latin America, the countries with the longest tradition of high margins are Brazil, Paraguay, and Peru, while for the analysis period Chile, El Salvador, Mexico, and Argentina have the lowest intermediation margins. Notably, countries such as Bolivia, Colombia, Guatemala, and, to a lesser extent, Honduras, show decreasing financial intermediation margins. Costa Rica, Nicaragua, the Dominican Republic, Uruguay, and Venezuela do not show any clear tendency with their fluctuating margins.

The country rankings are shown in Table 7. This information could be obtained directly from the table above, but this relative index is used for an aggregate analysis, where the value zero indicates the highest position; one is the lowest. As mentioned above, Argentina achieves the top position at the beginning of the period analyzed, 2005-2006, and in 2010. Chile ranks second throughout the entire period, except in 1998, 2009, and 2010. It is followed by El Salvador and Mexico. Brazil is at the other extreme, in 17th place, behind Paraguay, Peru, Bolivia, Costa Rica, Honduras, and Guatemala. Venezuela, in a mid-ranking position, moved to the upper positions between 2009 and 2010. Colombia, Ecuador, Nicaragua, the Dominican Republic, and Uruguay are all in middle-ranking positions.

Processing the exchange rate stability is more complex than the previous indicators. Firstly, the real exchange rate is estimated for each of the countries analyzed, considering the United States' domestic and foreign inflation. Then, the percentage deviations from the average during the period analyzed are calculated. Finally the relative index between the effective value and maximum and minimum deviation is applied. Since the information is handled in terms of absolute values, the best positions are nearest to zero and the worst nearest to one.

TABLE 6

Banking sector's financial intermediation margins

(percentages)

Year	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	2.27	3.08	2.99	2.75	11.55	12.43	8.99	4.17	2.40	2.21	3.08	8.42	4.06	1.39
Bolivia	35.32	26.59	23.11	23.62	10.24	11.05	6.25	7.05	11.69	7.86	9.31	9.21	8.92	8.86
Brazil	53.84	58.36	54.42	39.63	39.76	43.74	45.11	39.51	37.75	36.88	33.14	35.59	35.37	31.12
Chile	3.65	5.25	4.06	5.64	5.70	3.96	3.45	3.19	2.75	2.89	3.06	5.77	5.20	3.13
Colombia	10.09	9.66	4.44	6.64	8.28	7.39	7.39	7.28	7.55	6.61	7.37	7.44	6.86	5.72
Costa Rica	9.45	9.71	11.43	11.51	12.06	14.96	15.17	13.92	14.52	12.42	6.45	11.68	12.76	11.77
Dominican Republic	7.61	7.99	8.98	9.15	8.65	9.52	10.89	11.51	10.25	9.65	8.87	9.60	10.33	7.28
Ecuador	14.93	10.16	6.91	8.32	9.45	10.20	7.97	5.79	6.03	5.59	7.10	4.93	4.42	4.79
El Salvador	4.28	4.66	4.71	4.65	4.10	3.70	3.20	3.00	3.50	3.10	3.10	3.70	4.80	4.75
Guatemala	12.81	11.12	11.55	10.71	10.21	9.94	10.20	9.62	8.68	8.26	8.08	8.31	8.27	7.89
Honduras	10.79	12.11	10.18	10.89	9.28	8.95	9.32	8.79	7.93	8.11	8.83	8.45	8.63	9.05
Mexico	5.78	10.91	12.14	8.67	6.57	4.45	3.93	4.74	6.24	4.21	4.35	5.67	5.06	4.08
Nicaragua	8.61	10.86	5.74	7.34	6.99	10.51	10.00	8.77	8.07	6.71	6.96	6.60	8.03	10.33
Paraguay	14.79	14.28	10.46	11.06	12.03	15.80	34.16	28.43	28.25	23.42	20.03	22.73	26.80	24.83
Peru	20.56	21.73	23.26	20.20	17.43	17.23	17.90	22.25	22.94	20.72	19.63	20.16	18.21	17.44
Uruguay	37.62	31.63	28.54	27.80	26.96	55.80	29.25	17.48	10.77	7.42	6.58	9.22	10.88	8.17
Venezuela	8.99	11.51	10.85	8.90	6.94	7.58	7.98	5.90	5.18	5.22	6.40	6.22	3.48	3.55

Source: Compiled by the author based on IMF international financial statistics.

Table 7
Country ranking by the banking system's financial intermediation margins
(percentages)

Year	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	1	1	1	1	12	12	8	3	1	1	2	9	2	1
Bolivia	15	15	14	15	11	11	4	7	13	10	14	11	11	11
Brazil	17	17	17	17	17	16	17	17	17	17	17	17	17	17
Chile	2	3	2	3	2	2	2	2	2	2	1	4	6	2
Colombia	9	5	3	4	6	4	5	8	8	7	10	7	7	7
Costa Rica	8	6	11	13	14	13	13	13	13	14	6	14	14	14
Dominican Republic	5	4	7	9	7	7	12	12	12	13	13	13	12	8
Ecuador	13	7	6	6	9	9	6	5	5	6	9	2	3	6
El Salvador	3	2	4	2	1	1	1	1	1	3	3	1	4	5
Guatemala	11	10	12	10	10	8	11	11	11	12	11	8	9	9
Honduras	10	12	8	11	8	6	9	10	10	11	12	10	1	12
Mexico	4	9	13	7	3	3	3	4	4	4	4	3	5	4
Nicaragua	6	8	5	5	5	10	10	9	9	8	8	6	8	13
Paraguay	12	13	9	12	13	14	16	16	16	16	16	16	16	16
Peru	14	14	15	14	15	15	14	15	15	15	15	15	15	15
Uruguay	16	16	16	16	16	17	15	14	14	9	7	12	13	10
Venezuela	7	11	10	8	4	5	7	6	6	5	5	5	1	3

Source: Compiled by the author based on IMF international financial statistics.

Table 8 shows the top results for the real exchange rate calculated between 1995 and 2010. It is hard to draw general conclusions, since each country has its own dynamic. However, a first group of countries stands out, where the real exchange rate shows a quadratic function. In the first years under analysis it is low, and then rises in the middle years, before decreasing again. This is the case of Bolivia, Brazil, Chile, Colombia, Paraguay, Peru, and Uruguay. A second group has an increasing real exchange rate: Costa Rica, Nicaragua, the Dominican Republic, and Venezuela. The third group refers to a real exchange rate with less variation, such as Ecuador, El Salvador, Guatemala, Honduras, and Mexico.

TABLE 8

Real exchange rate

(each country's currency per U.S. dollar)

Country	*1995-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	1.0	1.0	1.0	2.5	2.6	2.9	2.7	2.8	2.9	3.0	3.5	3.6
Bolivia	5.0	6.0	6.7	7.2	7.6	7.8	7.9	7.9	7.4	6.5	6.9	6.9
Brazil	1.1	1.7	2.2	2.7	2.7	2.8	2.4	2.2	1.9	1.8	1.9	1.7
Chile	422.0	530.9	626.9	683.1	687.0	620.3	561.3	529.6	515.1	491.1	556.6	508.0
Colombia	1 089.6	1 953.0	2 178.0	2 392.8	2 743.9	2 552.5	2 283.0	2 337.6	2 027.1	1 879.2	2 098.5	1 873.6
Costa Rica	206.9	283.8	302.3	334.9	372.1	401.0	433.9	473.6	486.3	474.1	536.5	502.2
Dominican Republic	13.8	15.6	15.9	18.0	24.7	28.6	30.2	32.0	32.3	32.0	35.8	35.0
Ecuador*	7 642.2	0.5	0.7	0.9	0.9	1.0	1.0	1.0	1.0	0.9	1.0	1.0
El Salvador	8.4	8.7	8.6	8.7	8.8	8.6	8.6	8.7	8.6	8.3	8.8	8.7
Guatemala	6.0	7.5	7.5	7.4	7.7	7.6	7.2	7.4	7.4	6.9	8.1	7.8
Honduras	10.6	13.7	14.9	15.5	16.5	17.3	17.9	18.5	18.2	17.3	17.5	18.2
Mexico	6.7	8.8	9.0	9.3	10.5	11.1	10.8	10.9	10.8	10.8	13.0	12.2
Nicaragua	8.7	12.1	12.9	14.0	14.6	15.1	15.8	16.6	17.1	16.5	19.8	20.4
Paraguay	2 237.0	3 268.2	3 914.2	5 256.3	5 745.4	5 889.4	5 977.3	5 309.8	4 791.3	4 047.7	4 884.2	4 566.0
Peru	2.6	3.4	3.5	3.6	3.5	3.4	3.4	3.3	3.2	2.8	3.0	2.8
Uruguay	7.9	11.8	13.1	19.0	24.1	27.0	24.2	23.4	22.3	19.8	21.3	19.0
Venezuela	0.3	0.6	0.7	1.0	1.3	1.6	1.9	2.0	1.9	1.7	1.7	2.0

Note: */ Ecuador's significant change in exchange rate is due to the economy's dollarization.

Source: Compiled by the author based on IMF international financial statistics.

The real exchange rate determines the relative index of the percentage deviations of the real exchange rate. When the values are close to zero, the deviations from the average are lower, and when the value is one, the deviations are more pronounced in the entire sample of Latin American countries for each year in particular. Venezuela's relative real exchange rate is the most variable, followed by Argentina and Brazil. At the other extreme, El Salvador has the least variations in the real exchange rate throughout the entire period analyzed, followed by Chile, Ecuador, Honduras, Paraguay, and Bolivia.

Table 9 shows the countries' ranking according to the index on the real exchange rate's percentage deviations, confirming which countries have had the most stable real exchange rate or, conversely, which ones have seen most variation. The former group of countries includes El Salvador and Chile, as well as Argentina and Brazil at the start of the first decade of this century. The following countries are in last place: Venezuela, Argentina, Nicaragua, the Dominican Republic, Costa Rica, Uruguay, and Honduras. Other countries such as Guatemala, Paraguay, and Peru are in middle-ranking positions.

Table **9**
Country ranking by real exchange rate variability

Country	*1995-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	14	17	17	12	12	12	13	14	15	16	17	16
Bolivia	5	7	3	8	11	10	9	9	8	2	5	4
Brazil	12	4	14	17	17	16	12	7	4	7	3	7
Chile	4	1	12	16	13	9	3	1	2	8	6	3
Colombia	11	3	10	14	16	13	10	11	6	3	7	1
Costa Rica	10	12	8	7	3	6	11	13	14	14	14	13
Dominican Republic	9	14	15	13	4	11	14	15	16	15	16	15
Ecuador	16	15	11	1	2	3	5	5	7	6	4	5
El Salvador	1	2	2	3	1	1	1	2	1	5	1	2
Guatemala	2	6	7	6	6	2	2	3	5	4	8	8
Honduras	7	8	1	5	7	7	8	10	11	11	9	11
Mexico	6	5	5	2	8	8	6	6	9	10	12	12
Nicaragua	8	9	6	4	5	4	7	8	12	13	13	14
Paraguay	13	11	4	15	14	15	16	12	10	1	10	9
Peru	3	10	9	11	10	5	4	4	3	9	2	6
Uruguay	15	13	13	10	15	17	15	16	13	12	11	10
Venezuela	17	16	16	9	9	14	17	17	17	17	15	17

Source: Compiled by the author based on IMF international financial statistics.

The banking systems' monetary and supervisory authorities must aim for higher levels of financial intermediation, and in particular make more domestic credit available to the private sector as a percentage of GDP. According to information in Table 10, the highest levels in this last measurement are found in Chile, Brazil, and Costa Rica, and are also significant in Honduras and El Salvador. At the other extreme, the lowest levels have historically been found in Argentina, followed by Venezuela, Uruguay, the Dominican Republic, Guatemala, and Peru. Bolivia, Paraguay, Nicaragua, Colombia, Ecuador, and Mexico are in middle-ranking positions.

Table **10**
Banking system's domestic credit for the private sector
(percentage of GDP)

Country	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	20.84	14.15	10.75	10.37	11.25	13.09	14.40	12.63	13.35	15.10
Bolivia	51.88	48.82	46.84	42.05	39.92	35.32	35.39	32.47	34.02	38.57
Brazil	29.72	24.78	29.81	31.03	31.57	35.20	46.28	37.71	55.23	56.52
Chile	65.44	66.51	76.29	72.79	74.39	66.78	77.82	69.98	89.95	79.54
Colombia	21.77	18.78	21.76	24.16	22.96	28.73	31.78	28.01	31.51	30.71
Costa Rica	26.69	28.60	29.84	30.57	34.25	37.37	46.05	48.10	50.10	51.61
Dominican Republic	31.81	27.69	28.96	31.01	20.07	19.22	20.77	20.30	21.13	22.28
Ecuador	27.60	20.75	18.90	21.48	23.09	23.69	24.60	25.49	24.28	30.63
El Salvador	40.08	39.58	41.20	41.15	42.24	42.39	42.29	40.79	40.69	40.35
Guatemala	21.38	20.63	25.31	26.24	24.81	27.66	27.75	26.04	24.57	23.89
Honduras	35.66	35.04	35.47	36.35	38.13	44.14	51.52	51.04	51.25	49.30
Mexico	16.01	16.58	15.37	15.24	16.74	19.69	22.10	17.31	24.14	25.08
Nicaragua	17.29	19.07	22.28	24.86	28.63	33.17	38.94	39.86	33.57	31.74
Paraguay	27.94	23.94	18.46	16.28	17.81	18.34	20.69	20.46	31.37	36.38
Peru	24.82	23.00	20.62	19.09	18.66	18.29	21.92	23.08	25.11	24.96
Uruguay	48.57	55.11	41.58	26.35	22.83	23.36	24.98	23.33	23.71	21.98
Venezuela	11.56	8.27	8.81	10.82	12.76	16.93	23.77	21.68	23.88	19.79

Source: Compiled by the author based on IMF international financial statistics.

Throughout the period analyzed, Chile has ranked highest in terms of levels of domestic credit offered to the private sector as a percentage of GDP. Also, according to Table 11, both Argentina and Venezuela rank lowest in Latin America. Over time, Brazil, Colombia, Costa Rica, Nicaragua, and Mexico have

improved their position; on the other hand, the relative positions of Bolivia, the Dominican Republic, and Uruguay have all dropped. The group of countries that have maintained their relative positions includes Ecuador, El Salvador, Guatemala, Honduras, and Peru. Paraguay ranked highest at the start of the period, dropping in the middle period, before climbing again starting in 2009.

Table **11**
Country ranking by banking system's domestic credit to the private sector

Country	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	14	16	16	17	17	17	17	17	17	17
Bolivia	2	3	2	2	3	5	7	7	6	6
Brazil	7	8	7	5	6	6	3	6	2	2
Chile	1	1	1	1	1	1	1	1	1	1
Colombia	12	14	11	11	10	8	8	8	8	9
Costa Rica	10	6	6	7	5	4	4	3	4	3
Dominican Republic	6	7	8	6	12	13	15	15	16	14
Ecuador	9	11	13	12	9	10	11	10	12	10
El Salvador	4	4	4	3	2	3	5	4	5	5
Guatemala	13	12	9	9	8	9	9	9	11	13
Honduras	5	5	5	4	4	2	2	2	3	4
Mexico	16	15	15	15	15	12	13	16	13	11
Nicaragua	15	13	10	10	7	7	6	5	7	8
Paraguay	8	9	14	14	14	14	16	14	9	7
Peru	11	10	12	13	13	15	14	12	10	12
Uruguay	3	2	3	8	11	11	10	11	15	15
Venezuela	17	17	17	16	16	16	12	13	14	16

Source: Compiled by author based on IMF international financial statistics.

Monetary authorities' foreign reserves as a proportion of GDP can be seen in Table 12. Most Latin American countries have increased their reserves, in particular Bolivia, Honduras, Nicaragua, Brazil, Peru, Paraguay, and Uruguay. The lowest levels can be found in Ecuador, Guatemala, and Venezuela in recent years. Argentina, Chile, Costa Rica, El Salvador, and Mexico rank in middle positions. As indicated in the second section of this study, two options are examined: a ranking based on the maximization of foreign reserves and the least deviation from a target equivalent to 15% of GDP.

TABLE **12**
Monetary authorities' foreign reserves
(percentage of GDP)

Country	*1990-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	6.02	8.85	5.42	10.28	10.92	12.40	14.88	14.48	17.17	13.76	15.04	14.11
Bolivia	8.65	11.54	11.39	7.89	9.45	10.51	14.38	23.25	35.10	41.84	44.02	52.81
Brazil	5.37	5.05	6.43	7.44	8.85	7.91	6.04	7.83	13.14	11.67	14.89	14.17
Chile	20.56	19.99	20.97	22.81	21.41	16.72	14.32	13.21	10.25	13.51	15.45	13.67
Colombia	11.38	8.90	10.30	10.94	11.38	11.44	10.10	9.38	10.02	9.68	10.58	9.64
Costa Rica	9.49	8.26	8.11	8.92	10.50	10.34	11.58	13.82	15.66	12.80	13.91	14.17
Dominican Republic	2.84	2.62	4.42	1.77	1.19	3.63	5.42	5.89	6.17	4.96	6.17	6.74
Ecuador	8.65	6.18	4.13	3.03	2.99	3.42	4.72	3.67	6.25	6.92	5.10	2.65
El Salvador	9.67	13.66	11.69	10.45	12.08	11.25	10.19	9.80	10.42	11.11	13.66	12.17
Guatemala	2.35	6.81	7.57	7.34	6.53	8.23	8.56	8.70	7.42	6.32	5.60	6.58
Honduras	22.18	24.72	30.43	29.70	34.54	38.76	37.66	35.96	33.42	32.03	34.75	36.68
Mexico	5.54	6.11	7.19	7.80	8.42	8.44	8.72	8.01	8.49	8.73	11.39	11.57
Nicaragua	7.97	12.41	9.28	11.14	12.24	14.95	14.93	17.51	19.63	19.45	25.61	27.46
Paraguay	12.03	10.82	11.09	12.50	17.48	16.80	17.37	18.34	20.14	16.87	26.97	23.00
Peru	13.26	15.81	16.17	16.54	16.03	17.55	17.20	18.19	25.04	23.49	24.61	27.76
Uruguay	6.46	11.07	14.82	5.66	17.30	18.34	17.71	15.58	17.18	20.38	25.48	18.96
Venezuela	16.13	11.57	7.91	9.68	19.89	16.88	16.81	16.34	10.95	10.82	6.85	3.55

Source: Compiled by author based on IMF international financial statistics and the World Bank's *Databank* database.

Table 13 shows the country ranking for the maximization of foreign reserves in relation to GDP. One is the best value in the index; zero is the worst. In 2000, in the top positions with the highest reserve levels were Honduras, Chile, Peru, El Salvador, and Nicaragua. In the bottom positions were the Dominican Republic, Brazil, Mexico, Ecuador, and Guatemala. Venezuela, Bolivia, Uruguay, Paraguay, Colombia, Argentina, and Costa Rica were in the middle of the table. As might be expected, this situation changed by 2010, with Bolivia, Honduras, Peru, Nicaragua, and Paraguay in the highest ranking positions. Venezuela joined Ecuador, Colombia, the Dominican Republic, and Mexico as the lowest ranking countries.

Table **13**
Country ranking by maximization of foreign reserves

Country	*1990-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	13	11	15	8	10	8	7	8	7	7	8	9
Bolivia	10	7	6	11	12	11	8	2	1	1	1	1
Brazil	15	16	14	13	13	15	15	15	9	10	9	8
Chile	2	2	2	2	2	6	9	10	12	8	7	10
Colombia	6	10	8	6	9	9	12	12	13	13	13	13
Costa Rica	8	12	10	10	11	12	10	9	8	9	10	7
Dominican Republic	16	17	16	17	17	16	16	16	17	17	15	14
Ecuador	9	14	17	16	16	17	17	17	16	15	17	17
El Salvador	7	4	5	7	8	10	11	11	11	11	11	11
Guatemala	17	13	12	14	15	14	14	13	15	16	16	15
Honduras	1	1	1	1	1	1	1	1	2	2	2	2
Mexico	14	15	13	12	14	13	13	14	14	14	12	12
Nicaragua	11	5	9	5	7	7	6	5	5	5	4	4
Paraguay	5	9	7	4	4	5	3	3	4	6	3	5
Peru	4	3	3	3	6	3	4	4	3	3	6	3
Uruguay	12	8	4	15	5	2	2	7	6	4	5	6
Venezuela	3	6	11	9	3	4	5	6	10	12	14	16

Source: Compiled by author based on IMF international financial statistics and the World Bank's *Databank* database.

Table 14 shows the country ranking, considering that optimum levels of foreign reserves must be equal to the pre-established target of 15% of GDP. These results are different to the previous ones since they reward central banks that

have deviated least from the target value. In this index, one is the worst value; zero is the best. The lower a country's deviation from the optimum value, the better; remaining closest to the target value will earn them a higher ranking. In 2010, Costa Rica, Brazil, Argentina, Chile, and El Salvador were in the top positions, only slightly below the target value. Bolivia, meanwhile, ranked lowest despite having accumulated large amounts of foreign reserves. In this case, over-accumulation is considered an excess that would cause greater opportunity and effective costs for the monetary authority. The central banks of Honduras, Peru, and Nicaragua are also in this position of having excesses, while Ecuador, Venezuela, and Guatemala were found to be have a shortage of foreign reserves.

Table **14**
Country ranking by foreign reserve deviation from target value of 15% of GDP

Country	*1990-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	13	10	14	6	7	6	2	1	3	1	1	3
Bolivia	9	5	4	9	10	10	3	14	17	17	17	17
Brazil	15	16	13	11	11	14	14	13	2	5	2	2
Chile	7	8	8	13	12	2	4	5	8	2	3	4
Colombia	4	9	6	4	6	8	11	10	9	9	7	8
Costa Rica	6	11	9	8	8	11	9	3	1	4	4	1
Dominican Republic	16	17	15	16	16	15	15	15	14	15	9	10
Ecuador	8	13	16	15	15	16	16	16	13	12	12	13
El Salvador	5	2	3	5	5	9	10	9	6	6	5	5
Guatemala	17	12	11	12	14	13	13	11	12	14	10	11
Honduras	11	15	17	17	17	17	17	17	16	16	16	16
Mexico	14	14	12	10	13	12	12	12	11	11	6	6
Nicaragua	10	3	7	3	4	1	1	6	7	8	14	14
Paraguay	3	7	5	2	3	3	7	8	10	3	15	9
Peru	2	1	2	1	1	5	6	7	15	13	11	15
Uruguay	12	6	1	14	2	7	8	2	4	10	13	7
Venezuela	1	4	10	7	9	4	5	4	5	7	8	12

Source: Compiled by author based on IMF international financial statistics and the World Bank's *Databank* database.

Tables 15 and 16 show the results of the general ranking of central banks, considering the five indicators in question: inflation, financial intermediation

margin, real exchange rate variability, availability of credit for the private sector, and the accumulation of foreign reserves according to the criteria of maximization and lowest possible deviation from the target rate of 15% of GDP. This is calculated by considering the indices for each variable and the corresponding weightings.

For the first objective function, Chile's central bank is the best in Latin America, in first place for every year in the period analyzed. For the second objective function, it remains in first place between 2004-2010, before ceding its top position to El Salvador between 1990 and 1999, in 2000, and in 2002 and 2003. This drop in ranking is mainly due to the Chilean central bank's excess of foreign reserves during those years. El Salvador's central bank comes second, especially in terms of the second objective function, while in terms of the first objective function its position is more variable.[8] In 2009 and 2010, Bolivia ranks second in the first objective function. Honduras is third in terms of the first objective function, although it ranks lower when considering that foreign reserves must be as close as possible to the target value of 15% of GDP.

The lowest ranked central bank throughout the entire period analyzed for both objective functions is Venezuela—although in some years Ecuador, Brazil, and Argentina took over this position in the 1990s and in the first five years of the twenty-first century. No single central bank occupied the second bottom position in Latin America throughout the entire period: various countries occupy this spot in specific years. Argentina is in this position two or three times, depending on the objective function; Costa Rica once or twice; and Brazil, Bolivia, Nicaragua, and the Dominican Republic at least once. It is interesting to note that three countries show a clear tendency to improve their position over time: Brazil, Colombia, and Ecuador in both objective functions. Also, Mexico and Peru climb the ranking considerably when comparing their performance in the current decade to the 1990s. However, both countries reach their highest position between 2007 and 2008 and between 2005 and 2007, respectively, *vis-à-vis* the first objective function, with their performance dropping marginally in recent years. For the other central banks, no clear trend or performance can be identified.

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[8] Without taking into account other variables such as contribution to economic growth, issuing domestic debt, or effectiveness in the face of financial crises, among other issues not included in the analysis.

Table **15**

Country ranking by first objective function (Maximization of foreign reserves)

Country	*1990-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	6	11	12	17	12	10	13	15	16	13	16	16
Bolivia	4	8	2	3	4	4	6	5	7	7	2	2
Brazil	17	15	15	15	15	15	15	10	9	10	11	14
Chile	1	1	1	1	1	1	1	1	1	1	1	1
Colombia	10	6	11	11	11	11	8	8	8	3	7	5
Costa Rica	8	12	13	10	10	12	16	16	12	14	15	11
Dominican Republic	9	14	14	8	16	17	10	13	13	15	14	15
Ecuador	15	17	17	13	9	5	2	6	5	8	10	7
El Salvador	2	2	4	2	2	3	4	2	3	2	3	3
Guatemala	7	7	10	9	8	9	11	9	10	11	6	8
Honduras	3	3	3	5	3	2	7	4	4	4	5	4
Mexico	13	9	9	7	7	8	5	7	6	6	13	9
Nicaragua	11	4	8	6	6	6	12	12	15	16	8	13
Paraguay	5	10	7	12	13	13	14	14	14	12	9	10
Peru	12	5	5	4	5	7	3	3	2	5	4	6
Uruguay	14	13	6	14	14	14	9	11	11	9	12	12
Venezuela	16	16	16	16	17	16	17	17	17	17	17	17

Source: Compiled by author based on IMF international financial statistics and the World Bank's *Databank* database.

Table **16**

Country ranking by first objective function (distance from value target of 15% of GDP)

Country	*1990-1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Argentina	7	10	12	17	12	9	12	14	13	12	16	16
Bolivia	4	6	1	2	3	3	6	6	16	15	11	11
Brazil	17	16	15	14	15	15	14	9	6	6	7	9
Chile	2	2	3	4	2	1	1	1	1	1	1	1
Colombia	6	5	11	7	11	10	7	7	7	3	4	3
Costa Rica	5	11	13	9	8	11	16	15	9	13	13	8
Dominican Republic	10	15	14	11	16	17	8	13	12	14	9	15
Ecuador	15	17	17	13	9	4	3	4	3	5	5	4
El Salvador	1	1	2	1	1	2	2	2	2	2	2	2
Guatemala	8	7	9	8	7	7	11	8	8	9	3	6
Honduras	11	12	10	10	10	12	15	11	11	11	14	10
Mexico	13	9	8	6	6	6	5	5	4	4	8	5
Nicaragua	9	3	7	5	5	5	10	12	15	16	10	14
Paraguay	3	8	6	12	13	13	13	16	14	10	12	13
Peru	12	4	4	3	4	8	4	3	5	7	6	7
Uruguay	14	13	5	15	14	14	9	10	10	8	15	12
Venezuela	16	14	16	16	17	16	17	17	17	17	17	17

Source: Compiled by author based on IMF international financial statistics and the World Bank's *Databank* database.

Conclusions

Creating indicators to assess the performance of central banking in Latin America is useful not only in order to understand their effectiveness, but also to provide tools with which to analyze whether these institutions are helping our economies grow and develop. A more effective monetary authority is the one that helps stimulate the business climate by seeking a lower rate of inflation —its main objective— and contributes to the financial sector offering more credit to the productive sector both for financing current operations and for expanding productive capacity. Also, lower financial intermediation margins bring down costs and increase its contribution. The business environment will also be improved with fewer fluctuations in the real exchange rate and with appropriate levels of foreign reserves, which guarantee the country's solvency and enable it to honor its foreign trade commitments as well as its services and capital accounts.

A methodology has been developed to calculate the value of the indicators and of the objective function using two options. This is an initial approach to the topic, working with the hypothesis that Latin America's monetary authorities' policies are comparable. We have only selected what we consider the most relevant available data. From our analysis of the respective political constitutions, organic laws, and legal framework, clearly individual circumstances exist that affect this comparison. We do not examine countries' particular objectives, or their ability to respond, or the effects resulting from the implementation of a specific monetary policy. For example, the reaction of lending and borrowing interest rates to adjustments in the reference rate, the effectiveness of increasing or decreasing the reserve rates for increasing or reducing available liquidity in a comparative international perspective, which could be done using a macroeconomic model applicable to every country.

In the case of the first indicator for inflation, we chose the simple criterion of ranking countries based on which one has the lowest inflation. We did not develop an index to compare their effective rates in relation to their inflation targets, since this approach is only applied to six countries in the region. Of all the indicators, only the level of international reserves may be the cause of debate, since for some countries, maximizing foreign reserves is important, whereas

others consider that there are optimum levels. In this study, we have trialed a target level equivalent to 15% of GDP for the entire period analyzed. If a monetary authority has foreign reserves in excess of this level, this creates higher opportunity and effective costs, while lower levels would entail greater risks. Clearly, setting a single target for all Latin American countries throughout the entire period provides an observable criterion.

Individual indicators and objective functions are useful for ranking central banks according to standard criteria. Performance indicators and objective functions do not factor in issues involving the monetary authorities' autonomy or independence, level of transparency, or operational efficiency, and we do not look at internal processes that might explain the higher or lower ranking of one bank compared to another. The analysis is restricted to understanding the result of each one of the specified indicators.

Calculating the indicators and the ranking based on the objective functions makes it possible to draw some conclusions about which central banks are more or less effective, and which ones rank in the middle. The top-ranking group includes Chile, El Salvador, and Honduras. According to our criteria, Venezuela ranks lowest, although in some years Ecuador, Brazil, and Argentina take its place. No single Latin American central bank consistently comes in second lowest, as this position has been shared by Brazil, Argentina, Bolivia, Costa Rica, Nicaragua, and the Dominican Republic.

It is interesting to note that three countries show a clear tendency to improve their ranking over time in both objective functions: Brazil, Colombia, and Ecuador. Also, Mexico and Peru show improvements when comparing their performance in the current decade to that of the 1990s. However, each of these countries has fallen in the rankings in recent years. No clear trend or performance can be observed in relation to the other central banks in the region.

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