



# **A Historical Analysis of Central Bank Independence in Latin America: The Colombian Experience, 1923-2008\***

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## **Abstract**

This paper explores the relationship between central bank independence and inflation in Latin America, using as a case study the experience of Colombia (1923-2008). Since its creation, in 1923, Colombia's central bank has undergone several reforms that have changed its objectives and degree of independence. Between 1923 and 1951, it was private and independent, with a legal commitment to price stability. In 1962 monetary responsibilities were divided between a government-dominated Monetary Board, in charge of monetary policy, and the central bank, which carried them out. In the early 1990s, the bank recovered its independence and its focus on price stability. Inflation varied substantially during these subperiods. The analysis shows that central bank independence, combined with a commitment to price stability, renders the best results in terms of price stability.

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## **1. Introduction**

In this paper we study the relationship between the institutional reforms that the Colombian central bank, Banco de la República, has undergone since its creation in 1923 and the level and variability of the country's rate of inflation. Over the last decade there has been an abundant empirical literature on the relationship between central bank independence and inflation. This body of literature, however, usually employs cross section statistical analysis. Thus, there are important country-specific characteristics that have not been taken into consideration. For this reason it is fruitful to examine in depth country-specific historical experiences. Colombia, moreover, is an interesting case study in this respect, since its central bank is one of the two oldest in Latin America and has gone through distinct subperiods in which its objectives and degree of autonomy have varied.

In the next section we review the recent empirical literature on the relationship between central bank independence and inflation. Then we present the Colombia case study. In the fourth section we discuss if there was a structural break in the inflation rate in the early 1990s as a result of the change in central bank legislation ushered by the Constitution of 1991. Finally, we present some conclusions.

## **2. A Review of the Literature**

In 1973, with the generalized increase in inflation after the end of the Bretton Woods agreements, under which fixed exchange rates worked as nominal anchors, several proposals to achieve price stability were put forward. One of the first came from Milton Friedman. Friedman argued that price stability could be achieved by allowing central banks to pursue a monetary policy based upon a fixed rule announced every year. It can be shown, however, that commitment to such a rule is not an optimal strategy because it makes central banks too inflexible to face unanticipated shocks, particularly supply-side shocks (Rogoff 1985).

In 1976, F. A. Hayek proposed a more radical strategy to achieve price stability (Hayek 1976). His argument was based on the denationalization of money, and his core idea was that private banks should issue their own currencies – currencies that were not convertible against each other. Under this proposal, banks would have the incentive to obtain funds from consumers at no cost by encouraging them to hold their own currency. This is known as a “free banking” regime.

As a result of Hayek’s “eccentric” proposal, interest increased in the study of the historical experience with free banking. Under the free banking system there are no barriers to entry and there is no centralized control of international reserves (Schuler 1992). The arrangement existed in many countries prior to the consolidation of a system with a single central bank that holds a monopoly on the issuance of currency.

Traditional economic historiography, particularly in the United States, viewed very negatively the experience with free banking, given that this system was supposed to “over print” money. According to this view, free banking regimes would inevitably end up in massive withdrawals of deposits and banking panics. More recently, research by economic historians, such as H. Rockoff (1974), A. J. Rolnick and W. E. Weber (1983), and L. White (1984), have contributed to the analysis of a wide variety of international historical experiences with free banking. These authors find that free banking regimes were generally successful in achieving price stability.

Despite the historical evidence supporting the success of free banking in achieving price stability, free banking currently has very few supporters. The problem is that it is unclear how a system of free banking can be introduced without going back to a gold or silver standard. Thus, at present the attractiveness of the free banking system is very limited (Sechrest 1993).

A less radical approach to achieve price stability is that which postulates an autonomous central bank. In fact, since the 1980s, the idea of an autonomous central bank has gained support (Cukierman 2008). Part of this support stems from the success of the Bundesbank (one of the most autonomous central banks in the world) in achieving a relatively low rate of inflation for several decades. For the period 1970-1990, the average inflation rate in the Federal Republic of Germany reached 3.8%, the lowest among the main economies of the world.

How does central bank independence yield lower inflation rates? There are at least three mechanisms. First, some authors who hold the “public choice view”, such as Buchanan and Wagner, argue that, without independence, there is strong pressure on the central bank to behave in line with the preferences of the government. As Buchanan and Wagner put it (de Haan and Sturm 1992):

A monetary decision maker is in a position only one stage removed from that of the directly elected politician. He will normally have been appointed to office by a politician subject to electoral testing, and he may even serve at the pleasure of the latter. It is scarcely to be expected that persons who are chosen as monetary decision makers will be the sort that are likely to take policy stances sharply contrary to those desired by their political associates, especially since these stances would also run counter to strong public opinion and media pressures... ‘Easy money’ is also ‘easy’ for the monetary manager....

A second mechanism through which greater central bank independence yields lower inflation is that governments with discretionary powers over monetary policy have the incentive to follow an expansionist path to achieve short-term reductions in unemployment. As this instrument is used more and more often, feeding price-rise expectations, inflation increases without having any effect on employment. For that reason, in this context an autonomous central bank will achieve lower inflation without affecting the real sector of the economy.

The third mechanism is suggested by Sargent and Wallace (1981), who point out that when fiscal policy is dominant—that is, when the central bank can not affect the size of the fiscal deficit—money supply becomes endogenous. If, on the other hand, monetary policy is the dominant policy, fiscal authorities will be forced to reduce the fiscal deficit.

Perhaps the idea of central bank independence owes its current popularity more to the international empirical evidence about its positive effects than to theoretical arguments. In fact, since the pioneering work of Bade and Parkin (1985), several other studies have found statistical evidence consistent with the hypothesis of an inverse relationship between the degree of central bank independence and the inflation rate (Alesina 1988).<sup>1</sup>

One of the first studies that analyze the relationship between central bank independence and price stability is that of Bade and Parkin (1985), who examine the experiences of 12 developed countries in the period after Bretton Woods. They constructed a measure of central bank independence that takes a value 1, if independence is minimal, and 4, when independence is the highest. The results show that the degree of independence, as measured by their index, is an important factor determining the level of inflation, and that the two countries with highest central bank independence in the sample (Germany and Switzerland) had inflation rates below the average for the sample. On the other hand, they find no differences in the inflation rates of countries whose central banks were classified as less independent. Alesina (1988) adds four more countries (Denmark, New Zealand, Norway, and Spain) to the Bade and Parkin sample, and shows that there is an inverse relationship between the degree of independence of the central bank and the average inflation level in the period 1973-1985.

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<sup>1</sup> See Eijffinger and de Haan (1996), Berger et al. (2001), and Cukierman (2008) for thorough reviews of the literature on central bank independence.

Other studies using different types of independence indexes also find evidence consistent with these results. Grilli, Masciandaro, and Tabellini (1991), for example, develop two types of indexes to capture different facets of central bank independence: one measures economic independence and the other political independence. In their regression analysis of inflation, they use data for the period 1950-1989 and a sample of 18 developed countries. They find that central bank independence indexes always have the correct sign (negative). In addition, the coefficient on the economic independence of the central bank is statistically significant in periods of high inflation and the political independence index is statistically significant in the 1970's. Although not conclusive, these results are indicative of a potential association between central bank independence and inflation.

Despite the evidence presented by these early studies, it was not clear how robust these results were to the use of a more representative sample of countries, and, in particular, how these results would change with the inclusion of developing countries. Cukierman et al. (1992) partially address both these concerns by using a sample of 72 countries, of which 51 are developing nations. Their results are consistent with the previous literature in that they find a negative correlation between central bank independence and inflation. This result, however, is only found for the industrialized countries in their sample. The authors argue that, in developing countries, "formal" central bank independence can differ from "actual" independence. For that reason, they use indicators of real independence, such as the political vulnerability of the central bank governor, as measured by the probability of a change of governor given a change in government. As expected, they find a statistically positive relationship between inflation and the political

vulnerability of the central bank governor. Since the authors find that for developing countries there is Granger-causality in both directions between inflation and the vulnerability of the central bank governor, the role of autonomy in shaping inflation is not as clear as for the sub-sample of developed countries.

The main characteristic of the studies described above is that they use cross-section analysis. It is very unlikely that the correlations thus estimated reflect the true interrelation between the autonomy of the central bank and the dynamics of inflation. Alesina (1988), for example, points out that this correlation can arise because countries that prefer low inflation may also prefer independent central banks. In other words, there might be some unobserved characteristic correlated with central bank independence that, if not controlled for in the regressions, will make the coefficient on independence biased. In a recent study, Crowe and Meade (2008), using longitudinal data to eliminate country fixed effects and using their own measure of central bank independence, find evidence of an inverse relation between independence of the central bank and inflation.<sup>2</sup> This implies that, even when controlling for country heterogeneity and shocks that affect all countries simultaneously, the inverse relation between central bank independence and inflation still persists.

For the specific case of Latin America, Jácome and Vázquez (2008) have produced what is perhaps the most complete empirical analysis of the relationship between central bank

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<sup>2</sup> This study also calculates measures of central bank transparency and relates them to inflation rates.

independence and inflation. Their study uses data for 24 countries in the period 1985-2002. The authors use longitudinal information and panel data methods to overcome some of the limitations of previous studies. In particular, they are able to account for time-invariant variables related to inflation and to take into account shocks that affect all countries in the same year (e.g., the reforms of the 1990's). They find that, on average, countries with more independent central banks (as measured by four measures of legal and actual independence) have lower inflation rates during the period. This finding is in sharp contrast with previous studies, such as de Hann and Kooi (2000) and Jácome (2001), which were unable to find a strong relationship between these two variables for the case of developing countries.<sup>3</sup> Studies that used alternative measures of central bank independence (for example, whether countries include legal independence in the constitution), also find a negative correlation with inflation, perhaps because this measure captures in a better way the commitment with price stability and because constitutional measures are more likely to be enforced and implemented (Gutiérrez 2003).<sup>4</sup>

Despite the recent focus of the literature on panel data methods and cross-country regressions, other authors take a different empirical approach by focusing on the experience of particular countries.<sup>5</sup> For example, Otero and Ramírez (2006) fit a pure time-series model of the determinants of inflation to statistically test whether the reform to the independence of the

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<sup>3</sup> Some papers also find no evidence of a relationship between central bank independence and inflation in industrialized countries. Daunfeldt and de Luna (2008), for example, find that price stability is achieved *before* more independence is given to central banks in OECD countries.

<sup>4</sup> For an analysis of the reforms that lead to the creation of independent central banks in Latin America, see Junguito Bonnet (1996), Carstens and Jácome (2005), and Jácome (2008).

<sup>5</sup> For the Colombian experience, see Echeverri (1991), Meisel (1992), Restrepo (2000), Kalmanovitz (2003), and Giraldo Palomino (2007).

central bank in the early 1990s in Colombia changed the parameters of the model. They found that both internal factors and external factors are important in explaining the inflation rate (at least in the Colombian case), and that reestablishing the independence of the central bank changes the parameters of the model. In particular, they find that disequilibria in the goods and money markets had a larger effect on inflation before the central bank was made independent in 1991.<sup>6</sup>

An alternative approach for the analysis on the relationship between the independence of the central bank and price stability is a careful review of country cases. One advantage of case studies is the possibility of carrying out deeper analysis over a relatively longer period of time and taking advantage of changes in the degree of autonomy of the central bank over time. Colombia is an interesting case in this respect because, since its creation in 1923, the central bank has acted under different degrees of independence.

### **3. The Case of Colombia, 1923-2008**

Colombia has one the most varied experiences with central banking in Latin America, since it was the second country in the region to have such an institution.<sup>7</sup> Additionally, since its creation in 1923, under the direction of the American advisor Edwin W. Kemmerer, the Banco de la

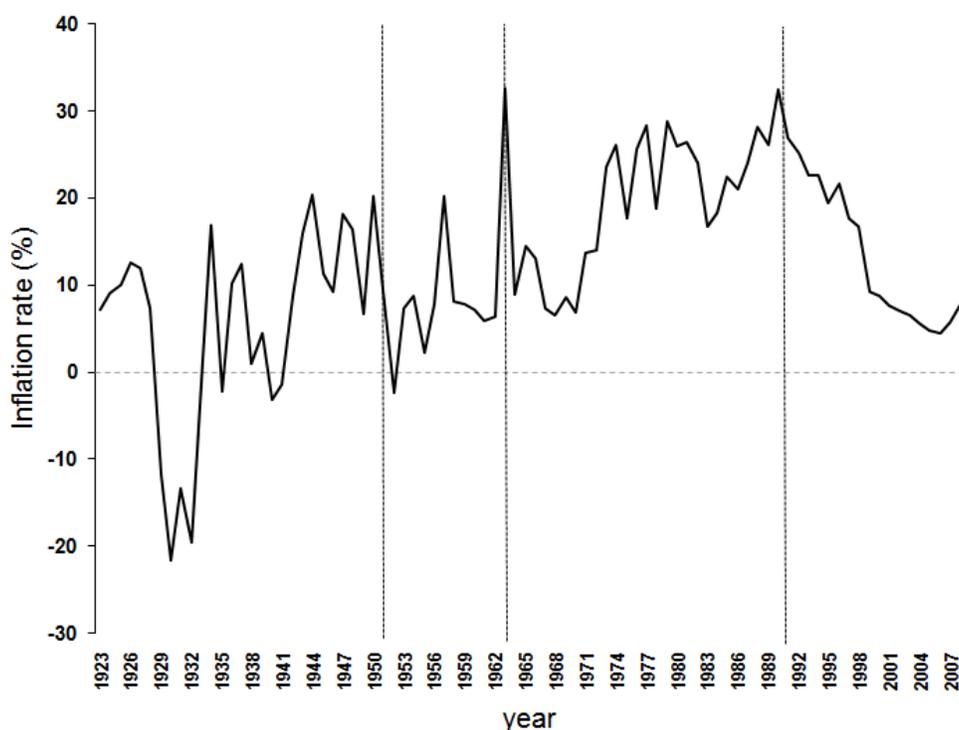
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<sup>6</sup> In terms of the legal independence of the central bank in Colombia, one important question is how the legal powers given to the central bank in the early 1990s compare to the legal set up of successful central banks in other countries. Gómez Mejía (1997) undertakes a comparative analysis of the laws that determined central bank independence in several countries. He finds that the legal structure that defined the central bank in Colombia is similar to that of successful European central banks, and concludes that, at least in theory, this gives the central bank in Colombia a good chance of succeeding in controlling inflation.

<sup>7</sup> For an analysis of the development and evolution of the Colombian financial system during the 20<sup>th</sup> Century see Urrutia Montoya and Caballero Argáez (2006).

República has undergone several major reforms which have influenced the degree of its autonomy *vis a vis* the central government. Thus, it is an ideal case to study the interrelationships between the degree of central bank independence and the level and variability of the rate of inflation. Figure 1 presents the evolution of inflation since the creation of the central bank in 1923.

**Figure 1.** Inflation Rate in Colombia (1923-2008)



**Sources:** *Grupo de estudios económicos regionales* (1999) and data from the Banco de la República website ([www.banrep.gov.co](http://www.banrep.gov.co)).

**Note:** The vertical lines coincide with the years of major reforms to the autonomy of the central bank.

To establish the main subperiods in the history of the Banco de la República, two aspects were taken into consideration: whether formal autonomy existed and the main objectives established

for the central bank by law. Using the above two criteria, it is possible to identify four subperiods (see Table 1).

**Table 1.** Main Subperiods in the Institutional History of the Colombian Central Bank (1923 to present)

<b>Period</b>	<b>Name of the central bank</b>	<b>Nature</b>	<b>Main objective</b>	<b>Commitment to price stability?</b>
1923-1951	Banco de la República	Private and autonomous	Price stability	Yes
1952-1963	Banco de la República	Private and autonomous	Price stability and "rapid economic development"	No
1964-1991	Junta Monetaria	State-owned with no autonomy	Management of monetary, exchange rate and credit policies	No
1992-present	Banco de la República	State-owned and autonomous	Price stability	Yes

When the Colombian central bank was created in 1923, a clear commitment with the stability of the purchasing power of the peso convertible to gold and the smooth functioning of the gold standard was established by law. To further maintain that commitment, it was determined that the institution would be a private bank, with the government among its stockholders. At the time, many countries were establishing independent central banks and the most influential academic economists were also promoting them. For example, at the International Conference of Finance, held in Brussels in 1920, a call was made for every country to create an autonomous central bank (Deane and Pringle 1994).

In Colombia, the gold standard was maintained until 1931. Afterwards, the nominal exchange was kept fixed, except in the period 1933-1935, when the peso was devalued with respect to the US dollar. Thus, during the period 1923-1951, the money supply was endogenous and the level of inflation was determined by the level of inflation in the main trading partners, basically the United States. Thus, the correlation coefficient between the level of inflation in Colombia and the United States for this first subperiod was 62%.

It can be said that central bank autonomy and the commitment to price stability in the period 1923-1951 produced a relatively low average yearly rate of inflation (5.6%). However, the variability of the inflation rate, as measured by the standard deviation around the linear trend, was the highest among the four subperiods we are discussing (see Table 2). Since the money supply was endogenous and the inflation rate depended on the international rate of inflation, the explanation for the enormous variability of its level is found in events related to the world economy: the Great Depression, and the reduction of inflation it produced, and World War II, which in Colombia generated price rises because of lower imports of key supplies, that in turn led to an enormous increase in international reserves.

**Table 2.** Some Monetary Indicators for the Main Subperiods in the History of the Colombian Central Bank

Period	Inflation rate (mean)	Coeff. on Trend <sup>(a)</sup>	Standard deviation around linear trend <sup>(b)</sup>	Was inflation higher than in the previous period?
1923-1951	5.6	0.49 (.23)	10.4	
1952-1963	9.3	1.29 (.67)	7.6	Yes
1964-1991	19.8	0.71 (.12)	5.0	Yes
1992-2008	12.5	-1.37 (.15)	2.9	No

Notes:

(a) This figure is the coefficient on a linear trend that comes from a OLS regression of inflation on a constant and a linear trend. The numbers in parentheses are standard errors.

(b) This is the standard deviation of the residuals from an OLS regression of inflation on a constant and a linear trend.

Beginning in the late 1940s, there was wide discussion in Colombia about different proposals to reform the central bank. One of the issues most often raised was credit policy, which was seen as too orthodox. Some of the promoters of the reform wanted the Banco de la República to play an active role in economic development through the granting of long-term subsidized credit. With that intention, in 1949 the government invited Richard Grove and Gerald Alter, of the Federal Reserve Bank, to study the Colombian financial system and recommend changes. Their proposals were presented in two documents written in 1950 (Grove and Alter 1986a; 1986b). The main aspects of what they proposed were included in Decree 756 of 1951, which redefined the instruments at the disposal of the central bank, as well as its objectives. In its first article this decree was very clear about the new perspective that would guide the central bank: "...the Banco de la República will carry out a monetary, credit, and exchange rate policy oriented towards stimulating the conditions for the accelerated development of the Colombian economy." As a result of the changes in the central bank legislation carried through in 1951, subsidized credit, *crédito de fomento*, increased from 7.6% of total credit in 1952, to 15.0% by 1960.

The new economic philosophy that started to dominate monetary policy since the early 1950's led to a reduction in price stability. However, since there were still fixed exchange rates monetary expansion led to cycles of price increase, revaluation of the peso versus the US dollar, and, eventually, to a devaluation of the nominal exchange rate. This is why the period is known in Colombian macroeconomic history as that of "stop-go" policies. Thus, it can be said that the period 1951-1963 was very unstable from a macroeconomic point of view: inflation almost doubled and its deviation from the trend was also high (see Table 2).

Beginning in the 1940's, it was often argued that it was inconvenient for the Banco de la República to be a private bank. Finally, in 1962, a way around the private nature of the central bank, in a fashion similar to what had been done in Paraguay (1944), Guatemala (1945) and Ecuador (1948), was proposed: the creation of a government-controlled Monetary Board (Junta Monetaria). As a result, since 1963 the Colombian central bank was divided between a Monetary Board, that determined monetary, credit, and exchange rate policies, and the Banco de la República, that carried out those policies.

The Monetary Board never had a clear commitment to the stability of the purchasing power of the peso. In this respect, the Minister of Finance at the time was very clear about the consequences of the lack of autonomy of the Monetary Board with respect to the government (Sanz de Santamaría 1965, 228):

If governments are bad, there will be bad monetary management, and a bad and difficult situation for the country. If governments are good, the situation will improve for the country. But it is the state, represented by the government, that ought to direct monetary policy.

As a consequence of the loss of central bank autonomy there was a significant increase in the average level of inflation, which rose to a yearly 19.8%, during the period 1964-1991. Although the instability of the average inflation rate fell with respect to the previous period, it was still high. That reduction could perhaps be explained by the adoption of a crawling peg regime in 1967, that eliminated the abrupt devaluations of the period 1952-1963 and the stop-go macroeconomic cycles.

In 1991, Colombia approved a new constitution. One of the most important economic reforms it brought about was the reestablishment of central bank autonomy. The Monetary Board was abolished and the Banco de la República regained control of the monetary and credit policy. Since in 1973 it had been converted into a government bank (the government became the controlling stockholder), this reform did not represent just a return to the situation of the period 1923-1951. Now, the Banco del República also controlled all aspects of exchange rate policy, an important aspect of economic policy that, before 1991, was in the hands of Congress.

Law 31 of 1992, which developed the new constitutional obligations of the central bank, established very clearly that its main goal is to maintain the purchasing power of the peso. To assure the independence of the Banco de la República, the law also determined that each

president of Colombia, midway through his period, would appoint two of the five members of the board of directors. These members are appointed for successive periods of four years and can stay in office for a maximum of three periods (12 years). In turn, the members of the board of directors, in conjunction with the Minister of Finance, who presides the board, appoint the General Manager (President) for a period of four years. The general manager may be reelected for a maximum of two periods.

The board of directors of the Banco de la República is composed of the five members, plus the Minister of Finance and the General Manager. Thus, theoretically, of the seven members, each President would appoint a maximum of three, but for two of them the appointment only coincides with the last two years of that presidential period. In almost every case since 1991 the president has appointed at least three members of the board (in addition to the Minister), since it has been common that some board members resign before the end of their four-year period. Additionally, in 2006 the Constitution was changed to allow for the reelection of the president. Thus a reelected president, as has happened with Alvaro Uribe in the period 2006-2010, appoints at least four board members plus the Minister, which leads to a clear majority. For this reason some critics argue that presidential reelection has weakened the autonomy of the central bank. Others, nevertheless, argue that the constitutional mandate of the central bank to preserve the purchasing power of the currency is so clear, that it does not matter that one president eventually may appoint a majority of the board members. Finally, others believe this will depend to a great extent on the quality of the appointees. If, as has happened until now, high-level professional economists are named, the independence of the bank will be preserved. This situation, however,

would not prevent that if politically motivated designations predominate, things could be different and the central bank could fall under the complete control of the government in office. In sum, the presidential reelection has a potential for loss of autonomy of the central bank.<sup>8</sup>

**Figure 2.** Institutional Determinants of Inflation

		<b>Central bank's objective</b>	
		<b>orthodox</b>	<b>unorthodox</b>
<b>Central bank's type</b>	<b>Independent</b>	<p>①</p> <p>Minimum inflation</p>	<p>③</p> <p>Intermediate to high inflation</p>
	<b>Dependent</b>	<p>②</p> <p>Intermediate to low inflation</p>	<p>④</p> <p>Maximum inflation</p>

The Colombian experience with central bank autonomy brought by the Constitution of 1991 has been quite successful. In the period 1992-2008 the inflation rate fell to an average level of 12.5%. Additionally, it is the only subperiod in which the trend in the inflation rate is negative. Also, the variability of the rate fell to the lowest level among the four subperiods discussed here, with a standard deviation around the linear trend of 2.9.

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<sup>8</sup> Kalmanovitz (2003) also carries out an analysis of the degree of autonomy of the central bank in Colombia and concludes that autonomy is real but limited.

**Figure 3.** Institutional Determinants of Inflation and the Colombian Experience (1923-2008)

		<b>Central bank's objective</b>	
		<b>orthodox</b>	<b>unorthodox</b>
<b>Central bank's type</b>	<b>Independent</b>	1923-1951 ( <b>5.6</b> ) 1992-2008 ( <b>12.5</b> )	1952-1963 ( <b>9.3</b> )
	<b>Dependent</b>	—	1964-1991 ( <b>19.8</b> )

Note: The numbers in parentheses refer to the average inflation rate during the period.

#### **4. Empirical Application: Was There a Structural Break in the Early 1990's?**

A few years after the 1991 reform that gave the Colombian central bank a higher degree of independence, there was some debate on whether this new institutional arrangement was superior, in terms of lowering inflation, compared to the previous arrangements, in particular the Junta Monetaria [Meisel (1996) and Fernández Riva (1996)]. Since the reforms were very recent, it was very difficult to conclude whether they had helped significantly to lower the levels of inflation. At present, however, we have a sufficient number of observations to examine this issue using rigorous statistical methods.

In this section, using quarterly data for the period 1980-2008, we explore the hypothesis of whether there was a structural break in 1991 in the inflation series. If the central bank did in fact make use of the new flexibility that independence gave it, one should observe a structural break in the series of inflation soon after the reform went into effect in 1991.<sup>9</sup> We interpret these tests as a necessary condition for determining whether central bank independence in Colombia had an impact on inflation.

Figure 4 shows CUSUM and CUSUM of squares tests (rows 1 and 2) for the inflation series in Colombia and Chile. The reform that established the independence of the central bank in Chile was passed in 1989, while in Colombia it was adopted in 1991. Additionally, the figure shows in

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<sup>9</sup> This is not to say that this is the only explanation consistent with the data, but it does constitute a necessary condition.

the third row the residuals of the model behind the CUSUM and CUSUM of squares test; these are univariate autoregressive models with five lags—AR(5). It is important to point out that if our main hypothesis is correct (i.e. that there was a structural break in 1991) fitting a “well behaved” model will be very difficult.

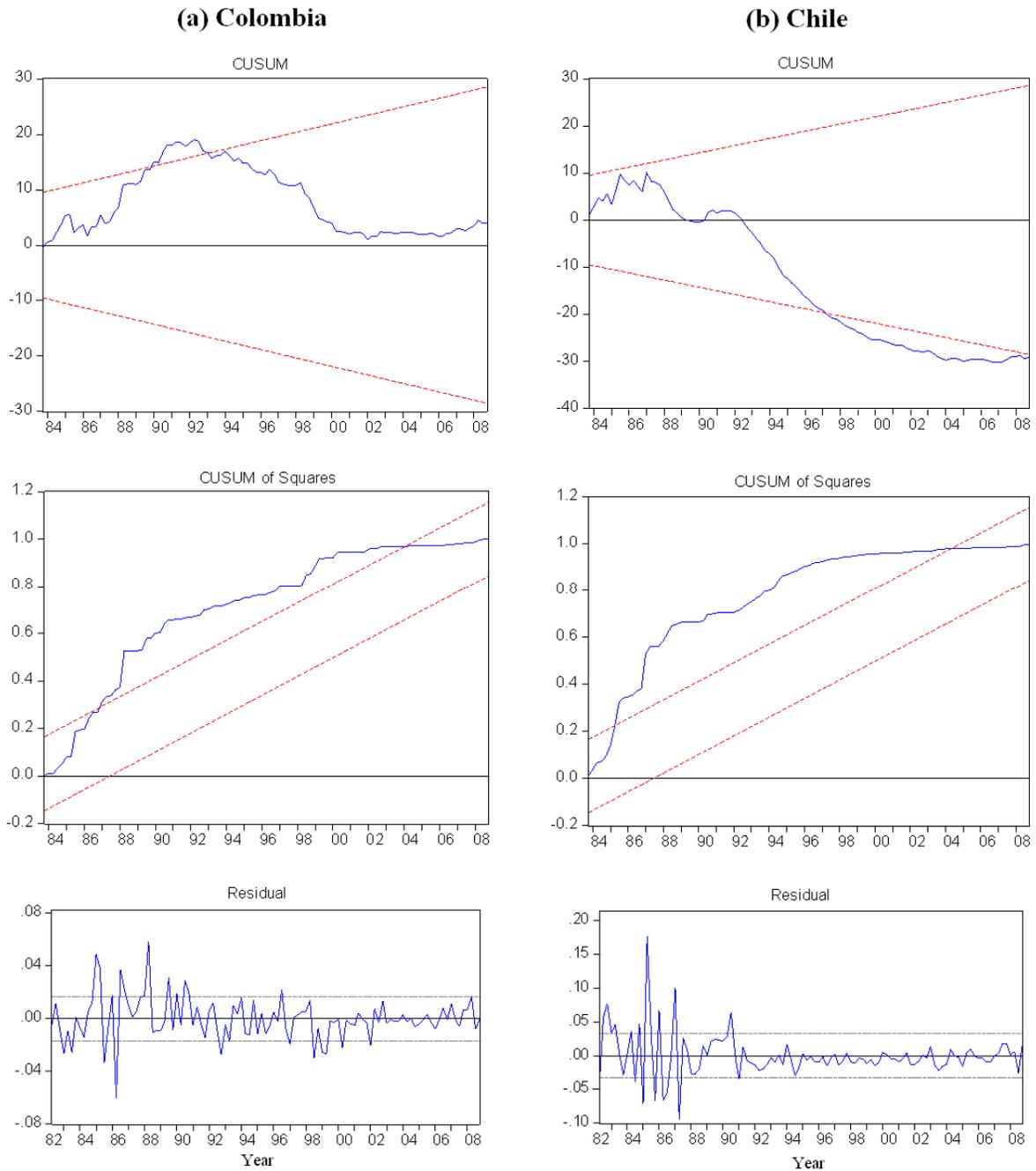
The CUSUM test is based upon the recursive residuals of the model. Figure 4, first row, presents the graphical representation of  $R_m = \hat{\sigma}^{-1} \sum_{t=k+1}^m r_t$  for  $m = k + 1, \dots, T$ ; where  $r_t$  stands for the recursive residual (Maddala and Kim 1999). The straight, dashed lines are the probabilistic bounds for the path of  $R_m$  under the null hypothesis (the level of the test is 5%). The null hypothesis of no-break is rejected if  $R_m$  crosses the boundary. The aim of this test is to detect *systematic* changes in the coefficients of the model. On the other hand, the CUSUM of squares (second row) plots  $S_m = \left( \sum_{t=k+1}^m r_t \right)^2 / \sum_{t=k+1}^m r_t^2$  for  $m = k + 1, \dots, T$ . This tests aims at capturing *irregular* changes in parameters. In a similar fashion to the CUSUM test, the null hypothesis is rejected if  $S_m$  crosses the boundary. The boundary in the figure is at the 5% level.

Figure 4 shows that there is some evidence consistent with systematic parameter instability (CUSUM test) in Colombian inflation soon after the new constitution gave the central bank its independence in 1991. The same test, however, finds no evidence of parameter instability in the Chilean inflation rate around the date of the reform of the central bank in that country (1989). The CUSUM of squares tests finds evidence of irregular changes in parameters for both

Colombia and Chile, starting approximately in 1986 and ending in 2004. This is not surprising, given the high variability of the inflation series at the beginning of the sample (see Appendix, Figure A1, for inflation rates for Colombia and Chile during this period). Moreover, the residuals of these models (Figure 4, row 3) indicate the bad fit of the model for both countries before central bank independence – in Colombia before 1991 and in Chile before 1989. In general, several other models that were estimated show the same problem: either good or bad fit before the reform and good or bad fit after the reform. This indicates that no single model can accommodate the dynamics of inflation before and after reform.

Although not all the tests show consistency with the hypothesis that there is a break in the series of inflation, the ones that do are too precise to be simply disregarded. This, in addition to the dramatic change in the trend of inflation after the reform, the reduction in the variance in the series, and results from other studies such as Otero and Ramirez (2006), indicates a structural break shortly after the establishment of central bank independence.

**Figure 4.** Tests of Structural Break in the Inflation Series, Colombia and Chile, 1980-2008



Notes: To obtain information for this figure we estimate univariate AR(5) models for the quarterly series of inflation for the period 1980-2008. The first row presents the CUSUM test, the second the CUSUM of squares test, and the third plot the residuals of the model. The reform to the central bank in Colombia and Chile was in 1991 and 1989, respectively. Dashed lines represent boundaries for the tests at 5% level. We cannot reject the null hypothesis of no break-point at 1992q1 for Colombia using a Chow test ( $F$ ,  $p$ -vale=0.2879). The test for Chile, however, rejects the null hypothesis of no break-point at 1990q1 ( $F$ ,  $p$ -vale=0.0004).

## **5. Concluding Remarks**

In Table 2 and Figure 3 we present a summary of the results of the four phases of the history of the Banco de la República in terms of the inflation rate. It is very clear that the first period (1923-1951) has the best outcome from the point of view of the average level of inflation. However, in terms of instability, the fourth period (1992-2008) has the lowest standard deviation around the trend. Although the fourth period has the third highest level of inflation, this period has lasted only 18 years and the inflation rate when it started was quite high. The trend in the inflation rate, nevertheless, is negative and statistically significant. Thus, we conclude that the best results in terms of inflation are obtained with an independent central bank that follows autonomous objectives. The second period (1952-1963) produces intermediate results in terms of inflation. The worst results are those for period three (1964-1991), a dependent and un-orthodox central bank. Thus the Colombian experience coincides quite well with the predictions presented in Table 2 about the institutional characteristics of the central bank and their influence on the level of inflation.

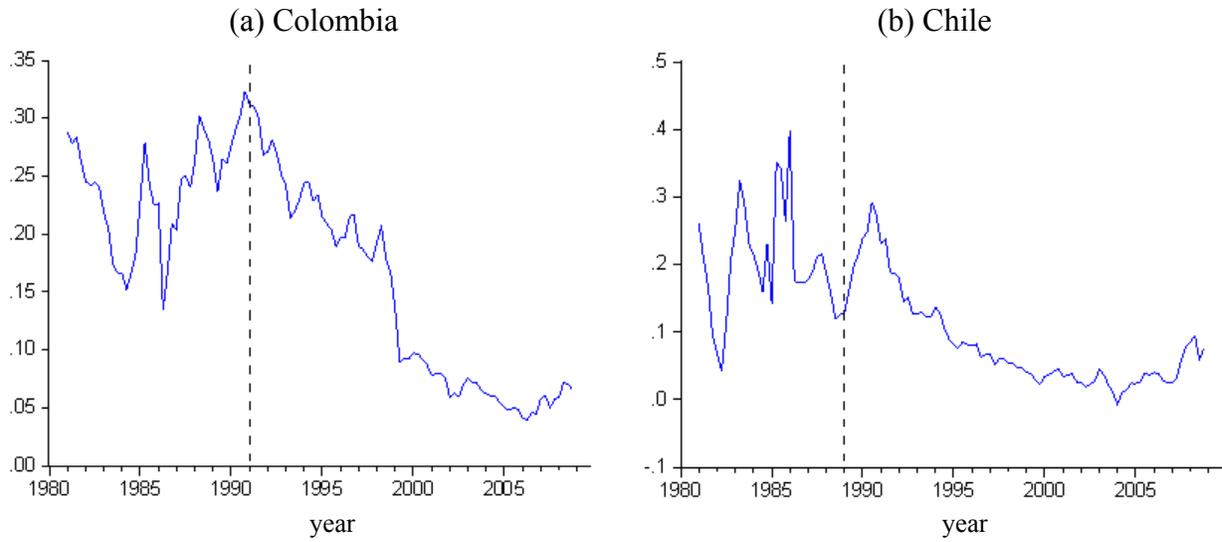
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**Appendix Figure A1.** Inflation Rates in Colombia and Chile, 1981-2008.



Source: Banco de la República and International Financial Statistics (IFS), International Monetary Fund (IMF).