

# Fiscal Sustainability and Crises. The Case of Argentina

**María Florencia  
Aráoz**

UNSTA

[faraoz@unsta.edu.ar](mailto:faraoz@unsta.edu.ar)

**Ana María  
Cerro**

UNT and UNSTA

[acerro@herrera.unt.edu.ar](mailto:acerro@herrera.unt.edu.ar)

**Oswaldo  
Meloni**

UNT

[omeloni@herrera.unt.edu.ar](mailto:omeloni@herrera.unt.edu.ar)

**Tatiana  
Soria Genta**

UNSTA

[tsoriag@yahoo.com.ar](mailto:tsoriag@yahoo.com.ar)

## Abstract

This paper contributes to the study of the economic history of argentine crises by analyzing the fiscal sustainability for the period 1865-2002. Fiscal deficits are sustainable if the current market value of debt equals to the discounted sum of expected future surpluses. Following a large literature started by Hamilton and Flavin (1986) sustainability is empirically tested by finding out if revenues and expenditures (including interest payments) are cointegrated along a given period.

It is found that Argentina never had “strong” fiscal sustainability. At most, it reached weak sustainability for some sub periods and no sustainability at all for 1950-1989. Interestingly, sustainability gets worse as the economy went from mostly open to relatively close.

## Resumen

El presente trabajo contribuye al estudio de la historia de las crisis argentinas mediante el análisis de la sustentabilidad fiscal para el período 1865- 2002. Los déficit fiscales son sustentables si el valor de mercado de la deuda pública es igual al valor presente de los superávit futuros. Siguiendo una extensa literatura iniciada por Hamilton y Flavin (1986) la sustentabilidad fiscal se testea indagando si los recursos y gastos públicos (incluyendo servicios de la deuda) están cointegrados en un dado período.

Se encuentra que Argentina nunca tuvo sustentabilidad fiscal “fuerte”. Como máximo exhibió sustentabilidad fiscal “débil” para algunos subperíodos o no-sustentabilidad para los años 1951- 1989. Se observa además que la sustentabilidad empeora cuando la economía nacional pasa de buenos niveles de apertura a relativamente cerrada.

**Keywords:** fiscal sustainability, currency crises, cointegration, unit roots.

**JEL Classification Codes:** E32, N26

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**María Florencia  
Aráoz**

UNSTA

[faraoz@unsta.edu.ar](mailto:faraoz@unsta.edu.ar)

**Ana María  
Cerro**

UNT and UNSTA

[acerro@herrera.unt.edu.ar](mailto:acerro@herrera.unt.edu.ar)

**Oswaldo  
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[omeloni@herrera.unt.edu.ar](mailto:omeloni@herrera.unt.edu.ar)

**Tatiana  
Soria Genta**

UNSTA

[tsoriag@yahoo.com.ar](mailto:tsoriag@yahoo.com.ar)

“... Only I have no luck anymore. But who knows? Maybe today. Every day is a new day. It is better to be lucky. But I would rather be exact. Then when luck comes you are ready”

Ernest Hemingway  
The old man and the sea

## I. Introduction

Blaming unfavorable external conditions for their persistent currency crises is a deeply rooted tradition in Argentina. From incumbent politicians to academics, several arguments have been put forth to present the country as a “victim” of international agencies, core countries policies or contagion from diseases generated elsewhere. Recent developments in the field of international economics seem to give some support to the “unfavorable external conditions hypothesis”. The sudden stops theory of currency crises emphasizes the liquidity problem in emerging economies due to a sudden and massive reversal in capital inflows. The reversions generally happen in countries that have experienced heavy capital inflows and consequently important current account deficits. Sudden Stops has to be met by reserve losses or lower current account deficits. In fact, both take place. Losses of international reserves increase the country’s vulnerability, and are frequently the prelude of the currency devaluation. The resulting reverse in current account deficit impacts on economic activity and employment. This line of research is associated to the works of Calvo (1998), Calvo and Reinhart (2000) and Calvo, Izquierdo and Talvi (2002).

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The literature on contagion also seems to endorse the proposition that emergent economies are mainly victims of a chain reaction triggered by external financial events, like devaluations. For instance, Kaminsky, Reinhart and Vegh (2003) sustain that most of the fast and furious contagion episodes are characterized by a large surge in capital flows that come as a surprise, and involve a leveraged common creditor<sup>1</sup>.

Although both, sudden stops as well as contagion literature, stress external conditions, they recognize that the magnitude of the impact on a given country depends on domestic variables such as the degree of openness, the extent to which a country has diversified production, the degree of liability dollarization and the monetary and fiscal policies followed<sup>2</sup>. As posit by Calvo, Izquierdo and Talvi (2003), the share of the tradable goods relative to domestic absorption of tradable goods magnify the effect of a sudden stop in capital flows, as well as high initial public debt, denominated in foreign currency and the liability dollarization mainly in the non-tradable sector. Likewise, Vegh and Talvi (2000) and Tornell and Lane (1998) stress the role of procyclical fiscal policy in emergent economies that discourage both public saving and reserve accumulation during good times, exposing the country to exchange rate instability and disruptive currency drops.

On the other hand, comprehensive studies of the history of Argentine currency crises like Cerro (2006) and Cerro and Meloni (2003) find that the “unfavorable external conditions” have some responsibility in explaining crises but, in most of them, “domestic fundamentals” played the main role. Interestingly, these findings match with results obtained from political economy models applied to Argentina<sup>3</sup>. This line of research accentuates deleterious incentives faced by federal and provincial governments that lead the latter ones to overspend and overborrow in the expansionary phase of the business cycle and the first one to rescue them. Rather than a “victim of unfavorable external conditions”, it seems that Argentina was hit by perverse fiscal incentives that made it prone to twin deficits and hence extremely vulnerable to contagion and capital flow reversals. As shown by Calvo, Izquierdo, and Talvi (2003) the sudden stop reversal that began with the Russian Crises in 1998, had different impact on Argentina and Chile, which calls for further research in domestic conditions.

This paper contributes to the study of the economic history of Argentine crises by analyzing fiscal sustainability of Argentina for the period 1865-2002. Fiscal deficits are sustainable if the current market value of debt equals to the discounted sum of expected future surpluses. Following a large literature started by Hamilton and Flavin (1986) sustainability is empirically tested by finding out if revenues and expenditures (including interest payments) are

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<sup>1</sup> The authors christen these factors as the “the unholy trinity”.

<sup>2</sup> See Bordo (2006)

<sup>3</sup> See Nicolini, Posadas, Sanguinetti, Sanguinetti and Tommasi (2002) and Jones, Sanguinetti and Tommasi (1997, 1999)

cointegrated along a given period. Since the extended period considered (138 years) may include several breaks that might biased the results, we study various sub periods taking the breakpoints from the regression tree results obtained by Amado, Cerro and Meloni (2005). As in Quintos (1995) and Martin (2000) we also evaluate strong and weak sustainability for each sub period. We conjecture that Argentina's fiscal stance was either unsustainable or weakly sustainable for most of the sub periods under investigation.

The remainder of the paper is organized as follows. Section II motivates the paper by analyzing some salient features of the Argentine crises throughout its history and their relation with international crises. Section III discusses the characteristics and the limits of the sustainability tests proposed to explore the strength of the "domestic fundamentals", while section IV explains the empirical results obtained from standard unit root and cointegration tests. Finally, section V elaborates the conclusions.

## **II. Crises in Argentina: capital flows reversals and Contagion**

One of the most striking observations for those who study the economic history of Argentina is its record of currency crises. From 1823 to 2002, Argentina experienced 26 crises, which implied 43 *crisis years*, that is, on average, one crisis every 4 years. Moreover, six of these episodes can be termed as crashes. It is also surprising that despite the differences in historical periods and protagonists, in economic structure and arrangements, in international and domestic conditions, in the eves and the outbreaks of the crises, there are some common factors that repeat throughout history<sup>4</sup>. Cerro and Meloni (2003), relying on parametric and non-parametric tests show that Argentina's crises, taken as a set, are mainly explained by domestic variables behavior like fiscal deficit, public revenues and expenditures and RER overvaluation, although exogenous variables like the Terms of Trade and LIBOR also play a role in some crises. Likewise, Amado, Cerro and Meloni (2005) applying the Regression Tree technique, classify the argentine currency crises into groups or varieties. They found that crises respond to four "recipes", having fiscal deficit as the common factor in all mixes. The first variety includes only extremely high fiscal deficits (greater that 4.4% of GDP), which predict a crisis with 54% of probability. This is the most frequent type of crisis in Argentina and, as will be evident later, is related to the closed economy period, from the 50's to the 80's. The relationship between fiscal deficit and crises is evident from simple inspection of figure1. Except for the years 1908, 1920 and 1992 the argentine governments **always** run fiscal deficits. However, during open economy years the fiscal deficit remained in the neighborhood of the 1% of the GDP, while in the closed economy period not only

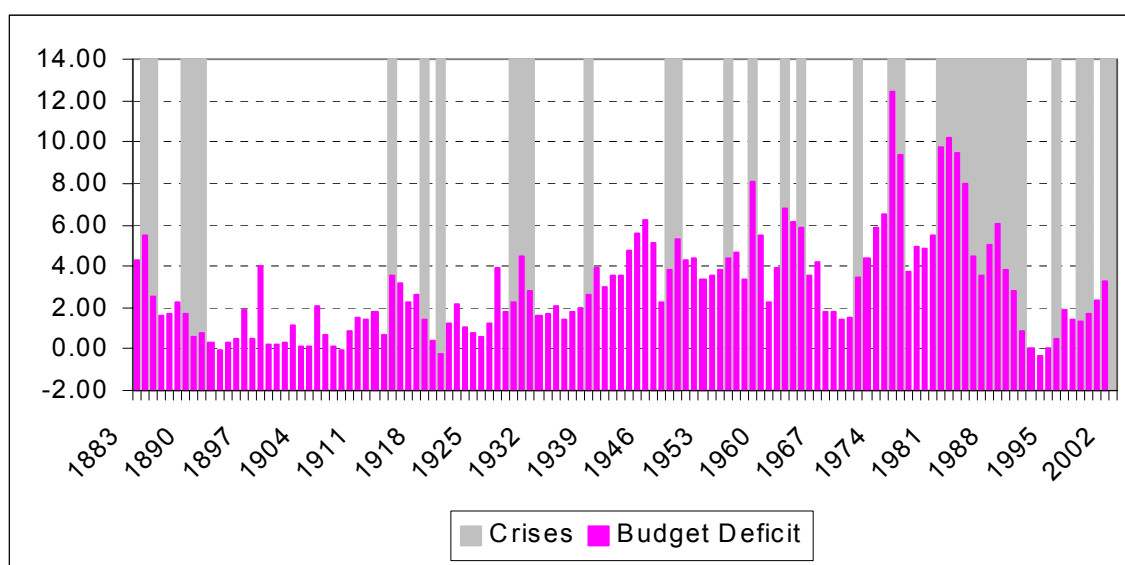
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<sup>4</sup> Notable analysts of the economic history of Argentina like Alberdi (1994) in the XIX century, and Prebisch (1921) in the XX century, made similar conjectures.

surpassed that mark, but also was more volatile. Notice also that crises become more frequent and longer (the wider the grey lines) as the fiscal deficit exceeded the 2% of GDP threshold.

Another mix that leads to a currency crisis occurs when combining “moderate” fiscal deficits (less than 4.4% of GDP) with real exchange rate overvaluation. The probability that this type of mix provokes a crisis remains around 53%. On the other hand, the concurrence of moderate fiscal deficit with huge declines in the rate of growth of real deposits produces a crisis with a probability of 75%. Finally, there are few cases where the main ingredients for a crisis are moderate fiscal deficits and high external debt to ratio exports. The probability of crisis when this combination is present is 100%.

Figure 1. **Fiscal Deficit (as % of GDP) and Crises in Argentina: 1883- 2002.**



Source: Authors calculation based on Gerchunoff and Llach (2002)

Table 1 shows the results of the Regression Tree technique. It is easily seen that crises were explained mainly by the high fiscal deficit during closed economy decades (from the 30's to the 80's in the XX century), that is, domestic conditions were dominant. While for periods of relatively open economy, (from 1870 to 1930 and 1991 to 2001) crises occurred when mixing moderate fiscal deficit with other ingredients, like real exchange rate overvaluation, decline in real deposits and high debt to exports ratio: Precisely, if “unfavorable external conditions” were to play a central role in the explanation of argentine crises, it has to be during the years were the economy remained open.

How can “unfavorable international conditions” cause recessions or various types of crises in a given country? “Bad news” spread out through changes in relative prices. There are two

main channels. One is the interest rate and the other is the price of exports relative to the price of imports, the so-called terms of trade. When the international rate of interest goes up, the government not only suffers due to increases in the debt payments services which affects the composition of public expenditures, but also because investors redirect funds from emerging markets to the developed ones, causing exchange rate drops and downturn in economic activity.

**Table 1. Crises Ingredients (from the Regression Tree classification technique)**

Crisis	Ingredients	Crisis Type	Openness		
1876	High Fiscal Deficit/GDP ratio (>4.4%)	Mild	Open		
1885		Deep			
1889/91	Moderate Fiscal Deficit, no RER Overvaluation plus strong decline in Real Bank Deposits	Very Deep			
1914		Deep			
1918/19		Mild			
1920/21	Moderate Fiscal Deficit and Real Exchange Rate Overvaluation	Mild			
1929/31		Very Deep			
1937/38		Mild			
1948/49		Deep			
1950/51	High Fiscal Deficit/GDP ratio (>4.4%)	Mild	Closed		
1955		Mild			
1958		Deep			
1962		Deep			
1964/65	High Fiscal Deficit/GDP ratio (>4.4%)	Mild			
1971	Moderate Fiscal Deficit and Real Exchange Rate Overvaluation	Deep			
1975/76	High Fiscal Deficit/GDP ratio (>4.4%)	Very Deep			
1981/82		Deep			
1983/84/85		Mild			
1986/87/88		Deep			
1989/90/91		Very Deep			
1995		Moderate Fiscal Deficit, mild Real Deposits decline and high External Debt to Export ratio		Mild	Open
2001/02		Moderate Fiscal Deficit and Real Exchange Rate Overvaluation		Very Deep	

Source: Amado, Cerro and Meloni (2005)

On the other hand, an impairing in the terms of trade, i.e. a declining price of exports or an increasing price of imports, may provoke severe balance-of-payments problems, leading to reserves drainage and ultimately to a currency devaluation to regain competitiveness. During the XIX century and the first quarter of the XX century, the worsening in terms of trade also

brought about severe fiscal problems in Argentina<sup>5</sup>, given the particular structure of public revenues that relied heavily in trade taxes.

The literature on contagion provides several explanations for the propagation of diseases across borders. The most popular is based on trade linkages. The typical case is the competitive devaluation in one country, which puts pressure on other countries to take a similar measure to avoid losing competitiveness. Another plausible explanation for the contagion is the existence of financial linkages and a common leveraged creditor that, given a collapse in one of the assets in her portfolio, sells other assets causing prices to fall and spreading the original disturbance across markets. Closed related to this explanation is the *herding behavior* which emphasizes the impact of informational asymmetries on decision-making.

Table 2. **International Crises and their impact on Argentina**

Year	Epicenter of the Crisis	Growth Recession	Crisis		
			Mild	Deep	Very Deep
1826	Crisis in London, 1825-26				
1873	World Recession				
1890	Baring Crisis				
1907	Crisis in USA				
1914	World War I				
1929	Wall Street Crash				
1982	Mexican Default				
1992	European Crisis				
1994	Mexican Crisis (tequila)				
1997	South East Asian Crisis				
1998	Russian Crisis				
1999	Brazilian Crisis				

Source: authors' calculations based on Cerro (1999) and Reinhart y Kaminsky (2002)

Table 2 presents the mayor international crises in the XIX and XX centuries, and their impact on the argentine economy<sup>6</sup>. Given the “clinical record” of Argentina, it does not surprise that only the European and the South East Asian crises had no impact on Argentina. These episodes were regional, circumscribed to a few countries in the neighborhood of the epicenter. All other international episodes left some trace in the argentine economy. The World recession in 1873, the US crisis in 1907, the Russian crisis in 1998 and the Brazilian devaluation in 1999 only provoke a *growth* recession (or a desacceleration in the growth

<sup>5</sup> Officially, the name *República Argentina* was established in 1860.

<sup>6</sup> The Turkish crisis is not included since Argentina started its recession at the end of 1998, more than 30 months before the devaluation in Turkey.

rate) in Argentina<sup>7</sup> while the beginning of the World War I and the Mexican Crisis of 1982 caused mild crises. It is interesting to notice that in 1914 Argentina was an open economy, apparently vulnerable to international episodes, while in 1982, was pretty much closed, which explains why the impact of the Mexican crisis was rather mild. Table 2 also poses a central question: why some crises end up in crashes and some other in deep and mild crises, or just a growth recession? We argue that fiscal sustainability helps to answer the question<sup>8</sup>.

### III. Testing for Fiscal Sustainability

The standard framework for modeling fiscal sustainability departs from the well-known federal government budget constraint:

$$G_t - T_t = B_t - (1 - r_{t-1})B_{t-1} \quad [1]$$

Where  $G_t$  is the real government expenditures at  $t$ ,  $T_t$  is real tax collection net of transfers (except for interest payments on the government debt), and  $B_t$  is the real market value at  $t$  of one period bonds issued at  $t$ , to be paid off at  $t+1$  and to bear interest at net real rate  $r_t$  (assumed to be stationarity around the mean  $r$ ). Note that we do not allow the government to finance its expenditures by printing money<sup>9</sup>.

Setting  $\gamma = (1+r)^{-1}$  and substituting forward equation [1], we obtain:

$$B_t = \sum \gamma^{j+1} (T_{t+j} - G_{t+j}) + \lim_{j \rightarrow \infty} \gamma^{j+1} B_{t+j} \quad [2]$$

The intertemporal budget is sustainable if and only if the current value of outstanding government debt is equal to the present value of future budget surpluses<sup>10</sup>. That is, the following condition must hold:

$$E_t \lim_{j \rightarrow \infty} \gamma^{j+1} B_{t+j} = 0 \quad [3]$$

Where  $E_t(\cdot)$  is the expectation conditional on information at time  $t$

<sup>7</sup> The Russian crisis and Brazilian devaluation can be considered as the factors that triggered the 2002 Argentinean crisis, however, in the very short-run they only provoked a growth recession in Argentina.

<sup>8</sup> The analysis of current account sustainability is left for further research.

<sup>9</sup> See Sargent (1986)

<sup>10</sup> We can also interpret equations (2) and (3) as the stock of debt held by the public is expected to grow, on average, no faster than the mean real rate of interest.



Taking first differences in [2] gives an empirical testable representation of the federal government budget constraint:

$$\Delta B_t = \sum \left(\frac{1}{1+r}\right)^{j+1} (\Delta T_{t+j+1} - \Delta G_{t+j+1}^*) + \lim \left(\frac{1}{1+r}\right)^{j+1} \Delta B_{t+j+1} \quad [4]$$

Analogously, sustainability implies:

$$\lim E_t \left(\frac{1}{1+r}\right)^{j+1} \Delta B_{t+j+1} = 0 \quad [5]$$

Following Martin (2000), testing for fiscal sustainability involves two steps: first, we test whether  $G_t$  and  $T_t$  are I(1). If the null hypothesis is confirmed, we proceed to the second step: testing for cointegration by means of the following regression model

$$T_t = a + b G_t' + \varepsilon_t \quad [6]$$

Where  $G_t'$  denotes real government expenditures plus the interest payments on the government debt. That is,  $G_t' = [G_t + r_t B_{t-1}]$

If  $T_t$  and  $G_t'$  are cointegrated, the deficit is strongly or weakly sustainable depending on the value of the  $b$  coefficient in the regression [6]. If  $b=1$ , the fiscal deficit is **strongly** sustainable, but if  $0 < b < 1$  the deficit is weakly sustainable. On the other hand, if  $b \leq 0$  the deficit is unsustainable. In contrast, if the Johansen test rejects cointegration, we considered that the deficit is unsustainable too<sup>11</sup>. Table 3 summarizes the criteria for sustainability. Notice that the criteria are established for  $\Delta B$ , so the required degree of integration is I(0) instead of the I(1) called for when the variables involved are  $T$  and  $G'$ .

Table 3. **Criteria for Sustainability**

Cointegration	Value of b	Degree of Integration $\Delta B$	Sustainability
Yes	b=1	I(0)	Strong
Yes	0 < b < 1	I(0)	Weak
Yes	b=0	I(0)	Non-sustainable
No	irrelevant	I(1)	Non-sustainable

<sup>11</sup> Quintos (1995) claims that cointegration is not a necessary condition for weak sustainability. Nonetheless, as pointed out by Martin (2000) the interpretation of the coefficient  $b$  is unclear in this case.

## Structural Breaks

Conclusions about cointegration and the values of the parameters may change in the presence of structural breaks in the series. For example, early findings about the fiscal sustainability of the U.S. economy by Hamilton and Flavin (1986) were overturned when structural breaks were taken into consideration. By imposing exogenous breakpoints, Hakkio and Rush (1991) found that Hamilton and Flavin results were supported by one sub period but not for the other. The latest developments follow the trace started by Haug (1992) that picked the breaks endogenously. Haug relied on the parameter stability tests by Hansen (1992) to obtain the breakpoints and consequently determine the sub periods, while Quintos (1995) uses a sequential Chow test with I(1) process. Recently, Martin (2000) developed a cointegration model with multiple endogenous breaks. This methodology produces simultaneous inferences about the presence of cointegration, the value of the cointegrating parameters and the size and timing of shifts.

This paper tests for fiscal sustainability in various sub periods whose turning points were taken from the regression tree results (see Cerro and Meloni, 2005). We distinguished four sub periods 1865-1914 (mostly an open economy), 1915-1950 (transition from open to close economy), 1951-1989 (closed economy), and 1990-2002 (open economy). This series breakup is also supported on economic and political events<sup>12</sup>.

Figure 2, panel A, B, C and D, in the Appendix, portrays the behavior of the target variables: Total revenues and Total expenditure in real terms, for the sub periods. Notice that panel D shows variables in quarterly periodicity.

## IV. Empirical Results

In order to test for fiscal sustainability, we pursue the standard procedure to find out if two time series are cointegrated on a given period. First, we check for unit roots by the usual Augmented Dickey-Fuller (henceforth, ADF) and Phillips-Perron (PP) tests and second, we verify cointegration with the Johansen test. Previously, we define five sub periods taking the turning point from Regression Tree Analysis performed by Amado, Cerro and Meloni (2005) and from economic and political events.

The data set comprises annual Argentina data on real revenues and real government expenditure inclusive of interest paid on debt, over the period 1865 -1989, and quarterly data over the period 1990 - 2002<sup>13</sup>.

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<sup>12</sup> For more details, see Cerro and Meloni (2003)

<sup>13</sup> Data are available upon request from the authors

Table 4 contains the outcomes of the PP tests for the whole period, 1865 - 2002, while Table 5, panels A and B shows the results for the four sub periods chosen: 1865 -1914; 1915 - 1950; 1951 - 1989 and 1990 - 2002. Except for the most recent period, 1990 - 2002, that was computed with quarterly data, the periodicity of the series were annual.

**Table 4. Unit-Root Tests. Phillips- Perron. Period: 1865 - 2002**

Variables	Model without intercept		
	Level	1 <sup>st</sup> Difference	2 <sup>nd</sup> Difference
Real Revenues	<b>-0,5370</b>	<b>-10,3216</b>	<b>-21,6041</b>
Real Expenditures	<b>1,6987</b>	<b>-12,7109</b>	<b>-37,4185</b>

Note: \*Critical Values: -2,6, -1,9 and -1,6 for the 1%, 5% and 10% level of significance respectively

We tested different models (with or without intercept, with or without trend) and most of them sustain the non stationarity of the series. ADF tests are not displayed since results are very similar to PP.

**Table 5. Unit-Root Tests. Phillips- Perron. Annual Data**

Period	Variables	Model without intercept		
		Level	1 <sup>st</sup> Difference	2 <sup>nd</sup> Difference
<b>1865- 1914</b>	Real Revenues	<b>1,2050</b>	<b>-11,4335</b>	<b>-64,2914</b>
	Real Expenditures	<b>1,1062</b>	<b>-7,7284</b>	<b>-21,8173</b>
<b>1915-1950</b>	Real Revenues	<b>2,3257</b>	<b>-5,9098</b>	<b>-16,1418</b>
	Real Expenditures	<b>1,3741</b>	<b>-5,7471</b>	<b>-16,2702</b>
<b>1951- 1989</b>	Real Revenues	<b>1,0025</b>	<b>-5,6044</b>	<b>-10,0814</b>
	Real Expenditures	<b>1,5430</b>	<b>-8,4120</b>	<b>-41,8254</b>

Note: \*Critical Values: -2,6, -1,9 and -1,6 for the 1%, 5% and 10% level of significance respectively

**Table 5. Panel B. Unit-Root Test ADF. Period: 1990- 2002. Quarterly Data**

Variables	Model without intercept		
	Level	1 <sup>st</sup> Difference	2 <sup>nd</sup> Difference
Real Revenues	<b>0,5491</b>	<b>-12,376</b>	<b>-26,4713</b>
Real Expenditures	<b>0,2033</b>	<b>-8.441</b>	<b>-28.720</b>

Note: \*Critical Values: -2,6, -1,9 and -1,6 for the 1%, 5% and 10% level of significance respectively

Since the traditional unit-root tests (ADF, PP) may bias the results towards accepting the null hypothesis of unit roots in the presence of structural breaks, we also performed the Zivot-Andrews unit-root test (Z-A), which allows for a single break in intercept, the trend or both. The null hypothesis is unit-root versus the alternative of stationarity with a break. Table 6 exhibits the Z-A results. We accepted the null of unit root with breaks in 1899, 1946, 1981 and 2001 in real revenues, while in real expenditure we also accept the null with breaks in 1905, 1946, 1981 and 1999.

Table 6. **Unit Root Test. Zivot- Andrews**

Period	Variables	Allowing for Break in Intercept Only
		Minimum T-Statistic*
1865/ 1914	<b>Revenues</b>	-3.44913 at <b>1899</b>
	<i>Unit Root</i>	Yes
	<b>Expenditures</b>	-4.18918 at <b>1905</b>
	<i>Unit Root</i>	Yes
1915/ 1950	<b>Revenues</b>	-0.28955 at <b>1946</b>
	<i>Unit Root</i>	Yes
	<b>Expenditures</b>	-2.10124 at <b>1946</b>
	<i>Unit Root</i>	Yes
1951/ 1989	<b>Revenues</b>	-4.37700 at <b>1981</b>
	<i>Unit Root</i>	Yes
	<b>Expenditures</b>	-3.64856 at <b>1984</b>
	<i>Unit Root</i>	Yes
1990/ 2002	<b>Revenues</b>	-4.670 at <b>2001:4</b>
	<i>Unit Root</i>	Yes
	<b>Expenditures</b>	-2.657 at <b>2001:4</b>
	<i>Unit Root</i>	Yes

The Johansen cointegration test for Real Public Revenues and Real Public Expenditures (including debt services) is presented in Table 7<sup>14</sup>. Once we find the cointegrating equation, we use the normalized cointegrating coefficients, and test the null of  $b=0$  versus the alternative,  $b>0$ . If we accept the null, we conclude that deficit is unsustainable in that period. If we do not accept the null, we test that  $b=1$  against the alternative that  $0<b<1$ . If we accept

<sup>14</sup> See Also Table 2A in the Appendix.

the null, we infer that there exists strong sustainability, otherwise we conclude that sustainability is weak.

Table 7. **Johansen Cointegration Test**

Periods	Cointegration Max-eigenvalue test	Cointegration Coefficient b		Conclusions From b test	Sustainability
		Johansen	Fully Modified		
1865-1914	Yes*	-0.824	0.798	$0 < b < 1$	Weak
1915-1950	Yes*	-0.705	0.669	$0 < b < 1$	Weak
1951-1989	No	-0.402	0.544	No interpretation	No sustainability
1990-2002	Yes*	-0.614	0.618	$0 < b < 1$	Weak

\* In all cases there is only one cointegrating equation at both 5 and 1% level

\*\* Under Quintos weak sustainability

\*\*\* By Phillips and Hansen (1990). All coefficients significative at 1% level

According to Johansen test<sup>15</sup>, Argentina never had strong fiscal sustainability. At most, it reached weak sustainability. Interestingly, sustainability gets worse as the economy went from mostly open to relatively close. That is, the cointegrating coefficient b passes from 0.798 in the first period (1865-1914) to 0.53 in the years 1951-1989. In the last period (1990 – 2002) b experiments a small increase, but still fiscal deficit is deem weakly sustainable, but closer to 1.

The period 1951-1989 was characterized by huge average fiscal deficit (as % of GDP), volatility in public accounts and high inflation rate ensuing from money printing to finance fiscal disequilibria<sup>16</sup>. These results are consistent with the ones obtained by the Regression Tree Analysis, in which fiscal deficit was the first variable to split the sample in this period.

## V. Concluding Remarks

This study accounts for fiscal sustainability in Argentina for the period 1865-2002. The results leave no doubt that Argentina's fiscal performance was either weakly unsustainable or not sustainable at all, depending on the period considered, which help us to explain why the country was so prone to be infected by crises originated overseas and why it also generated its own crises. The years in which the economy remained mostly closed (1951-1989) show no cointegration between real public revenues and expenditures and also an outrageous

<sup>15</sup> According to the Gregory Hansen test (G-H), there is no cointegration neither in the whole period nor in sub periods (the null in the G-H test is no cointegration versus the alternative of cointegration with a break).

<sup>16</sup> Inflation was the main source to finance public deficits during the four decades, although external funds were available for shorter periods, like 1978-1980.

number of crises with almost no intervention of “unfavorable international conditions”. On the other hand, the other sub periods in which the economy was relatively open, sustainability was weak, which made the country more vulnerable to international shocks, sometimes transmitted by the interest rate and some other by the terms of trade, or both. Clearly, fiscal sustainability matters and the evidence presented here exclude any explanation of crisis in Argentina based only on bad international conditions. In other words, in order to have a crisis, to the unholy trinity we must add up the unholy fiscal unsustainability.

Moreover it seems, although we do not demonstrate it, that an episode of unfavorable condition may end up in a recession, a mild or a deep crisis depending on the intensity of the shock but also on the fiscal stance of the country. However, from the policy implication point of view, deactivating sudden stops or impeding terms of trade impairing are out of the reach of a small country, while fiscal prudence should be a more attainable objective.

Our findings supports the results of previous comprehensive studies of the history of Argentine crises, like Cerro and Meloni (2003) and Amado, Cerro and Meloni (2005) and Cerro (2006) that showed that external factors only played a decisive role in few episodes and a secondary part in most of the crises, even though Argentina was involved in most of the international crises accounted for by Bordo (2006) and Eichengreen and Adalet (2006). Our evidence also fits very well the political economy studies on Argentina (see Jones, Sanguinetti and Tommasi, 1997 and Nicolini, Posadas, Sanguinetti, Sanguinetti and Tommasi, 2002)) that stresses the failure of some key institutions as the tax-sharing system, that provides incentives to overspend and overborrow in the argentine provinces and to rescue them by the federal government.

Notice also that the  $b$  coefficient achieves a larger value when the whole sample is considered, which is consistent with the interpretation of crises as a mechanism chosen by domestic authorities to correct for unsustainable fiscal deficits. It remains an open question why if crisis are so costly, authorities do not adjust smoothly, to get a soft landing instead of painful crises. The answer seems to point out at the institutions (see Cerro, 2006)

## References

- Amado, Néstor Adrián, Cerro, Ana María and Meloni Osvaldo (2005) *Making Explosive Cocktails. Costs and Recipes for 26 Argentine Crises*. Annals of the XXXVIII Annual Meeting, Asociación Argentina de Economía Política, La Plata. Web Site: [www.aaep.org.ar](http://www.aaep.org.ar)
- Bordo Michael (2006) *Sudden Stops, Financial Crises and Original Sin in Emergent Countries: Déjà Vu?*. NBER Working Paper 12393. July.
- Calvo Guillermo (1998) *Capital Market Contagion and Recession: An explanation of the Russian Virus*. Working Paper. University of Maryland.
- Calvo, Guillermo and Reinhart, Carmen (2000) *When Capital Inflows come to sudden stop: Consequence and Policy*. En Kenen and Swoboda Editores, *Key Issues in Reform of the International Monetary and Financial System*. International Monetary Fund.
- Calvo, Guillermo, Izquierdo, Alejandro and Talvi, Ernesto (2003) *Sudden Stops, the Real Exchange Rate and Fiscal Sustainability: Argentina's Lessons*. NBER Working Paper No. 9828. July.
- Catao, Luis (2006) *Sudden Stops and Currency Drops: A historical view*. IMF Working Paper WP 06/133.
- Cerro, Ana María (1999) *La conducta cíclica de la economía Argentina y el comportamiento del dinero en el ciclo económico. Argentina 1820-1998*. Unpublished Master Thesis (Universidad Nacional de Tucumán)
- Cerro, Ana María (2006) *Un Estudio de las Crisis Argentinas: 1820- 2002*. Unpublished Ph.D. Dissertation, Universidad Nacional de Tucumán
- Cerro, Ana María and Meloni Osvaldo (2003) *Crises in Argentina: 1823-2002. The Same Old Story?*, Annals of the XXXVIII Annual Meeting, Asociación Argentina de Economía Política, Mendoza. Web Site: [www.aaep.org.ar](http://www.aaep.org.ar)
- Cerro, Ana María and Meloni, Osvaldo (2004) *Determinants of Currency Crises in Argentina: 1885 – 2003*. Paper presented at the XIX Jornadas de Economía, Banco Central del Uruguay. Web Site: [www.bcu.gub.uy](http://www.bcu.gub.uy)
- Damill, Mario, Frenkel, Roberto y Juvenal, Luciana (2004) *Las cuentas públicas y la crisis de la convertibilidad en la Argentina*, en Boyer, Robert y Neffa, Julio editores, *La Economía Argentina y su crisis (1976- 2001): visiones institucionalistas y regulacionistas* Ceil-Piette, Miño y Dávila Editores. Buenos Aires.
- Eichengreen, Barry and Aducci, Muge (2005) *Current Account Reversals: Always a Problem*. NBER Working Paper 11634. September.
- Eichengreen, Barry and Bordo, Michael (2002) *Crises Now and Then: What lessons from the Last Era of Financial Globalization?* NBER Working Paper # 8716.
- Gerchunoff, Pablo and Llach, Lucas (2002) *El Ciclo de la Ilusión y el Desencanto*. Editorial Ariel. Buenos Aires.
- Hakkio, C. and Rush, M. (1991) *Is the Budget Deficit "too large"?* Economic Inquiry. Vol. 29.
- Hamilton, J. and Flavin, M. (1986) *On the limitations of government borrowing: a framework for empirical testing*. American Economic Review. Vol. 76.
- Haug, A. (1992) *Cointegration and government borrowing constraints: evidence for the United States*. Journal of Business and Economics Statistics. Vol. 9.
- Jones, Mark, Sanguinetti, Pablo and Tommasi, Mariano (1997) *Politics, Institutions and Fiscal performance in a Federal System: an analysis of the Argentine provinces*. Mimeo. Universidad de San Andrés.
- Kaminsky Graciela and Reinhart Carmen (2000) *On Crises Contagion and Confusion*. Journal of International Economics, Vol 51, N1, 145-68
- Kaminsky, Graciela, Reinhart, Carmen and Vegh, Carlos (2003) *The Unholy Trinity of Financial Contagion*. NBER Working Paper No. 10061. October.

- Kaminsky, Graciela, Reinhart, Carmen and Vegh, Carlos (2002) *Two Hundred Years of Contagion*. Mimeo.
- Lane, Philip and Aaron Tornell (1998), *Why Aren't Savings Rates in Latin America Procyclical?* Journal of Development Economics, 57 (1); 185-99. October.
- Martin, Gael (2000) *U.S. deficit sustainability: a new approach based on multiple endogenous breaks*. Journal of Applied Econometrics. Vol. 15: 83-105.
- Nicolini, Juan Pablo, Posadas, Josefina, Sanguinetti, Juan, Sanguinetti, Pablo y Tommasi, Mariano (2002) *Decentralization, Fiscal Discipline in Sub-National Governments and the Bailout Problem: The case of Argentina*. Inter-American Development bank Research network Working Paper.
- Quintos, Carmela (1995) *Sustainability of the deficit process with structural shifts*. Journal of Business and Economic Statistics. October. Vol. 13 No. 4.
- Sargent, Thomas (1986) *Rational Expectations and Inflation*. Harper & Row, Publishers, New York. Chapter 2.
- Talvi, Ernesto and Carlos Vegh (2000), *Tax Base Variability and Procyclical Fiscal Policy*, NBER Working Paper #7499, January



## Appendix

Figure 2A. Panel A. Real Public Revenues and Real Public Expenditures: 1865- 1914

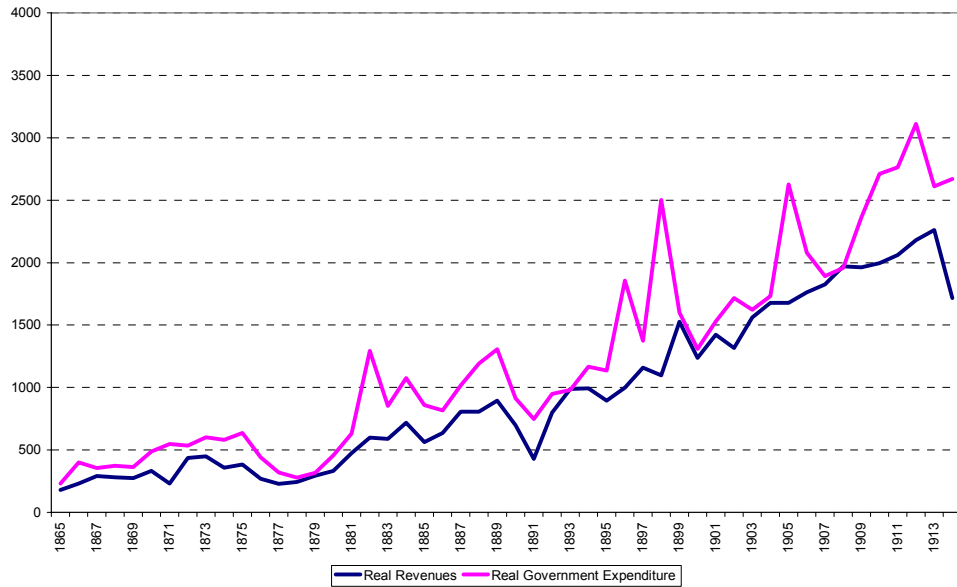


Figure 2B. Panel A. Real Public Revenues and Real Public Expenditures: 1915- 1950

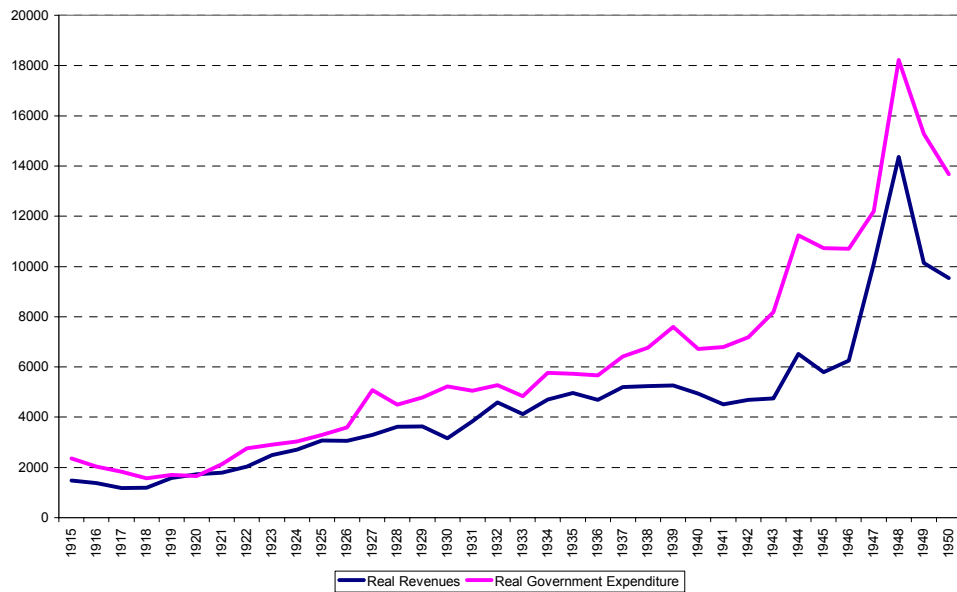


Figure 2C. Panel A. Real Public Revenues and Real Public Expenditures: 1951- 1991

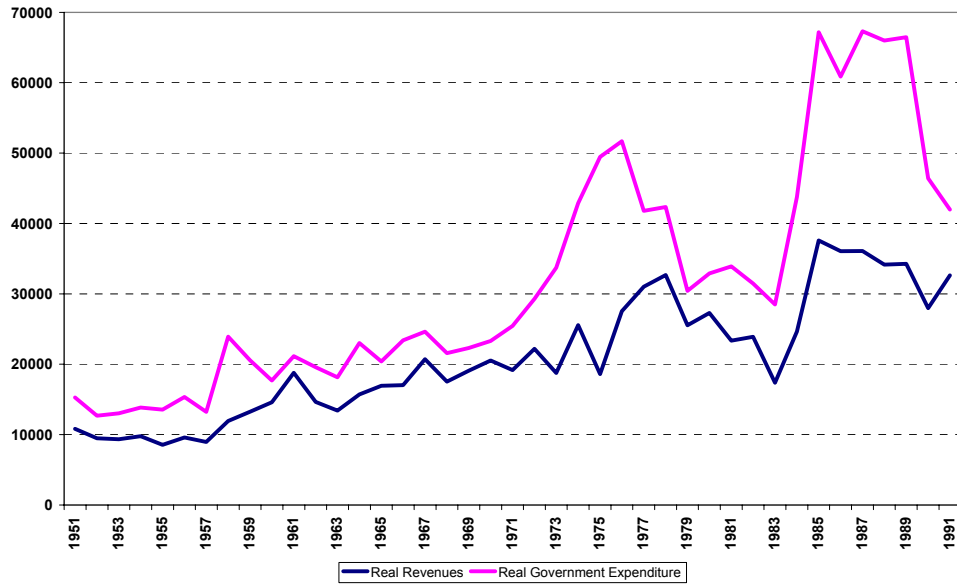


Figure 2D. Real Public Revenues and Real Public Expenditures: 1990:1- 2002:4

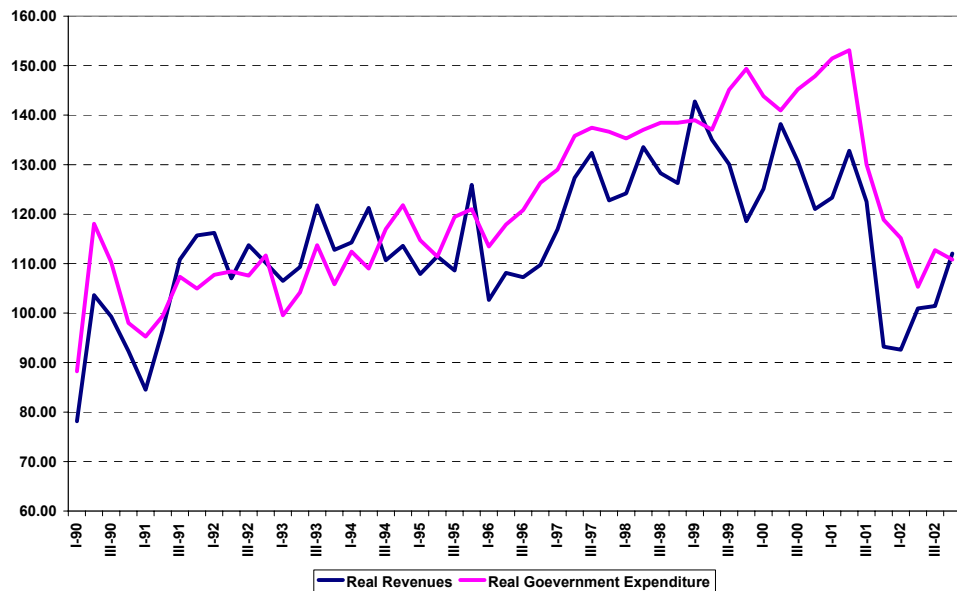


Table 2A. Johansen Cointegration Test

Hypothesized No. of CE(s)	None *	At most 1	None *	At most 1	None *	At most 1	None	At most 1	None *	At most 1
<b>Eigenvalue</b>	0.114598	0.000007	0.310689	0.00437	0.352555	0.004702	0.232542	6.69E-03	0.310633	0.054681
<b>Max-Eigen Statistic</b>	16.18796	0.000986	17.859	0.21022	14.78052	0.160253	9.792843	0.248308	18.59909	2.81165
<b>5% Critical Value</b>	14.07	3.76	14.07	3.76	14.07	3.76	14.07	3.76	14.07	3.76
<b>1 % Critical Value</b>	18.63	6.65	18.63	6.65	18.63	6.65	18.63	6.65	18.63	6.65