

CRISES & CRASHES: ARGENTINA 1885 – 2003.

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Abstract

This paper is aimed at studying the determinants of currency crises suffered by Argentina from 1885 to 2003, on one hand, and at characterizing each particular currency crisis, on the other hand.

Firstly, we identify crises episodes throughout the Argentine history. We apply the Eichengreen, Rose and Wyplosz (1994) methodology to sort crises from non-crises periods, and we distinguish among deep crises (crashes), mild crises and minor turbulences.

Secondly, we look for regularities and common factors throughout history. We report the two-sample Kolmogorov-Smirnov test of equality of distributions and the Kruskal-Wallis test of equality of population. We complemented it by estimating a *logit* model including a set of variables chosen from the prescriptions of the existing currency crises theories.

Thirdly, following Kaminsky (2003) we perform regression tree analysis to classify crises and crashes into different varieties proposed by the theories at stake. We use fifteen financial and macroeconomic variables suggested by the empirical literature.

It is found that fiscal imbalances were always present, which is consistent with the predictions of the first generation speculative attack models. All three methods used to characterize currency crises in Argentina show the importance of the fiscal side. Adverse foreign factors had also a key role in explaining crises. Finally, in most of the crises, regularities in the behavior of macroeconomic variables can be detected.

JEL Classification Codes: E3, N20

CRISES & CRASHES: ARGENTINA 1885 – 2003.

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La crisis actual es la misma de 1870, la de 1865, la de 1860, de la 1852, de la 1840, etc. El país ha vivido en esas crisis desde que dejó de ser colonia de España. Podría decirse que no es económica sino política y social. Reside en la falta de cohesión y de unidad orgánica del cuerpo o agregado social que se denomina Nación Argentina, y no es sino un plan, un desideratum de nación. La diversidad y lucha de sus instituciones de crédito, la anarquía de sus monedas, la emulación enfermiza que preside a sus gastos dispendiosos en obras concebidas para ganar sufragios y poder, vienen del estado de descomposición y desarreglo en que se mantienen las instituciones, los poderes, los intereses del país.

Juan Bautista Alberdi
Escritos Póstumos. Estudios Económicos. Tomo I.

En la historia monetaria argentina, a pesar de su confusa apariencia, nótese una serie de períodos de ilimitada confianza y prosperidad, de expansión en las transacciones, de especulación inmobiliaria y fantasía financiera, seguidos de colapsos más o menos intensos, precipitados en pánicos que originan la liquidación forzada de las operaciones, el relajamiento de la confianza, la postración y el estancamiento de los negocios. Sin duda, cada uno de estos ciclos no se presentan exactamente en las mismas condiciones, ni con idéntico carácter, pero, considerados en conjunto, es posible encontrar en ellos, hechos fundamentales que se repiten, cuyo análisis permite formular síntesis acerca de su evolución ... buscaremos demostrar que en nuestras crisis, aparte de las diferencias de menor cuantía, interviene un factor fundamental, ... y peculiar al grado de formación histórica del país.

Raúl Prebisch
Anotaciones sobre nuestro medio circulante (1921)

I. INTRODUCTION

Social sciences researchers that explore the Argentinean economic history for the first time, usually get surprised by the repetitiveness in economic episodes¹. Those that deepen the study get absolutely astonished. Some economic events, like crises, seem to come and go over and over again. The Argentine economic history leaves us with the sensation of *dejà vu*. As sustained by former central banker Raúl Prebisch, more than 80 years ago (see quotation), characters may change, characteristics might be different but some fundamental facts are always present and can be traced throughout history.

In the dawning of the nation, by 1880, the father of the Argentine constitution, Juan Bautista Alberdi, asserted that all the crises that Argentina went through since its independence

resembled each other. Moreover, Alberdi sustained that all of them were driven by irresponsible fiscal policy, which in turn were caused by weak or lacking institutions.

Many years later, President Arturo Frondizi recited the long litany of mismanagement and excesses of the Argentine economyⁱⁱ. Frondizi might have been aware of Alberdi's writings, but he could not know that he would not be the last in the large list of conspicuous men pledging for sound institutions and discipline in fiscal and monetary policies. Moreover, from Frondizi's years to the present, crises became more frequent and severe. According to Eichengreen and Bordo (2000), that studied an extended set of developed as well as emerging countries, Argentina had the largest number of crises not only in recent decades but also in the period 1885-1998, covered by their paper. Argentina was affected by most of the international and regional crisis as documented by Kaminsky and Reinhart (2002) and also generated its own particular episodes.

The cost of several crises and crashes for Argentina, in terms of real output losses, has been huge, and possibly one of the largest in the world. The last crash, in 2001/ 2002, known as Tango, brought about a 15% decrease in real GDP and pushed vast sectors of the population below the poverty line. Similarly, the 1989 crash, which ended in hyperinflation, resulted in a 9% fall in real GDP.

What are these crises caused by? Do they always recognize the same causes? Which are the "fundamental facts" repeated in every crisis, mentioned by Prebisch in the opening quotation at the epigraph? To put it in another way, did Argentina suffer from the same disease throughout history? Were there different varieties of the same disease? Is there any particular deficiency in the immunological system of Argentina that makes the country prone to currency crises? What was the role of external shocks in the crises?

This paper is not aimed at answering all these questions but at studying the determinants of the 19 currency crises suffered by Argentina from 1885 to 2003, on one hand, and at characterizing each particular currency crisis, on the other hand.

Firstly, using **monthly** data, we identify crises episodes from 1885 to the present and classify them into three categories: deep crises (crashes), crises (mild episodes) and minor turbulences.

Secondly, we look for regularities and common factors throughout history. We split the dataset in crises and non-crises years and we carried out non-parametric tests in order to establish whether macroeconomic variables, namely public expenditure, GDP, external debt, exports, imports and the current account deficit behave significantly different before and after crises. As in Eichengreen et al. (1994) we report the two-sample Kolmogorov- Smirnov test of equality of distributions and the Kruskal-Wallis test of equality of population. We also perform

graphical analysis to study the behavior of key macroeconomic variables in the neighborhood of currency crises.

Thirdly, since the previous studies are intrinsically univariate, we estimate a *logit* model. As in Frankel and Rose (1996) we include four groups of explanatory variables attempting to characterize Argentina's currency crises. Variables were chosen from the prescriptions of the existing currency crises theories.

Fourthly, following Kaminsky (2003) we perform regression tree analysis to classify crises and crashes into different varieties proposed by the theories at stake. We use fifteen financial and macroeconomic variables suggested by the empirical literature. While the *logit regression* approach misses the details but highlights the repeated facts, that is, the regularities; the regression tree approach stresses diversity, the *recipe* of each particular crisis.

The remainder of the paper is organized as follows. Section II sketches some theoretical issues on currency crises. In Section III we briefly survey the empirical literature on the topic. Section IV explains the empirical results obtained from the graphic analysis, the logit analysis and the regression tree. Finally, section VI presents some conclusions, conjectures and guidelines for further research.

II. THEORETICAL BACKGROUND

Krugman (1979) showed how inconsistencies between domestic economic conditions and the exchange rate commitment lead to the collapse of the currency peg. In his paper, budget deficit fully monetized is financed by Central Bank expending reserves. With the exchange rate fixed, investors get rid of the excess money supply by exchanging domestic currency for foreign reserves of the central bank. When such reserves fall to a critical threshold, a speculative attack is launched, causing reserves depletion and the abandon of the exchange rate peg.

The speculative attack takes place when the shadow price of exchange rates (the price that would prevail after the speculative attack takes place) equals the exchange rate. At that moment reserves are driven to zero forcing the abandonment of the fixed exchange rate, and the economy switches to a floating rate regime. With reserves depleted, budget deficit is financed by money creation, which in turn causes an increase in inflation rate.

Two important aspects of this model should be highlighted: the first one is that speculative attacks are not only possible, but also inevitable when fiscal policy is not consistent with the exchange rate regime. The time in which the speculative attack will take place is perfectly known forehand, so nobody is taken by surpriseⁱⁱⁱ. Secondly, there is no incompatibility between rational behavior and the (apparent) arbitrariness of currency attacks. Rational

economic behavior, characterized by smoothly evolution over time, can be associated with dramatic attacks and changes in the exchange rate regimes.

Second-Generation Models

The so-called second generation models developed by Flood and Garber (1984b) and Obstfeld (1986, 1994) became widely recognized after the canonical crisis model failed to explain the European Monetary System crises (1992-1993). Second generation models are based on the existence of multiple equilibria. When investors anticipate that a successful attack will alter policy (even if they agree that currency policy may be consistent with the currency peg) it will be expected that future fundamentals (conditional on an attack's taking place) be incompatible with the peg. In this case, government might defend the currency, but the costs (high interest rate, high unemployment rate) can be so onerous that government finally devaluates, so the market anticipates that action and acts in advance.

The government compares the net benefits from changing the exchange rate versus defending it. Policymakers usually have as many good reasons to defend the fixed exchange rate but also to abandon it. For example, if government has a large debt burden denominated in domestic currency, devaluation would evaporate part of the debt. Or, if the country is suffering high unemployment rates, and nominal wages are rigid, devaluation would diminish real wages. But, on the other hand, in inflation-prone countries a nominal anchor is a guarantee against high inflation rates, so defending the currency keeps inflation under control. Another argument put forward to resist devaluations is that a fixed exchange rate facilitates investment and international trade. Crucially, the cost of defending a fixed exchange rate increases when people expect that the regime will be abandoned.

Models of self-fulfilling attacks imply that good fundamentals are not enough neither to prevent attacks, nor to avoid a currency crisis. The state of fundamentals determines the existence and multiplicity of attack equilibrium. In Krugman's model fundamentals may be consistent with exchange rate or not. In second generation models the same is true for extreme values of fundamentals, but there's also a large middle ground over which fundamentals are neither so strong as to make crises inevitable nor so weak as to make an attack impossible. An important difference between this two models is that in the first the moment of the depletion of reserves can be anticipated, while in the second the timing is undetermined, so it can happens unexpectedly, and that is why they are considered so dangerous.

Third Generation Models

The Southeast Asian currency crisis in 1997 was the starting point for a new theory of currency crises. As Krugman (1998) points out, none of the fundamentals that led to a first

generation crises were present in the Asian economies. Asian economies did not face severe unemployment when the crisis begun, nor had any incentive to abandon the peg to carry out expansive monetary policy. Besides, in all countries were present a boom-bust cycle in the asset markets. Financial intermediaries had a central role in the crisis. A mismatch in the deposits of the banking and non-banking system was present: the institutions borrowed short term money, often in foreign currency, and lent that money in long term domestic currency.

The conventional currency crisis theories associated with inconsistency in present or future fundamentals missed the role played by financial intermediaries whose liabilities were perceived to have government guarantee, but were essentially unregulated and therefore subject to moral hazard problems.

The evidence seems to suggest that Asian crisis was neither the consequence of fiscal imbalances, nor were the incentives to follow an expansive monetary policy, but were the problems with financial intermediaries that drove the crisis. The excessive risk lending led to inflation in the asset prices. When the crisis burst, the asset prices fall, the insolvency of intermediaries were visible, forcing them to cease operations, which in turn implied further deflation in asset prices.

Sudden Stop Models

The sudden stop theory of currency crises emphasizes the liquidity problem in emerging economies due to a sudden stop, that is, episodes of 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. To face this sudden capital outflow, governments spend reserves, which increases financial vulnerability and finally devaluates its currency. The resulting reverse in current account deficit impacts on economic activity and employment. This line of research is only recent and is associate to the works of Calvo (1998), Calvo and Reinhart (2000) and Calvo, Izquierdo and Talvi (2002)

III EMPIRICAL LITERATURE

The numerous empirical researches on currency crises focused on two types of studies: (a) the analysis of specific events or particular countries and, (b) cross-country analysis. They are mainly dedicated to:

- Analysis of the probability of crises
- Test for contagion and determining the channels through which contagion occurs
- Establish the relationship between currency and banking crisis
- Comparison of historic and recent crises
- Test for specific theories of what causes crises in a given country or group of countries.

Table 1 summarizes some of the most relevant papers in the recent empirical literature.

Table 1. Empirical literature

Authors	Period	Countries
Blanco and Garber (1986)	1973-1982	Mexico
Cumby and Wijnbergen (1989)	Dec 1978- -April 1981	Argentina
Eitchengreen, Rose and Wyplosz (1994)	1967-1992	22 Emerging and developed countries suffering a crisis
Klein and Marion (1994)	1957-1991 -Monthly data	Panel data for 16 Latin American countries
Pazarbasioglu and Otker (1994)	1979-1993 - Monthly data	Denmark, Ireland, Norway, Spain and Sweden
Calvo and Mendoza (1996)	1994-1995	Mexico
Eitchengreen, Rose and Wyplosz (1996)	1959-1993 -quarterly data	20 industrialized countries
Frankel and Rose (1996)	1971-1992	105 countries
Sachs, Tornell and Velasco (1996)	1994/1995	20 emerging economies
Flood and Marion (1997)	January 1957-January 1991	80 episodes of fixed exchange rate in 17 Latin American countries
Burnside, Eichenbaum and Rebelo (1998)	July 1995-May 1998	Indonesia, Malaysia, Thailand, Korea, Philippines, Hong Kong, Singapore and Taiwan
Chang and Velasco (1998)	1987-1997	Indonesia, Korea, Malaysia, Philippines, Thailand, Mexico, Argentina, Brazil and Chile
IMF (1998)	1975-1997	50 industrialized and emerging countries
Kaminsky, Reinhart and Lizondo (1998)	1970-1995	15 developed and 5 developing countries
Berg and Pattillo (1999)	1997	Asian countries
Glick and Rose(1999)	1971, 1973, 1992-1993, 1994-1995, 1997-1998	161 countries affected by crises
Kaminsky and Reinhart (1999)	Crisis 1997	Asian countries
Tornell (1999)	1985-1995	Hong Kong and 22 emerging countries
Kaminsky and Reinhart (2000)	1997-1999 - daily data	35 countries
Moreno and Trehan (2000)	1974-1997 post Bretton Woods	121 countries
Eichengreen and Bordo (2002)	1883-1998	21 emerging and developed countries
Kaminsky, Reinhart and Vegh (2002)	1826-2002	Countries affected by different crises
Kaminsky (2003)	1970-2002	20 countries

In the first generation models, crises should have a significant predictable component. Previous to the speculative attack we should observe an expansive fiscal and monetary policy, and a decline in international reserves for long periods. On the other hand, second generation models imply that speculative attacks should be followed by expansive monetary and fiscal policies. Third generation models emphasize the role played by financial

intermediaries, so they analyze variables related to them, such as the liquidity coefficient, solvency of the financial sector, external debt maturity, and assets denomination versus liabilities.

IV. IDENTIFYING CURRENCY CRISES

There is not a unique definition of currency crisis, however most economists would agree that a currency crisis is an speculative attack against currency that ends up in a devaluation if the attack is successful. Nonetheless authorities may defend from the attack by losing foreign reserves and/or by increasing the rate of interest.

One of the key questions to be solved in the analysis of crisis is how to identify speculative attack in foreign exchange rate, and to determine under what circumstances the movement in these indicators represents a crisis. The following questions arise: Is a currency crisis limited to exchange rate devaluation? How large a movement must be to be considered a crisis? How large a devaluation must be to qualify for a crisis in high inflation periods?.

Eichengreen et al (1994) propose a weighted index of speculative attack that includes changes in the exchange rate, in the international reserves and in the interest rates. Each component is weighted by the inverse of its variability. As Moreno and Trehan (2000) point out this approach implicitly assumes that one standard deviation change in the interest rate represents as much as for a currency crisis as one standard deviation change in exchange rates or reserves. Many researchers followed a similar methodology. For example, Kaminsky and Reinhart (1999) construct a similar index, but they exclude interest rate arguing data availability, particularly, that interest rates series are not consistently available for the whole sample they use.

Frankel and Rose (1996) construct the most obvious indicator of crises: changes in the nominal exchange rate. They exclude reserves and interest rates on the grounds that foreign reserve data contains a lot of noise, and few countries have market-determined short-term interest rates. Moreover, since a successful speculative attack ends up in currency devaluation (and that is the case in most emerging countries) only changes in the nominal exchange rate are needed to determine currency crises^{iv}.

The second issue is related to how big a movement in the index should be to be considered a speculative attack. There are also different criteria. Frankel and Rose (1996) propose an absolute cutoff. Most researchers, however, rely on the moments of the distribution (mainly mean and standard deviation) to determine crisis. Some of them use the moments of the distribution of the index (for example Eichengreen et al., 1994, Reinhart and Kaminsky, 1999), while others prefer the moments of the component of the index (Moreno, 1995).

In high inflation episodes, rates of depreciation are consequently high. To ensure we are not considering each of these depreciations as an independent crisis, it is necessary to compute separate standard deviations for those periods. As pointed out by Reinhart and Kaminsky (1999), if standard deviation is computed for the full sample, many crises may be identified during inflationary episodes, while many others shall remain unidentified outside the inflationary period.

From the discussion we see that no measure of currency crises is perfect, they all have pros and cons, and there are always elements of arbitrariness. We choose an index similar to the one proposed by Eichengreen et al (1994) and Kaminsky and Reinhart (1999)^v, since we are interested in all speculative attack, successful or not. This specification of the index will allow us to capture episodes like “Tequila”, where authorities managed to keep the peg, despite the drainage in reserves and the increase in interest rate.

The index stems from the idea that market pressure increases when exchange rate devaluates (rises), when interest rates increase and when international reserves fall. Under a floating exchange rate regime, we expect abrupt increases in the exchange rate as crisis develops, while under a fixed exchange rate, prior to devaluation, interest rates increase and international reserves diminish.

We use the rate of change of nominal interest rate rather than the difference between the domestic and international rate, as in other papers, due to the inflationary process Argentina went through during several decades. These inflationary processes implied high and volatile rate of interest, and given the relative constancy of the international rate, the difference between domestic and international rate proved to be meaningless to capture turbulent periods. The Market Turbulent Index (MTI) is:

$$MTI = \frac{\hat{e}}{\sigma_e} - \frac{\hat{R}}{\sigma_R} + \frac{\hat{i}}{\sigma_i}$$

Where the symbol $\hat{}$ represents the growth rate of the variable, e is the exchange rate, R stands for international reserves, i is the domestic interest rate and σ_e , σ_R , σ_i are the standard deviations of the growth rate of the exchange rate, international reserves and domestic interest rate, respectively.

The Index is weighted by the inverse of the respective standard deviation to avoid the most variable component dominates the index movements. However, we also used different

weights to test the robustness of the index, and the crisis determination proved to be quite robust to different weight specifications.

The index was computed with monthly data from 1885 to 2002^{vi}. We imposed different criteria to sort crises, but whenever the *MTI* is greater than the mean (μ) plus k standard deviations (STD) we identify a “signal” or “turbulent episode”.

We require at least two “close” months with *MTI* greater than the mean value plus three STD to consider that episode as deep crisis or “crash”. If the *MTI* is greater than μ plus two STD but less than μ plus three STD, we call it “mild crisis”. If *MTI* exceeds its mean value in a half STD at least twice the episode is considered “minor turbulence”. The remaining episodes, i.e. when the index departs less than one half standard deviation from the average are termed as “non- crisis” or tranquility times. In high inflation episodes (1976 and 1989), we excluded the data for the estimation of the moments, to preclude these data distort the “signals”.

In order to determine the boundaries of a given crisis and so avoiding dating twice the same crisis, we require at least six months with no signals between each other.

Table 2. **Criteria to sort Crises**

Monthly Data		
Criteria		Classification
Index	# of Signals	
$MTI < 0.5 \sigma_{MTI}$		Non- crisis
$0.5 \sigma_{MTI} < MTI < 2 \sigma_{MTI}$	Two close months	Minor Turbulence
$2 \sigma_{MTI} < MTI < 3 \sigma_{MTI}$	Two close months	Mild
$MTI > 3 \sigma_{MTI}$	Two close months	Deep

The *MTI* was computed for five sub periods in order to keep its variance relatively homogeneous. Sub periods were chosen by political, economical and historical events. The sub periods chosen were the following:

- (a) 1885-1913: from Roca to the First World War
- (b) 1914- 1945: the Interwar Period:
- (c) 1946- 1976: from Perón to Perón:
- (d) 1976- 1991: from Hyper Inflation to Hyper Inflation:
- (e) 1992 – 2002: Convertibility, from boom to burst:

It is worth remark that the terms “tranquility”, “minor turbulence”, “mild” and “deep” are referred to the sub period considered and does not intent to be an absolute qualification for the whole period.

DATA

Considerably effort has been devoted on the construction of time series for 117 years. The market turbulence index was computed from monthly data from 1914 to the present. Exchange rates were taken from Vázquez- Presedo (1971 and 1975), *Ámbito Financiero* (1984) and FIEL. To construct the international reserves series we use data from Vázquez- Presedo (1971 and 1975) International Monetary Fund and Banco Central de la República Argentina (BCRA). Interest rates were taken from Vázquez-Presedo (1971 and 1975), FIEL and BCRA. Monetary, fiscal and international trade variables were obtained from Cortés Conde (1989) and also from BCRA, Ministerio de Economía de la Nación, Vázquez-Presedo and from Gerchunoff and Llach (2003). Recent data of terms of trade as well as exports and imports comes from CEPAL.

THE CLASSIFICATION OF CRISES

We dated **20** crises throughout **118** years of history. **5** crises were rated as “crashes”, **9** as “mild” and 7 as minor turbulence. Interestingly, the number and magnitude of the crises increases through time (see Table 2). The five “deep crises” identified correspond to the years, 1890-91, 1929-32, 1975-76, 1989-91 and 2001-02.

Table 3. *Crisis Summary*

Period	Years (1)	Number of crises (2)	Number of crises years (3)	Crises Years as % of total years (3)/(1)	GDP Growth (annual average in%)	Type of Crisis		
						Deep (crash)	Mild	Minor Turbulence
1885 - 1913	28	2	4	14.2	5.4*	1	1	0
1914 - 1945	32	4	7	23.3	3.1	1	1	2
1946 - 1976	31	7	10	32.2	3.8	1	4	3
1977 - 1991	15	4	9	60.0	0.4	1	2	1
1992- 2003	12	2	3	25	2.1	1	1	0
<i>Total</i>	<i>118</i>	<i>20</i>	<i>33</i>	<i>23</i>	<i>3.3</i>	<i>5</i>	<i>9</i>	<i>6</i>

The 20 crises implied 33 crisis years. That is, in 22% of the 118 years considered, Argentina was in crises, which meant one *crisis year* every 3.6 years. A given year is considered a *crisis year* if the market turbulence index exceeds one standard deviation from the average in at least 2 months, consecutive or alternate.

According to our index, the most turbulent period of Argentina's history was 1977 –1991, not only because it registered 4 crises in 15 years, but also because nine of those years were *crisis years*, which meant 60% of these years in crisis (see Appendix, Table 2A for details).

V. EMPIRICAL RESULTS

How did the Argentine economy perform in the neighborhood of crashes? Is there any regularity in the behavior of the macroeconomic variables around these extreme episodes? Moreover, are there any repeated factors contributing to the large number of crises throughout the Argentine history? Or is it that each crisis is unique in the sense that it is caused by a different set of factors? Our strategy to answer these questions will involve four steps, each containing different tests. Firstly, we split the dataset in crises and non-crises years and we carried out several non-parametric tests in order to establish whether key macroeconomic variables, suggested by the existing currency crises theories, behave significantly different before and after crises. Secondly, we perform graphical analysis to study the behavior of these macroeconomic variables in the neighborhood of currency crises. Thirdly, since the previous studies are intrinsically univariate, we estimate a *logit* model to characterize Argentina's currency crises. Finally, following Kaminsky (2003), we perform *regression tree analysis* to classify crises and crashes into different varieties proposed by the theories at stake. As in the *logit* model, we include several financial and macroeconomic variables suggested by the extended empirical literature. It is worthwhile to notice that *Regression Tree* and *Logit* analysis complement each other rather than compete. The *logit regression* approach misses the details but highlights the repeated facts, that is, the regularities; while the *regression tree* approach stresses diversity, the set of factors that contribute to each particular crisis.

NON-PARAMETRIC TESTS

Table 4 shows four tests of equality of population (Wilcoxon, Median Chi-square, Kruskal-Wallis and van der Waerden) and table 5 contains the Kolmogorov-Smirnov test for equality of distributions. The null hypothesis of the first group of tests is that the sample median of each selected macroeconomic variable does not differ significantly during crises and non-crises periods. The statistics tabulated are values of these tests under the null, so small probabilities

value computed let us reject the null. We reject the null for all variables, excepting Current Account Deficit (CA) and Terms of Trade (TOT), for all the methods reported.

We also tabulated the two-sample Kolmogorv-Smirnov test for equality of distributions. Under the null hypothesis MTI and macro variables have the same distribution in crises and non-crises periods. As in the tests of equality of population, the small probability values obtained led us to reject the null for all variables except for Current Account Deficit (CA) and Terms of Trade (TOT).

Table 4. Panel A. *Test of equality of population.*

Method	GDP	Public Expenditure	Public Revenue	Inflation	M3
Wilcoxon/Mann-Whitney	3.8**	2.6**	3.6**	4.4**	2.6**
Med. Chi-square	9.6**	2.8**	11.7**	11.7**	2.3**
Kruskal-Wallis	14.5**	6.9**	13.1**	19.5**	6.8**
van der Waerden	14.3**	7.0**	13.7**	21.6**	8.4**

Note: * p-value less than 5%.

** p-value less than 1%

Table 4. Panel B. *Test of equality of population.*

Method	Exports	Imports	CA/GDP	TOT
Wilcoxon/Mann-Whitney	2.51**	3.09**	0.91	1.87
Med. Chi-square	10.25**	7.08**	0.94	3.05
Kruskal-Wallis	6.31**	9.56**	0.83	3.53
van der Waerden	7.06**	10.16**	0.71	3.01

Note: ** p-value less than 1%

These results are consistent to the ones obtained by Eichengreen et al (1994). They found significant differences between crises and non-crises periods for emerging economies but none for European countries. These evidence supports the predictions of the first generation BOP crisis models. As argued by Eichengreen et al (1994), if speculative attacks are caused by self-fulfilling prophecies or simply by changes in expectation (as suggested by the second generation models), there should be no significant differences in macro variables behavior during periods of speculative attacks and tranquility. But, if we observe significant differences, the nature of these differences may reflect the inconsistent macroeconomic policies.

Unequal behavior in monetary and fiscal policy indicators during periods of crisis versus non-crisis may shed light on whether an expansionary monetary and fiscal policy may trigger speculative attacks as in Krugman's first generation model.

On the other hand, some internal or external indicators may signal high government's high costs of maintaining the peg, leading to a shift in expectations that may trigger a speculative attack, as in second-generation model. For example, a high rate of unemployment or a current imbalance may have this role, as suggested by Obstfeld (1994) and Drazen and Masson (1994)

Table 5. Panel A. *Kolmogorov- Smirnov Test.*

	GDP*	Public Expenditure *	Public Revenue*	Inflation	M3*
Kolmogorov Smirnov	0,45	0,32	0,44	0,51	0,51
P-value	0,00	0,02	0,00	0,00	0,00
Corrected	0,00	0,00	0,00	0,00	0,00

Table 5. Panel B. *Kolmogorov- Smirnov Test.*

	Exports*	Imports*	CA/GDP	TOT
Kolmogorov Smirnov	0,36	0,42	0,14	0,12
P-value	0,01	0,00	0,71	0,88
Corrected	0,00	0,00	0,63	0,83

GRAPHIC ANALYSIS

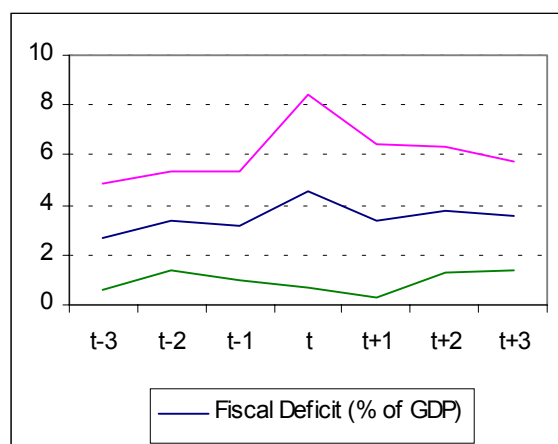
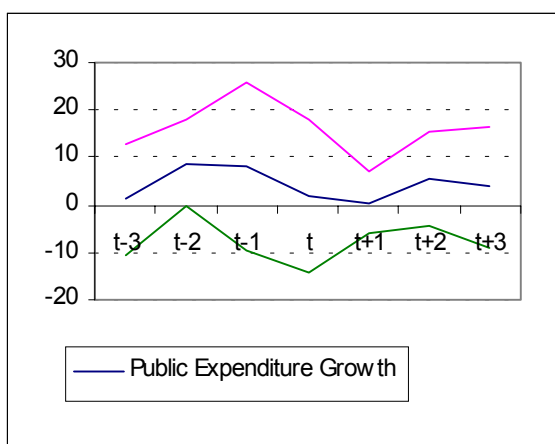
Once we established that main macroeconomic variables have significantly different behavior before and after crises episodes, we attempt to describe how each macroeconomic variable moves in the neighborhood of crises.

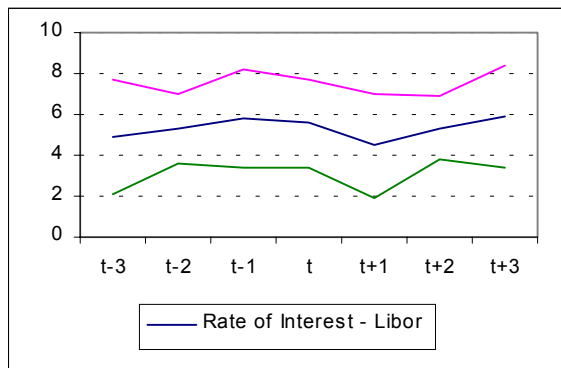
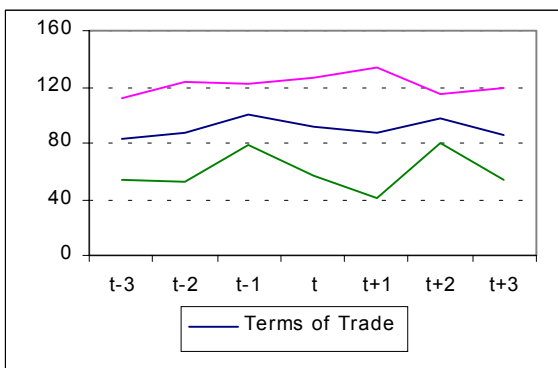
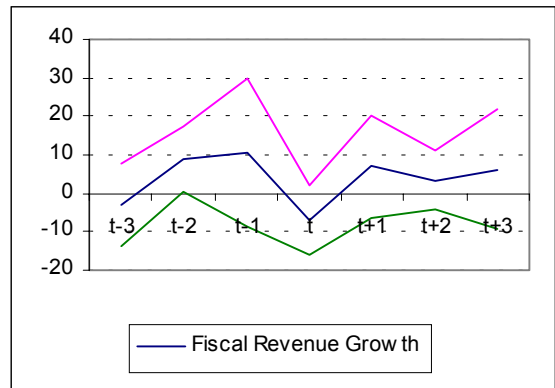
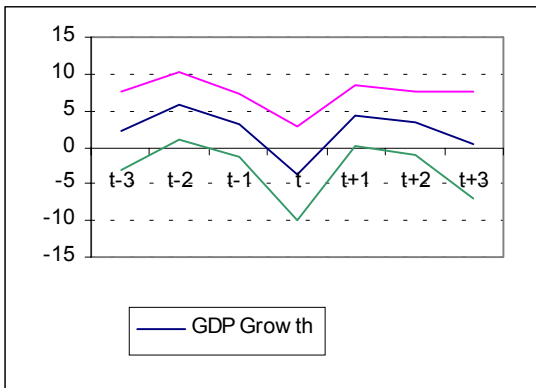
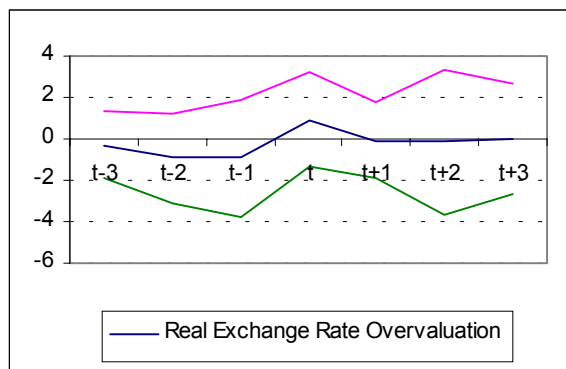
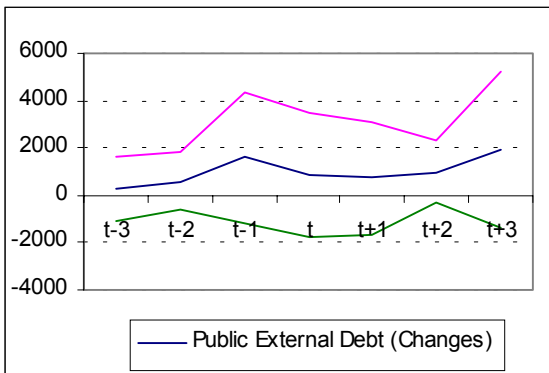
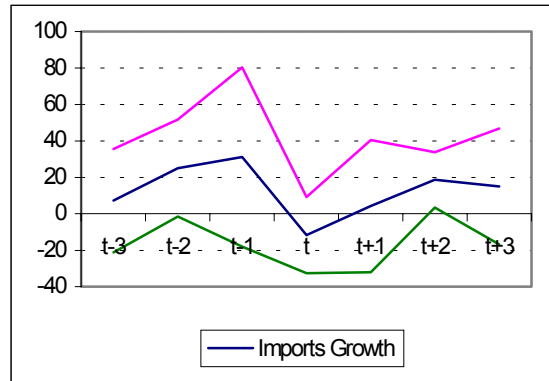
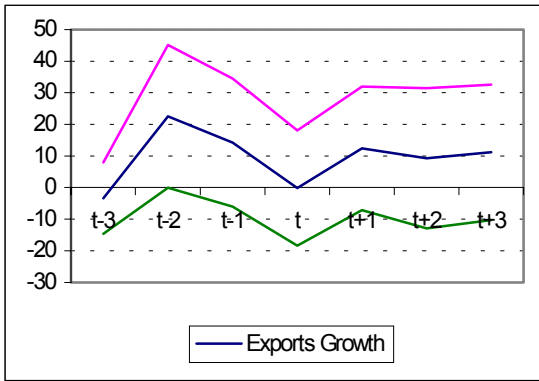
Each of the graphics portrays the movement in a variable of interest three years before and three years after the crisis. As Frankel and Rose (1996) point out, a graphical approach has advantages and disadvantages. Among the first, a graphical analysis imposes non-parametric structure on the data, makes only a few assumptions that are necessary in inference statistics, and they are often more accessible and informative than tables with estimations of coefficients. On the other hand, they are informal, and intrinsically univariate.

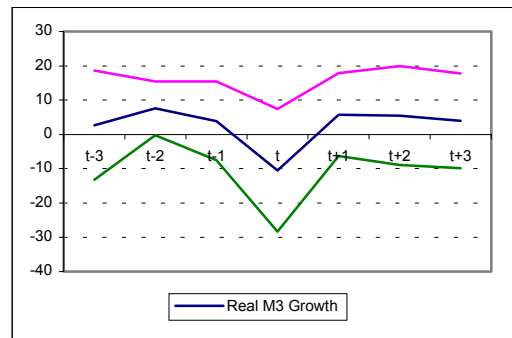
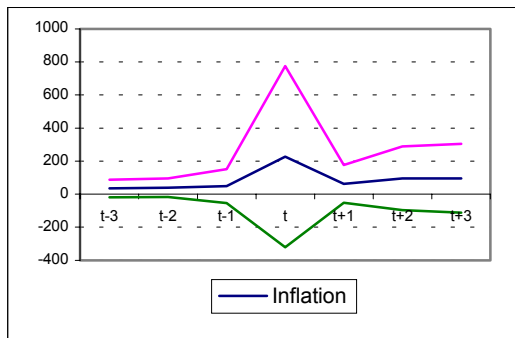
A brief comment on each variable follows.

- *GDP growth* reaches a peak two years before the beginning of crises (on average, it grows 5.7%) and the trough at the moment of the crises (-3.6%, on average). The difference between peak and trough is 9.3%, on average.
- *Public Expenditure Growth*: the peak is observed two periods before the crises (on average, increases 8.7%) and the trough at $t+1$ with an average value of 0.4% (which means a fall of 8.3%)

- *Fiscal deficit (as % of GDP)* increases before crises and peaks during the crises at an average level greater than 4%.
- *Inflation*: peaks during the crises and falls abruptly in $t+1$.
- *Real Money (M3/P)*: it reaches a peak in $t-2$ (18.6% on average) and a trough during the crises, averaging -7.4%.
- *Current Account Deficit (as % of GDP)* reaches a peak at $t-1$ (average -2.33) and a trough at t (-0.38%), i.e. an improvement of 2%
- *Real Exchange Overvaluation*: reaches a peak in $t-2$ (appreciation) and a trough at t .
- *International Reserve Growth*: on average they increase at 30% at $t-3$, and reach a minimum at t with a fall of -11%
- *International Rate of Interest and Terms of Trade (TOT)*: they both reach a peak one period before the crises begin. For emerging economies, the increase in the international interest rate is very important for two reasons. Firstly, it is key to explain the capital inflow and outflow to emerging countries as pointed out by Calvo, Reinhart and Leiderman (1992). Secondly, it impacts on the service of external debt. An increase in the rate of interest is associated with worsening in quasi fiscal deficit and consequently in fiscal accounts. The fall in terms of trade during crises from a peak one period before crisis, which as we have already said, it let us think that in most severe crisis adverse external conditions were present . A similar behavior shows an international interest rate. This
- *MTI and its components*, as we expect, since we use them to sort crisis, behave differently during crisis than in the periods before and after.







Note: color lines above and below the average are the intervals ($u + STD$) and ($u - STD$) respectively.

REGRESSION ANALYSIS

Following Frankel and Rose (1996), in this section we try to characterize the currency crises suffered by Argentina through 118 years of history. Rather than testing a specific theory of crises

We estimate a logit model whose binary dependent variable takes the value 0 for no-crisis years, and 1 for crisis years. Independent variables were classified into three groups: (i) **Domestic Macroeconomic Indicators:** real public expenditure growth, GDP growth, Real M3 growth. (ii) **External Indicators:** CAD, Reserves/Imports Ratio, Real Exchange Rate Over Valuation^{vii}, External Debt. (iii) **Foreign Variables:** International Rate of Interest, TOT. Three alternative models were estimated using maximum likelihood^{viii}. Results are tabulated in Table 6. Since *logit* coefficients are not directly interpretable, we report the effect of a change in variables on the probability of crisis. We tabulated z-statistics with null hypothesis of no effect. We also report McFadden R squared.

Most of the variables included are statistically significant at usual levels. It is found that the probability of crisis increases when GDP, real M3 growth, and the ratio reserves to imports fall. Crises are also more likely when the local currency appreciates (lagged once), and TOT impairs (although this variable is not statistically significant at standard values).

On the other hand, an increase in public expenditure growth, in the current account deficit (lagged one period), in the external debt (not significant in Model 1), and an increase in the international rate of interest also increase the probability of crisis.

Interestingly enough, the results of the regression let us conclude that fiscal variables have an important role in determining the probability of crisis. The domestic macroeconomic effects, measured by GDP growth and real M3 growth are very strong. An appreciation of the currency (lagged once) also increases the probability of a crisis, but contemporaneously it has the opposite sign as expected, since during crisis devaluation has already taken place.

However we can also see that an impairing of external conditions (measured by an increase in international rate of interest or by a worsening in TOT) makes a crisis more probable.

Table 6. **Regression Results.**

Variable	Model 1	Model 2	Model 3
C	3.90 (1.18)	-0.93 (-0.27)	-0.85 (0.25)
GDP growth	-0.17 (-2.99)	-0.17 (-2.76)	-0.17 (2.76)
Public expenditure growth	0.05 (2.55)	0.04 (2.29)	0.04
Real M3 growth	-0.08 (-2.79)	-0.09 (-2.60)	-0.08 (2.60)
External Debt	-6.05E-06 (-0.06)	1.45E-05 (0.13)	
Terms of Trade (TOT)	-0.06 (-2.10)	-0.03 (-1.14)	-0.03 (-1.18)
Current Account Deficit	-4.90 (-0.78)		
Current Account Deficit (-1)		-22.41 (-2.39)	-22.22 (-2.41)
LIBOR	0.23 (1.19)		
LIBOR (-1)		0.56 (2.37)	0.55 (2.36)
Reserves /Imports	-1.62 (-2.13)	-1.42 (-2.07)	-1.41 (-2.04)
Real Exchange Rate overvaluation	0.41 (2.51)	0.44 (2.59)	0.44 (2.60)
Real Exchange Rate overvaluation (-1)	-0.47 (-2.31)	-0.48 (-2.28)	-0.48 (-2.28)
LR statistic (11 df)	52.67285	60.28001	60.26328
Probability (LR stat)	8.56E-08	3.21E-09	1.19E-09
McFadden R-squared	0.42324	0.484366	0.484
Obs with Dep=0	92	92	92
Obs with Dep=1	26	26	26

Note: Z statistic in parenthesis below coefficient

REGRESSION TREE ANALYSIS

Regression Tree Analysis is a non-parametric device, aimed at identifying the characteristics of each crisis separately. This well-known method in many disciplines (see details in Appendix), was introduced in the analysis of currency crises by Kaminsky (2003).

The regression tree method applied to currency crises has a couple of advantages when compared to other traditional methods. First, it does not impose the same functional form to all crises such as logit and probit models. Second, the probability of crises augments as the number of variables indicating vulnerability increases. For example, an expanding domestic credit may be explosive with convertibility and with capital inflow reversal. As far as we know,

the Regression Tree approach has been applied only in cross-country analysis but we think it can also shed light on case studies like the present one.

The output of regression tree method is a set of terminal nodes, each one characterizing a crisis or a group of crises. The method considers an initial split of the data into two subgroups according to the rule of minimum node. Many different criteria can be defined for selecting the best split at each node. However, the properties of the final tree selected are insensitive to the choice of splitting rule. Variable misclassification costs and prior distributions can be incorporated into the splitting structure in a natural way.

This split is repeated in sequential form until each subset terminates either when there is no impurity reduction from splitting or when the number of observations in the cell is less than a specified number of rows.

Results

Previous to running the *Regression Tree* method, we classified years of crises and non-crises during 118 years of argentine history according to the MTI. We did not distinguish among crises intensity, i.e. deep, mild and minor turbulences. Indicators of crises were grouped according to the prescription of the first, second, third generation models and sudden stops. A total of fifteen indicators were used.

Table 7. **Indicators of Currency Crises Models**

Model of Currency Crises	Variables
First Generation Models	Fiscal Deficit (% GDP)
	Public Expenditure Growth
	Excess Real M1 Balances/GDP
Second Generation Models	Exports Growth
	GDP Growth
	Real Exchange Rate Overvaluation
	Current Account Deficit
Third Generation Models	M2/Reserves Growth
	M2 Multiplier Growth
	M2/Reserves
	M2 Multiplier
	Bank Deposits Growth
Debt	External Debt/Exports
Sudden Stop	Nominal Labor
	Nominal Labor Growth

The results of *regression tree* are reported in Figure 1. They show the criteria for splitting the sample. The 34 years of crises were classified in different varieties of currency crises

according to only five indicators (among the fifteen listed in table 4): Fiscal Deficit, Real Deposits, Overvaluation, Exports and Current Account Deficit. The overall importance of variables is presented in Table 1A.

It is found that observations are assigned to six terminal nodes, which let us classify the crises into three different groups. The first split of the data is carried out on the *fiscal deficit as percentage of GDP*, with a threshold of 6.6. For values greater than that, we identify eight crisis years. This variety of crises is consistent with first generation models.

For values minor than 6.6, there is a new split in the subgroup, performed by *real total deposits*. If its rate of growth is greater than -12.7, the new split comes from exports, and we have another final node with four crises.

If real deposits grow less than -12.7%, the sample is split again by the variable *overvaluation*. If there is a RER overvaluation greater than -2.6, and changes in Current Account Deficit are less than 0.4, we find another terminal node with eight crises.

Table 2A describes the characteristics of the final group. There we can identify indicators of vulnerability. In the first node (number 3) the only indicator of vulnerability is fiscal deficit, there are eight years of crises where fiscal deficit as percentage of GDP is greater than 6.6%. These crises correspond to the following years (see Table 3A): 1958, 1962, 1975 and 76 and 1981 to 1985.

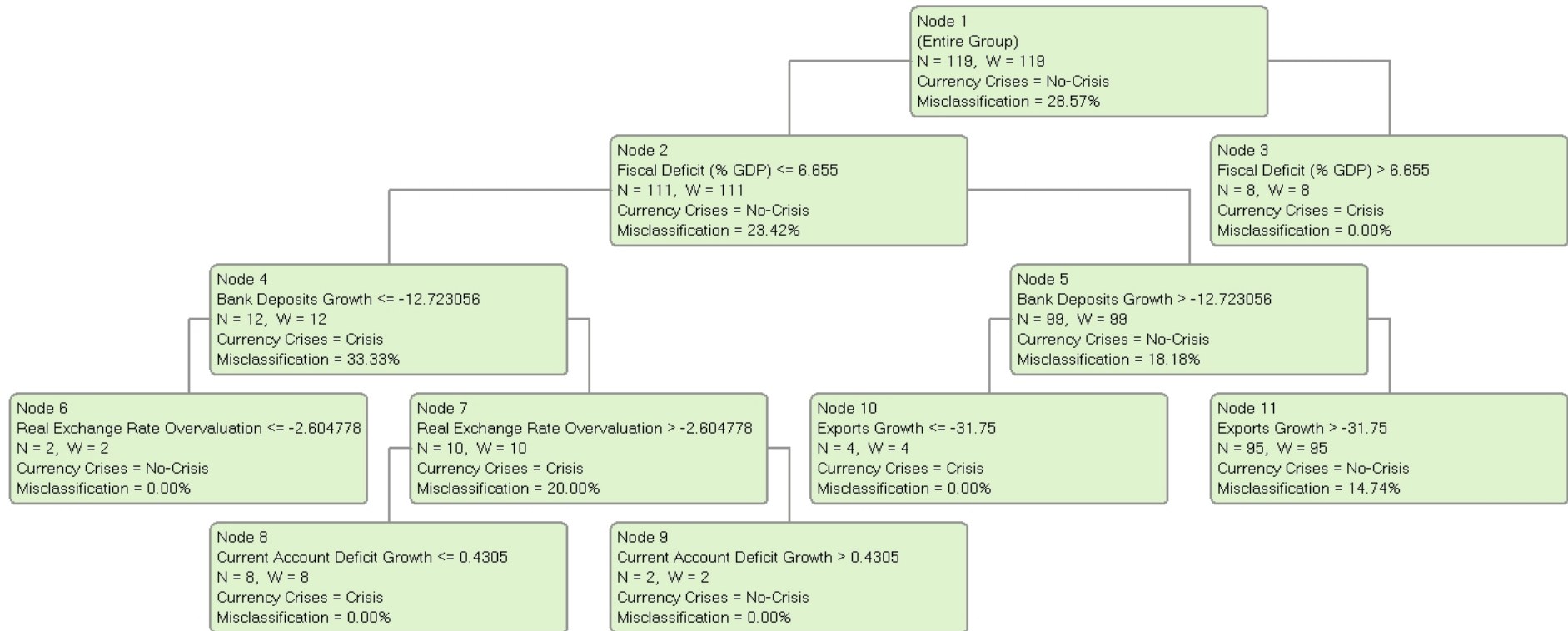
Node 8 is related to an important fall in real deposits jointly with an impairing in current account deficit not greater than 0.43 and an overvaluation greater than -2,6. In that final node we find the following crises years: 1890, 1891, 1914, 1951, 1989, 1990, 1995 and 2001. Notice that node 8 includes the most severe crises Argentina went throughout its history.

Node 10 is related with a considerable fall in exports. We identify this node with the following crises: 1921, 1930, 1938 and 1949. These crises are also consistent with a fall in Terms of Trade, which worsen the prices of exports, a fall of the international demand for Argentineans products or with a fall in production of primary goods, associated with climatological phenomenon.

The results obtained so far are quite preliminaries. Future research is necessary, basically in improving the data set in two directions. The first one is related to increase the number of indicators variables to be used, for example we need better indicators of external debt, domestic credit, among others. The second one is related to broaden the period or periodicity of the data. One possibility is to look for data during XIX century; other possibility is to find quarterly data for the whole period. The increase in the sample would be necessary to assure consistency.

However, even preliminary, some conclusions may be drawn. The first one is that extremely high fiscal deficit is responsible for eight currency crisis in Argentina. The second one is that worsen in external conditions may have deleterious consequences in Argentina, mainly when domestic imbalances are present. The third one, when many indicators of vulnerability are signaling crises, they are almost inevitable.

Figure 1
Regression Tree Analysis



VII. CONCLUSIONS

Alguna vez nos deja pensativos la sensación “de haber vivido ya ese momento”.

Jorge Luis Borges,

La doctrina de los ciclos. En Historia de la Eternidad.

For historians each event is unique. Economics, however, maintains that forces in society and nature behave in repetitive ways. History is particular, economics is general.

Charles P. Kindleberger

Manias, Panics, and Crashes: A History of Financial Crises,

Throughout its history, Argentina suffered several crisis episodes, which has become more frequent and severe since 1930. In the second half of the 20th century we dated 13 crises, and termed 3 of them as crashes. To give an idea of the magnitudes involved, the last crash, in 2001/ 2002, brought about a 15% decrease in real GDP and pushed vast sectors of the population below the poverty line. Similarly, the 1989 crash, which ended in hyperinflation, resulted in a 9% fall in real GDP. Why crises are so frequent and of such large magnitude? What are these crises caused by? Are there repeated factors or, different sets of variables intervene in each crisis, make them unique?

This paper, is aiming at analyzing the “clinical record” of the “patient” named Argentina. We look for regularities and common factors repeated in these extreme economical episodes throughout most of the lifetime of the country^{ix}. Our strategy involves various steps.

First, using a *Market Turbulence Index*, defined as the weighed rate of change of exchange rate, reserves and interest rates, we date and classify crises in three categories: (a) “minor turbulent episodes”, (b) crisis (or “mild episodes”) and (c) crashes (or “deep” crisis). The MTI was built from monthly data for the period 1885-2002.

Once we identified the critical episodes, we select 15 macroeconomic variables mentioned by the theories at stake as having a key role in explaining crises, and tests whether they behave significantly different in crises and non- crises years. It is found, by means of Wilcoxon, Median Chi-square, Kruskal-Wallis and van der Waerden tests, that the sample medians of the selected macroeconomic variables differ significantly during crises and non-crises periods. Likewise, the two-sample Kolmogorv-Smirnov test also shows that the distributions of the selected variables are different in crises and non-crises periods.

After that, we focus on crises episodes and their neighborhood. We perform **graphical analysis** of the selected macroeconomic variables, featuring three periods before and after crises. We observe that, except for the reversion in the current account, that supports the

sudden stop theory; all the variables behave as predicted by the first generation model of currency crises.

We also estimate a logit model, including as regressors, again, the same macroeconomic variables. We found that fiscal variables have an important role in determining the probability of crisis. Likewise, domestic macroeconomic effects, measured by GDP growth and real M3 growth, real exchange rate overvaluation (lagged once) and an impairing in external conditions (LIBOR) also make a crisis more probable.

Finally, the regression tree approach detects six terminal nodes that let us classify the crises into three different groups but all of them having fiscal deficits as key components of the “cocktail” that characterize crises factors. Actually, the first node has high *fiscal deficit as percentage of GDP* as the only factor for 8 of the 20 crises identified. The other two nodes feature, on one hand, moderate fiscal deficit, falling bank deposits and diminishing exports growth. On the other hand, the third category is characterized by moderate fiscal deficit, falling bank deposits, real exchange rate overvaluation and current account deficit.

With all this evidence at hand, some preliminary conclusions can be drawn:

- In most of the crises, regularities in the behavior of macroeconomic variables can be detected. In that sense, Prebisch was right.
- We can rule out Fiscal imbalances were always present, which is consistent with the predictions of first generation speculative attack models. In that sense, Alberdi were right.
- Adverse foreign factors had also a key role in explaining crises: an increase in international rate of interest and an impairing in TOT increases the probability of crisis. Notice, nonetheless, that adverse external conditions cannot explain any crisis by itself. The fiscal side has to be added to get a sound explanation of a given crisis.
- In like manner, we cannot affirm that argentine crises stem from the banking sector. Fall in deposits and other manifestations of banking problems are part of the dynamics of a given crisis but never its origin. As pointed out by della Paolera y Taylor (2003), in their analysis of early XX century crises, once the crisis starts, government takes banking funds, affecting financial sector solvency, which in turn feed the crisis and increases the probability of make it more severe.

The severity and persistence of currency crises in Argentina, the high vulnerability to external shocks regardless of the type of government (*de facto* or constitutional) and the political party in office, seem to reveal problems at the roots of the country rather than associated to particular economic policies or specific adverse shocks. It all seems to point out at the institutional design.

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Table 1 A.. *Crises Characteristics: 1914 – 2003*. Monthly Data

Crisis	Exchange Rate					International Reserves					Interest Rate					Crisis breath			Market Turbulence Index					Crisis Type
	Trough		Peak		Change %	Peak		Trough		Change %	Trough		Peak		Change %	Beginning	End	# months	> 3	> 2	> 1.5	> 1	> 1/2	
	\$/US\$	month	\$/US\$	month		mm	month	mm	month		%	Month	%	Month										
1914	2351	Mar-14	2368	May-14	-0.72	232.1	Apr 14	196.39	Jul-14	-15.39	7.50	Apr 14	8.75	Aug 14	16.7	May-14	Jul-14	3	0	2	0	0	1	Mild
1920/21	2330	Apr 20	3454	Jul-21	-32.54	470.6	Jul-20	470.6	May-21	0.00	7.38	Oct-20	8.13	Apr 21	10.2	Jul-20	May-21	11	0	0	1	1	5	Turbulence
1929/31	2375	Jan 29	4260	Oct-31	-44.25	502.6	Jan 29	256.9	Feb-32	-48.88	6.13	Dec 28	7.87	May-31	28.4	Mar-29	Dec 31	22	3	6	1	6	4	Deep
1937/38	3291	Jun-37	3903	Apr 38	-15.68	476.4	Jun-37	343.1	apr 38	-27.99	5.14	Oct-37	5.75	Jan 39	11.9	Mar-37	Apr 38	14	0	0	0	4	5	Turbulence
1948/49	475	Apr 48	1650	Nov-49	-71.21	3737	Feb-48	2067	Jul-49	-44.69						Mar-48	Nov-49	16	1	1	2	2	2	Mild
1951	1374	Jun-50	2950	Sep-51	-53.42	2689	Dic-50	1866	Dic-51	-30.61						Jan 51	Aug 51	8	0	1	0	2	1	Turbulence
1958	3720	Dec 57	7350	Oct-58	-49.39	461120	May-57	101270	Oct-58	-78.04						Jan 58	Oct-58	10	1	1	1	1	2	Mild
1962	8420	dec 61	14840	Nov-62	-43.26	497765	Ago-61	120865	Oct-62	-75.72						Jan 62	Oct-62	10	1	1	0	0	5	Mild
1964 /65	14040	May-64	28570	Jul-65	-50.86	321365	May-64	117180	Jun-65	-63.54						Jun-64	Jun-65	13	0	1	2	0	5	Turbulence
1971	41750	Feb-71	97750	Nov-71	-57.29	743825	Oct-71	194289	Jun-72	-73.88						Jun-71	Jul-72	14	0	2	2	2	3	Mild
1975 /76	14	Jun-74	333.5	Mar-76	-95.80	1536531	May-74	293346	Aug 75	-80.91						Jul-74	Mar-76	21	2	4	2	5	2	Deep
1981/82	1986.5	Dec 80	61568.2	Nov-82	-96.77	7343.891	Jul-80	2425.136	Nov-82	-66.98	4.31	Oct-80	10.82	Jul. 81	151.04	Dec 80	Nov-82	24	1	2	1	6	1	Mild
1983/84/85	94650	May-83	952045.4	Aug 85	-99.01	3244.84	Jan 82	973.53	Feb-85	-70.00	10.00	May-83	31.40	May-85	214.00	Jul-83	Apr 85	22	0	0	5	3	6	Turbulence
1987	8951.0526	Jun-86	143100	Sep-88	-93.74	3718.56	May-86	958.39	Ago-87	-74.23	4.20	Jun-86	19.30	Jul-88	359.52	Aug 86	Jun-88	23	0	3	0	3	5	Mild
1989/90/91	143100	Sep-88	987900	May-91	-99.86	2652.47	Nov-88	898.91	Jan 90	-66.11	8.35	Sep-88	83.20	Jun-89	896.41	Jan 89	Feb-91	26	11	1	0	2	1	Deep
1995	1	Dec 94	1	Mar-95	0.00	9967.07	Nov-94	5958.6	Apr 95	-40.22	0.60	Oct-94	1.50	Apr 95	150.00	Dec 94	Mar-95	4	0	2	2	0	0	Mild
2001/02	1	May-01	3.69	Nov-02	-72.87	27547	Sep-00	9031	Oct-02	-67.22	0.58	Aug 00	4.86	Jul-02	737.93	Oct-00	Oct-02	25	9	1	1	2	4	Deep

Note: the rate of growth of exchange rates and international reserves were computed from a peak to trough, considering the behavior of these variables six months before and after the signal given by the Market Turbulence Index announces the beginning and end of the crisis.

Appendix I

Table 2A. Panel A. **Mean and Standard Deviation of Crises and non Crises Episodes.**

	Parameter	Growth Rate (%)				
		GDP	Public Expenditure*	Public Revenue*	Inflation	M3/P
Crises	Mean	-0.5	-1.5	-2.9	237.7	-3.7
	Standard Deviation	6,3	15.4	14.2	617.4	29.2
Non-crises	Mean	5.0	8.1	8.5	15.0	12.4
	Standard Deviation	7,6	20.6	15.8	36.4	27.9
Total	Mean	3,6	6.1	5.1	81.7	7.6
	Standard Deviation	7,8	21.6	16,1	352.3	29.1

Table 3A. Panel B. **Mean and Standard Deviation of Crises and non-Crises Episodes.**

	Parameter	Growth		Current Account/GDP	Terms of Trade
		Exports	Imports		
Crises	Mean	-0.37	-3.68	-3.6	97.4
	Standard Deviation	20,31	29,87	6.9	17.8
Non-crises	Mean	10,84	13,14	-2.3	102.0
	Standard Deviation	19,67	27,82	5.4	17.6
Total	Mean	7.0	7.58	-2.7	100,5
	Standard Deviation	20.52	29.12	5.9	17,7

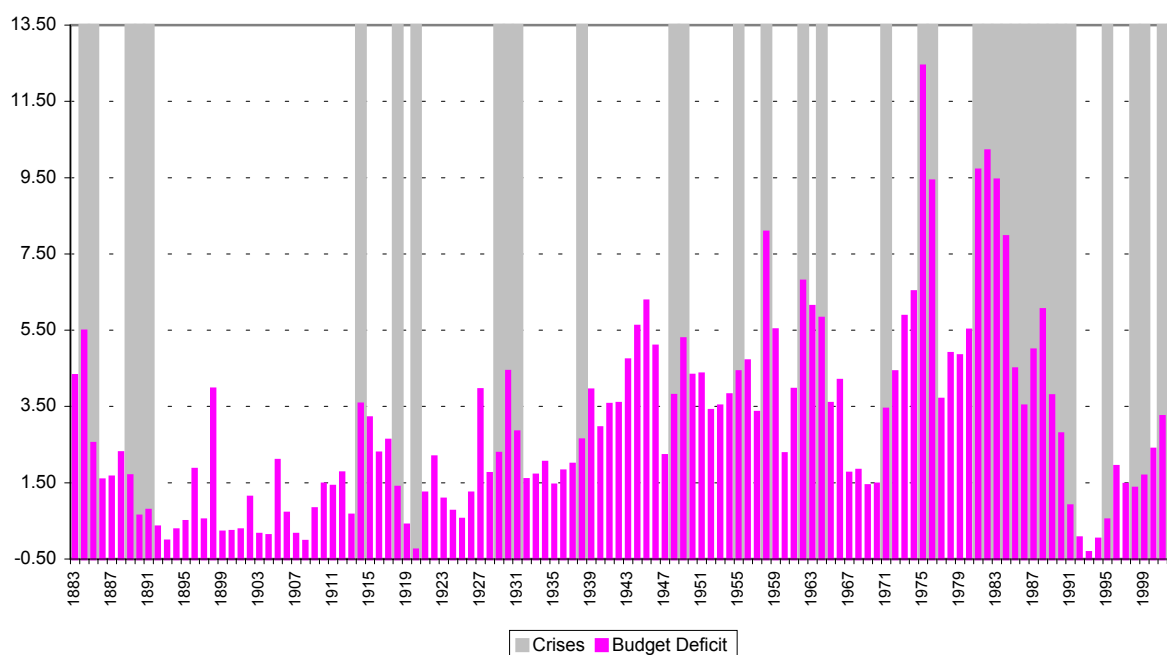
Appendix II.

Macroeconomic Behavior in the Neighborhood of Crashes

How did the Argentine economy perform in the neighborhood of crashes? Is there any regularity in the behavior of the macroeconomic variables around these extreme episodes? In order to approach to the answer of these questions we present a description of the macro variables behavior in the neighborhood of five “crashes” identified in section IV. Tables 5, 7, 9, 11 and 13 summarize the behavior of the main fiscal, monetary and external sector indicators before, during and after each crash, while tables 4, 6, 8, 10 and 12 show how GDP evolved during crisis years and the behavior of the components of the Market Turbulence Index: exchange rate, international reserves and interest rate.

- **Before crises.**
 - ◆ All five crashes had significant and persistent budget deficits in the years preceding each episode. Remarkably, the years before de 1975-76 crash show fiscal deficits around 8% of the GDP. Likewise, in the two years preceding the 1989-91 crisis and the 1890 –91 crisis budget deficit averaged 5.5% and 3.8% of the GDP respectively. A closer look at the fiscal history of Argentina shows that deficits were the norm and surpluses very rare: only the years 1893, 1920 and 1993 (see Figure 1).
 - ◆ In all five crashes, public expenditures as well as the real money aggregate M3 grew at very high rates in the years preceding the crisis.
 - ◆ We also verify increases in the interest rates, worsening in trade and current account deficits and severe drainage of international reserves.
- **During Crises.**
 - ◆ In the five cases economic activity plunges and consequently imports diminish substantially, which in turn contributes to trade and current account adjustment.
- **After Crises.**
 - ◆ After crisis, governments tighten fiscal accounts with a combination of fiscal revenue increment and public expenditure adjustment.
 - ◆ In the years following the 1889-91 and the 1989-91 crisis we also register a strong recovery in economic activity, and hence in imports, and the return to current account deficit.

Figure 1A. **Budget Deficit and Crises 1883 -2002**



Source: Gerchunoff and Llach (2003) and own calculations.

In order to give an historical content and context to the crises analysis, we offer a brief description of the events in each period.

THE BARING CRASH

The root of the crisis can be found in the poor administration of President Juárez Celman, voted in 1886, characterized by the outrageous increased in public expenditure and the high level of indebtedness, both external and domestic. As reported in della Paolera (1994), in the period 1884-1890, Argentina absorbed 11% of the new portfolio issue of the London market, while the U.S. the 30% with a population 20 times larger.

High public and private investments (in railroad, constructions, infrastructure) were financed with external borrowing. In this period government created the National Guarantee Banks (Bancos Nacionales Garantidos) that is, banks entitled to print their own money, which lead to huge increments in the monetary base.

High levels of public indebtedness coupled with easy monetary policy brought about devaluation expectations, with the consequently fall in specie reserves. In 1890 most private and public banks broke and, given the impossibility of facing their obligations, a generalized default was declared.

In April 1890 a new political party, Unión Cívica, generated a bloody insurrection that ended up in Juárez Celman resignation^x. According to Cortés Conde (1989), the revolution of the

90's was not only a political but also a moral reaction to a wasteful administration, accused by the revolutionaries as a corrupt one.

Table 4A. *The Baring Crash*

Crash	Growth Rate (%)			
	International Reserves	Exchange Rate Depreciation	Country risk Interest Rate Differential	GDP
1889/90/91	-94.6 1888 vs. 1891	153.1 1888 vs. 1891	79.1 1890 vs 1888	-14.8 1889 vs. 1891

Note: See Table 1A for details.

In 1891 the minister of finance, carried out a tight fiscal and monetary policy that allowed restructuring public debt and the return to convertibility in November 1899. These measures, in addition to the reforms in the banking sector, were the cornerstone of a renewed stability and growth for more than 20 years.

Table 5A. *Macroeconomic performance in the neighborhood of the 1889–1891 crash.*

Years	Growth rates						Fiscal Deficit % of GDP	Terms of trade 1995=100	Current Account as ratio of GDP
	Real GDP	Real Fiscal Revenues	Real Public Expenditures	Money (M3/P)	Exports *	Imports *			
1887	11.9	27.18	24.48	10.0	20.9	22.9	1.65	95.5	-18.5
1888	9.9	-8.68	7.03	34	18.6	9.4	2.29	92.9	-20.4
1889	17.2	9.38	8.09	33	-9.9	28.1	1.69	78.4	-30.4
1890	-4.3	-23.65	-31.6	12	11.9	-13.6	0.63	73.4	-24.5
1891	-11.1	-34.12	-11.75	-23	2.4	-52.7	0.79	67.2	1.1
1892	8.8	69.79	14.92	-7	9.9	36.1	0.35	80.5	-0.3
1893	4.9	17.77	-1.65	7	-17.0	5.1	-0.02	73.5	-7.5

* Millions of Gold Pesos

Source: Llach and Gerchunoff (2003), Cortés Conde (1989), della Paolera (1988) and Taylor (1997)

THE GREAT DEPRESSION

The World War I forced President Victorino de la Plaza^{xi} to suspend the full convertibility of the peso in August 1914, after 13 years of gold standard regime.

Argentina returned to convertibility in 1927, but abandoned it in December 1929 under the pressures of what later would develop into a worldwide depression. Gold backing of the currency diminished from 80% in 1928 to 45% in 1931 and the paper peso suffered 65% depreciation relative to the U.S. dollar. As reported in della Paolera (1994), Argentina was the only major Latin America debtor to honor the service on its external debt but at the cost of losing about 60% of the gold reserves at the Conversion Office.

Table 6A. *The great depression*

Crises	Growth rate (%)				Duration (months) Beginning - End
	International Reserves (U\$\$)	Exchange Rate Depreciation*	Nominal Interest Rate	Real GDP	
1929/ 30/31/32	-48.9 Jan 1929 - Feb 1932	79.5 Jan 1929 - Oct 1931	28.4 Dec 1928 - May 1931	-13.7 1932-1929	24 Mar 1929 - Feb 1932

Note: See Table 1A for details. The rate of growth of International reserves as well as exchange rate depreciation are computed from a peak to a trough in the neighborhood of the crisis

* Rate of growth of the depreciation of the local currency with respect to the U.S. dollar

The 1929-32 crisis was a turning point not only for economic reasons (regulation and interventionism started in those years) but also because the first *coup d'état* occurred in September 6, 1930 opening a dark period of interruptions of the constitutional order.

Table 7A. *Macroeconomic performance in the neighborhood of the 1929–1932 crash.*

Years	Growth rates						Fiscal Deficit as % of GDP	Terms of trade 1995=100	Current Account as ratio of GDP
	Real GDP	Real Fiscal Revenues	Real Public Expenditures	Money (M3/P)	Exports (U\$\$)	Imports (U\$\$)			
1927	9.4	7.3	41.1	6.8	33.1	11.1	1.8	88.8	-0.6
1928	-0.2	7.7	-13.4	11.4	4.6	14.2	0.3	87.1	-1.2
1929	1.9	2.4	8.7	-2.2	-10.9	1.6	2.7	120.3	-3.9
1930	-8.5	-13.1	9.1	-1.0	-43.8	-25.1	3.7	109.3	-9.5
1931	-1.8	18.5	-2.6	3.5	-17.3	-44.6	0.8	106.0	-3.2
1932	-4.8	17.6	3.7	10.7	-21.3	-36.7	4.9	79.2	-0.7
1933	1.8	-11.6	-9.4	-13.1	3.8	29.0	1.3	82.3	-0.3
1934	10.0	12.8	17.7	14	32.8	14.5	1.4	77.8	0.1

Source: IERAL (1986), Taylor (1997)

THE 1976 CRASH

In October 1973, Perón started his third period as President of Argentina, but a few months later, in July 1974 died and was succeeded by the vice-president, his widowed, María Estela Martínez. The fiscal situation was uncontrolled, the fiscal deficit as percentage of GDP was 8% and real public expenditure grew at 27%. In 1975 the fiscal deficit peaked 16% of the GDP. From June 1974 to March 1976, the depreciation of the peso Ley was 2282%. Again, we can associate crisis to increasing public expenditures and huge fiscal deficit

In March 1976, the military (Junta Militar) took the power. The junta tried to make economic reforms mainly directed at stopping inflation. The minister of economy, José Martínez de Hoz, attempted many devices to stabilize and recover economic growth. In December 1978, after another failure to control the inflation rate, a new plan was launched having as an anchor for the inflation a pre announced exchange rate known as "la tablita". By the end of 1980, the

evident inconsistency between the monetary and fiscal policy caused a run against the peso and forced the government to devalue in February 1981.

Again, crisis and increasing public expenditures and huge fiscal deficit are positively related

Table 8A. *The 1976 crash*

Crises	Growth Rate (%)			Duration (months) Beginning - End
	International Reserves (SDR)	Exchange Rate Depreciation	Real GDP	
1975/76	-80.9 May 1974 – Aug 1976	2282.3 Jun 1974 – Mar 1976	0.11 1976-1974	21 Jul 1974 – Mar 1976

Note: See Table 1A for details.

*GDP growth values are those of the following years, since we try to capture the impact of the crises

Table 9A. *Macroeconomic performance in the neighborhood of the 1975–1976 crash.*

Years	Growth rates						Fiscal Deficit As % of GDP	Terms of trade (1995=100)	Current Account as ratio of GDP
	Real GDP	Real Fiscal Revenues	Real Public Expenditures	Money (M3/P)	Exports (U\$S)	Imports (U\$S)			
1973	3.7	13.25	16.88	20	68.26	17.03	7.6	105.2	0.8
1974	5.4	31.08	26.85	26	20.35	63.04	8.1	115.4	0.1
1975	-6.0	-29.05	-0.90	-20	-24.66	8.57	16.1	99.9	-2.6
1976	0.0	16.13	-18.68	-15	32.24	-23.15	13.6	99.5	0.9
1977	6.4	17.73	3.83	20	44.32	37.21	8.3	95.1	1.7
1978	-3.2	-4.40	13.85	4	13.23	-7.88	10.3	86.7	2.1

Source: IERAL (1986) , Taylor (1997)

HYPERINFLATION AND CRISIS

After the defeat in the Malvinas war, the military regime came to an end and in 1983 the Junta transferred the power to the elected president Raúl Alfonsín.

After failing attempts in his beginnings, Alfonsín launched the anti-inflationary plan known as *Austral* that consisted on a few fiscal measures on the revenues side and a currency substitution (the Argentinean's peso was replaced by a new currency denominated austral, which represented 10000 argentine pesos). He also froze prices, wages, fares and fuels. The exchange rate would be fixed and controlled. In 1986 inflation rate was under control, reaching one-digit monthly rates, which represented a real achievement to the government. But it lasted very few. In 1987 inflation accelerated again and many social conflicts took place. In April 1988 Argentina unilaterally suspended the service of the debt, entering *de facto* in default. Real GDP shrank and inflation went completely out of control starting in March 1989 with an

annual rate of 4924%. The hyperinflation caused chaos and signaled the final collapse of the closed-economy approach. Alfonsín resigned six months early in July 1989.

Table 10A. *The 1989 crash*

Crisis	Growth Rate (%)				Duration (months) Beginning - End	Type
	International Reserves	Exchange Rate Depreciation	Interest Rate	GDP		
1989/90/ 91	-66.1 Nov 1988 - Jan 1990	42179.5 Sep 1988 - May 1990	896.4 Sep 1988 - Jun 1989	-6.15 90 vs 89	26 Jan 1989 - Feb 1991	Very Deep

Note: See Table 1A for details.

An important feature that characterized this period was the impossibility or the unwillingness for controlling public expenditures. Towards 1987, subsidies to private production amounted 6.6% of GDP. Adding the deficit of public enterprises gave an astonishing 10% of GDP spent on enterprises. On the other hand, different social benefits increased too. The expansion in public expenditure in the period 1970-1985 was of such magnitude that in 1970 it was 19.7% of GDP while in 1985 represented 25.3% of GDP. Of course, the main problem was how to finance an ever-increasing public expenditure. External resources were exhausted, mainly after the debt crisis, internal taxes were not enough to cover government expenditures, so inflation tax was the only resource available.

Table 11A. *Macroeconomic performance in the neighborhood of the 1989–1991 crash.*

Years	Growth rates						Fiscal Deficit as % of GDP	Terms of trade 1995=100	Current Account as ratio of GDP
	Real GDP	Real Fiscal Revenues	Real Public Expenditures	Money (M3)	Exports (U\$S)	Imports (U\$S)			
1987	2.58	0.06	10.6	-1.0	-7.24	22.78	4.99	79.1	-3.9
1988	-1.88	-5.32	-11.46	20.3	43.72	-8.44	6.05	89.3	-1.2
1989	-6.22	0.32	-10.28	-5.9	4.87	-20.99	3.79	89.7	-1.7
1990	-1.3	-18.4	-4.8	-65.4	28.95	-3.61	2.79	84.1	1.3
1991	10.5	16.6	11.33	-16.5	-2.65	101.67	0.90	88.7	-1.5
1992	10.3	14.2	12.51	27.8	2.31	79.26	0.06	95.4	-3.7
1993	6.03	7.85	7.10	22.4	6.26	15.64	-0.32	96.3	-3.5

Source: Ministerio de Economía de la Nación

THE END OF CONVERTIBILITY

In April 1991, Menem launched the so-called Convertibility Plan, a currency board system that tied the peso to the U.S. dollar at 1 to 1 rate. The fixed exchange rate served as an anchor to prices ending with decades of high inflation rates. In the first three years, convertibility was supported by important reforms, such as deregulation and privatization of state-owned companies, which brought about an economic boom. Argentina attracted extensive foreign

investment, allowing banks, public utilities and other key sectors to modernize by incorporating new technology. Two major problems were present in Menem administration: high unemployment rates and high corruption indexes.

Table 12A. *The 2001/2002 crash*

Crisis	Growth Rate (%)				Duration (months) Beginning - End	Type
	International Reserves (U\$S)	Exchange Rate Depreciation	Nominal Interest Rate	Real GDP		
2001/02	-67.2 Sep 2000 – Oct 2002	268.8 May 2001 – Nov 2002	737.9 Aug 2000- Jul 2002	-14.8	25 Oct 2000 – Oct 2002	Very Deep

Note: See Table 1A for details.

In December 1999, De la Rúa became president. Given the unwillingness of financial markets to finance a higher debt, De la Rúa administration was mainly concerned with reducing fiscal deficit. But as cutting spending was politically difficult, he raised taxes, so as not to abandon convertibility. The recession that had begun by the end of 1998 aggravated during 2000. The minister of the Economy, Machinea, resigned and was succeeded by Lopez Murphy, who attempted to cut spending, but given the strong interest groups opposition, he resigned and Cavallo was appointed Minister of the Economy. In December 2001 government imposed a freeze on bank deposits, in response to large withdrawals, known as “corralito”. A general strike and protest resulted in the resignation of De la Rúa.

Table 13A. *Macroeconomic performance in the neighborhood of the 2001- 2002 crash.*

Years	Growth rates						Fiscal Deficit As % of GDP	Terms of trade (1995= 100)	Current Account as ratio of GDP
	Real GDP	Real Fiscal Revenues	Real Public Expenditures	Money (M3/P)	Exports (U\$S)	Imports (U\$S)			
1997	8.1	12.68	6.11	21.5	13.46	26.27	1.46	106.5	-4.2
1998	3.9	2.99	4.82	22.1	-1.65	3.90	1.36	100.7	-4.9
1999	-3.4	-2.69	5.23	7.0	-11.42	-19.16	1.68	94.7	-4.2
2000	-0.8	3.21	0.46	-1.2	11.22	0.30	2.39	104.2	-3.1
2001	-4.4	-6.02	-0.17	-6.0	2.96	-19.92	3.24	103.7	-1.7
2002	-11.0	-15.9	-23.56	-52.1	-3.1	-55.41	1.3	101.9	9.2
2003	8.7	26.7	13.1	26.6	14.2	53.7	2.3	110.1	6.0

Source: Ministerio de Economía de la Nación

Three presidents followed in less than two weeks. One of them, Rodriguez Saá, decided to default on the government debt to foreign private sector lenders. Finally the Congress chose Duhalde (2002) to serve the rest of former president term. His first measure was to end with convertibility system, confiscating foreign reserves.

Notes

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ⁱ Excessiveness is also an outstanding feature of Argentina's economic life. Periods of euphoria and unlimited enthusiasm are followed by frustration and endless delusion without any transition time (see Prebisch's quotation)

ⁱⁱ In a Radio Speech reproduced by the Central Bank in its *Memoria Anual*, President Frondizi asserted: "En los últimos 15 años, la Argentina ha gastado mucho más de lo que producía, omitiendo reponer las inversiones básicas de capital y endeudándose fuertemente en el exterior. ... Más del 80% de los ingresos del Estado se va en sueldos, y ello explica que no haya dinero para hacer viviendas, ni caminos, ni escuelas, ni siquiera para reparar pavimentos o dar más luz a nuestras oscuras calles... La Argentina ha estado viviendo una ficción económica, cuyas consecuencias están claramente a la vista... Todos los gobiernos han coincidido en la necesidad de reducir los elencos administrativos y las crecientes pérdidas de los servicios públicos, pero año tras año, esos gastos y esas pérdidas han ido en aumento ..."

ⁱⁱⁱ Flood and Garber (1984) derive explicitly a solution for the time of collapse in a fixed exchange rate regime.

^{iv} Some researchers have proposed indexes that weight different components of speculative attacks. However in some cases they are not easy to construct, as is the case in Girton and Roper (1979)

^v We also included the rate of interest in the index but for some sub periods this series is not available on monthly basis.

^{vi} For the period 1885-1914 monthly data to compute the index were not available, so we used annual data.

^{vii} The degree of overvaluation of domestic currency is measured as the deviation from the trend

^{viii} We also estimated by probit and Linear Probability Model, but results do not differ significantly

^{ix} Argentina declared its independence from Spain in 1816 and our study covers the period 1885 to the present.

^x The vice-president, Carlos Pellegrini, succeeded Juárez Celman

^{xi} President Roque Sáenz Peña died in 1914 and was succeeded by Vice- President Victorino de la Plaza.