

**VOLATILITY OF THE CAPITAL FLOWS AND STRUCTURAL BREAKS IN LATIN AMERICA AND THE CARIBBEAN****FERNANDO ANDRÉS DELBIANCO Y ANDRÉS FIORITI****RESUMEN**

En este trabajo, se estudia la presencia de quiebres estructurales en los flujos de capitales de 16 economías de Latinoamérica usando el test de raíz unitaria de Zivot y Andrews (1992). Para complementar el análisis, se utiliza el test de quiebres estructurales de Bai Perron (1998). Luego, se procede a analizar la posibilidad de contemporaneidad entre los quiebres encontrados y las crisis que tales países sufrieron en los últimos 40 años. Dichas crisis pueden ser de moneda, bancarias, domésticas o de deuda externa. Se encontraron muchos casos de contemporaneidad, especialmente con las crisis que ocurrieron al final de los 90s.

*Clasificación JEL:* C10, G01, N26

*Palabras Clave:* quiebres estructurales, volatilidad, flujos de capital, crisis, contemporaneidad.

**ABSTRACT**

This paper studies the presence of structural breaks in the capital flows of sixteen economies of Latin America using the unit test root by Zivot and Andrews (1992). It is complemented by the structural breaks test by Bai Perron (1998). Afterwards, an analysis of the likelihood of contemporaneity between the breaks found and the crises the countries had suffered in the last forty years is presented. These crises were either of currency, banking, domestic and external debt type. Many cases of contemporaneity were found, especially with the crises that occurred at the end of the 90s.

*JEL Classification:* C10, G01, N26

*Keywords:* structural breaks, volatility, capital flows, crises, contemporaneity.

## **VOLATILITY OF THE CAPITAL FLOWS AND STRUCTURAL BREAKS IN LATIN AMERICA AND THE CARIBBEAN**

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### **I. Introduction**

The present paper highlights the high volatility of capital flows in Latin America and its relationship with the crises that took place in the last quarter of the previous century. The main hypothesis is that the high volatility of the capital flows of foreign and domestic agents show the presence of possible structural breaks.

In an attempt to confront this hypothesis, the test proposed by Zivot and Andrews (1992) is used. It tests stationarity and indirectly presents a date as a possible break. That is, the test endogenously finds possible breaks (this is the main difference with other tests, like Chow's) and allows confronting that dates with the crises dates.

The results are obtained in two stages. First, it is found that in most cases significant breaks arose in the series. Afterwards, the contrast among breaks and crises yields contemporaneity in a large number of cases, especially for crises taking place at the end of the nineties and breaks in the flows happening at the beginning of the 2000s.

These results suggest a strong correlation between structural changes in the financial flows in and out of Latin America and their crises. While no causal connection can be ascertained, this indicates that one of the weakest aspects of the growth process in Latin America can be found in the flow of capital, which seems associated to increased instability.

### **II. Evolution of the financial architecture since 1945**

#### **II.1. First part - Bretton Woods (1945 - 1971)**

The period considered begins with an attempt to reconstruct the world's economy, agreed in Bretton Woods by the Allied powers<sup>3</sup> in 1945. The plan

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was meant to put an end to the continuous financial crisis, the devaluations, the hyperinflations and the restrictions to international trade (originated in mismatches in the balance of payments), which were considered the main obstacles towards recovery after the First World War and the 1929 crisis of Wall Street.

Additionally, the real sector of the world's economy was devastated. At the end of the war Europe was almost paralyzed; mainly England and France, who had suffered great casualties, and Germany that had not only suffered a massive destruction of its productive structure but also had to pay the cost of the war as a consequence of being defeated.

The industrial production in 1946 was only 60% of the levels it had before the war. The real sector was one of the most complicated in terms of recovering the prewar production. The situation was even worse than at the end of the First World War.

The aid provided by the USA was very important for diminishing the impact of the aftermath of the war. Under the Marshall Plan four billion dollars were injected into Europe in the first two years of its application.<sup>4</sup>

Among the effects of the Marshall Plan, the most important ones were that the dollars received affected positively both the investment levels (the countries which got more money from this aid invested more) and consumption. From every dollar received from the plan 65 cents were devoted to increase consumption while 35 cents raised investment. Moreover, the returns of new investments were very high:<sup>5</sup> every extra dollar which was invested increased in 50 cents the product of the next year.

In order to solve financial sector problems the agreement of Bretton Woods established the next steps to follow: fixing the exchange rate in relationship with the dollar, exchange rates were fixed but adjustable in response to "fundamental disequilibria", the International Monetary Fund (IMF) was

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<sup>3</sup> The meeting took place in New Hampshire in July 1944 with the presence of representatives of 44 countries.

<sup>4</sup> Between 1948 and 1951, the US government under this plan spent 13.2 billions of dollars, and the main receptors of that money were the United Kingdom and France.

<sup>5</sup> This fact can be easily understood taking into account that the economies were devastated; also the consumption, previously focused on weaponry turned back to demand goods and food. The pity situation of war-torn economies made it easy to detect profitable opportunities.

created as a judge of potential economic conflict among nations, capital controls were explicitly allowed, the dollar's price was fixed in terms of gold.<sup>6</sup>

The signers of the agreement had to keep their reserves in gold or dollars and had the right of exchanging their dollars for gold in the U.S. Federal Reserve at the official price.

The IMF design allowed capital controls as means for the prevention of exchange crises and generated the possibility of exerting active monetary policies. The economists of the IMF were convinced that floating exchange rates were a cause of speculative instability that harmed international trade. In spite of this fact, it was afterwards demonstrated that nations were not willing to maintain free trade and a fixed exchange rate at the expense of unemployment in the long run.

The agreement provided the nations a solution for the persistent deficits of the balance of payments that could spread up to extinguish the international reserves of the country. Countries could ask for a loan from the IMF, which in turn recommended macroeconomic adjustment policies to reestablish the balance of payments at a sustainable level. The Fund was minded to help its members to recover from large deficits in the current account. The resources came from a common pool of gold and foreign exchange provided by all its members. The main problem of using the IMF solution was the imposition of macroeconomic policies that countries had to follow if they wanted to get a loan.

In this period the exchange rates could be modified if the IMF agreed that the balance of payments of a country was in a situation of a "fundamental disequilibrium". The most important issue was that the meaning of this expression was not explicitly defined in the constitution of the Fund, but informally referred to countries who suffered permanently adverse international changes in the demand of their products. In these cases the countries could take traditional policies of adjustment, mainly through devaluations, making the exchange rate to oscillate and improve the competitiveness of the country.

The IMF forced countries to make their national currencies convertible, favoring international trade<sup>7</sup>, which did not recover since the gold standard

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<sup>6</sup> It was fixed at 35u\$s per troy ounce, which is equivalent to 31,103475 grams.

was abandoned at the beginning of the First World War. During this period the world moved towards the restoration of the flows. The Marshall plan had, in particular, a great impact because it provided dollars to liquidity lacking Europe, allowing the intra-European trade to be reestablished.

This bonanza came to an end with the Oil Crisis of 1973, when the price of commodities grew rapidly as a result of the ensuing shortages. The energetic cost rose sharply in a context of low growth, investment falls, increasing unemployment and fiscal deficits. The conjunction of those factors started inflationary processes, changing the goals of policy. The eradication of inflation (inflation targeting) became a main issue for countries. On the other hand, several speculative episodes, preceding the Oil Crisis, began to erode the foundations of the Bretton Woods agreement.<sup>8</sup>

## **II.2. Second part - Floating exchange rate (1971/73....)**

During this period, the world economy recovered the international flows that existed during the gold standard and moved towards an increased integration. It was no longer necessary to control capital movements because floating exchange rates allowed adjustment through emission without reducing the reserves. The international flows increased rapidly due to the liberalization of the markets, to the point that international assets reached rates of more than 50% of the GDP.<sup>9</sup>

The deregulation of the capital flows was progressive. The first countries to enact them were Canada, Germany and Switzerland in 1973, followed by the USA in 1974, the United Kingdom in 1979, Japan in 1980, France and Italy in 1990 and Spain and Portugal in 1992. For two decades the main economies of the world opened up to further exchanges with the rest of the world. A generalized belief was that the opening of the economy would not be accompanied by fluctuations and that instabilities in an economy could only spread slowly to the others.

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<sup>7</sup> Even so, most of the countries did not reestablish convertibility until the end of 1958, whereby the progress in the international trade was severely delayed. Japan was one of the last developed countries to reestablish convertibility in 1964.

<sup>8</sup> The most important ones took place in France in 1958, Canada in 1962, Italy 1963, United Kingdom in 1964 and France 1968.

<sup>9</sup> As a representative image of that integration of the capital market it is enough to watch the interest rates, which dispersion diminished with respect to earlier periods.

However the preceding vision was misguided because crises started to spread. The new system became highly volatile. Exchange rates, interest rates and prices of assets were subject to big fluctuations in the short run as well as to oscillations in the long run. Before trying to understand how the transnationalization of crises took place, it is important to highlight important aspects of the new international financial architecture.

Three important processes took place, modifying the financial architecture in the developed world. Firstly, there was a process of banking disintermediation. This feature was vital for the occurrence of the future events in the world economy. Savings become progressively more institutionalized and new financial entities had to be opened. The most important among those entities were the non-bank financial intermediaries: mutual funds and pensions, investment banks and insurance companies. The prevalence of traditional banks decreased and financial conglomerates appeared. This was accompanied by the deregulation of the activities of those intermediaries and the elimination of the capital controls. Additionally, secondary markets of debt securities and new sources of financing appeared which deepened the financial markets now endowed with high-tech tools. To handle these new complexities, rating agencies of credit risk were created to avoid the huge information costs of the bigger spectrum of investment possibilities generated. Secondly, there was a concentration of the financial system: At the beginning of the nineties started an intense process of fusions and acquisitions which was spectacularly accelerated in the first years of XXI century and which decreased the number of banks in almost all the countries of the world. The remaining banks not only became highly responsive to mismatches but also highly susceptible to the downfall of other banks. Moreover, some financial operations, mainly in the insurance markets and in the investment banks, became highly concentrated. Thirdly, new financial instruments were introduced. The investors began to demand a higher diversification of risk, inducing the creation of specialized markets. The main involved derivatives, whose complexity was nearly extreme (they were created by mathematicians and no longer by economists because they required complex algorithms to diversify the risk). In the emerging economies “junk bonds” appeared, which were bonds based on shares of foreign companies but without any asset securitization, being just shares of shares. These new instruments were the ones that generated the “subprime” crisis of 2007/2008.

The ensuing system became susceptible to the spread of the financial turmoil from some economies to other countries and markets which apparently had no relationship with the initial problem.

Within the characteristics that engendered the volatility in the financial markets the most important was the insufficient regulation on both banks and financial intermediaries. Contagion problems arose among institutional investors due to weaknesses in the system of evaluation in the short run. Additionally, the rating agencies<sup>10</sup> gained excessive importance: they followed procyclical policies, overheating the economies in the boom phase and sank them during recessions.

While recessions were scarce during this period, it is important to focus on the successive crisis suffered by the emerging countries. In Latin America, the eighties were considered a lost decade, but by the nineties they started a potential path of sustained growth which was undermined by further crises. The first crisis took place in Mexico in 1995, followed by Argentina in the same year, the South East Asia crisis of 1997, Russia in 1998, Brazil in 1999, and Turkey and Argentina in 2001, being these crises, the biggest in size and consequences.

The flows toward the developing countries were modified. The multilateral credit organisms were no longer involved just in lending money to solve mismatches, but also in promoting long term development plans by means of loans, mainly in the emerging economies.

Despite all the changes that the world financial architecture underwent, the predictions about the future of the world economy were not the best. The diagnosis at the beginning of the XXI century indicated that twin crises were increasingly frequent. There was evidence of volatility in capital flows because they basically were short-termed and had big contagion effects. Some countries were heavily indebted. Unsustainable growth paths started in this period and some countries conflicted with the IMF.

The evolution of the system caused the crises to return to the developed economies. The comeback of the crises happened for two main factors that seemed to be isolated in the beginning but concurred to engender the crises. The first of them is that these economies went from being importers of foreign

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<sup>10</sup> Actually, doubts have been raised about the evaluations of risk made before the subprime crisis, because the rating agencies had shares of the main financial entities and therefore had incentives to underrate their risks.

savings, which helped them to maintain their growth paths, to be exporters of savings. Those savings were canalized to riskier and more volatile assets. New financial instruments were created with nearly no backing of any kind.<sup>11</sup>

The banking system did not have any efficient mechanism to solve the problems of the period. A massive substitution of deposits took place, turning from constituting 70% of the liabilities in 1980 to be just the 40% in 2008.<sup>12</sup> This happened even though the banks provided help to obtain credits, canalizing the excess in world savings.

The 2008 crisis started in the mortgages market in USA, but rapidly spread throughout the rest of the world. In order to characterize this crisis, a model proposed by Minsky was resurrected.<sup>13</sup> The explanation presented by Minsky of how a financial crisis takes place focuses on a pattern that can be easily detected in the subprime crisis. Still, it is not enough to understand how a bubble that burst in the USA spread around the world with an incredible speed and magnitude.

The relationship between the economies in the world could be seen in the integration of capital markets. The saving excess of the USA went to the acquisition of homes through mortgages for people without enough repayment capacity and whose collateral was only the increased value of those homes in an overheated housing market. Packages were made, chopping up those mortgages, which became disguised under more attractive names. The problem was that their only backing was the miracle of ever growing real estate prices. Those packages began to flow across the world without restrictions.

When the bubble burst and became evident that most of the people with those mortgages collateralized by the high value of properties were not be able to repay them. The prices of houses fell down abruptly and the sales of mortgaged homes did not earn the banks enough money to recover the loans. This is how at first the most important investment banks of USA went into bankruptcy and then the rest of the banks with similar characteristics around the world followed because the money they had lent could not be recovered.

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<sup>11</sup> This case is the typical one of financial instruments created on the basis of mortgages that did not have any sustenance in the economic position of the debtor, who probably did not have any collateral to back his mortgage.

<sup>12</sup> The savings in this period were conveyed to capital markets and short term commercial values because they offered a larger profit, although the risk associated was unknown.

<sup>13</sup> There are other papers that analyze the origin of the financial crises.

### III. Financial traps in the nineties in Latin America

Globalization combines two processes that are complementary. On the one hand there is the adoption of institutions and legal measures which allow capitals to flow freely within the economy, moving from one sector to another, known as “market liberalization”. On the other hand, the total amount of capital that flow between countries increases.

At the nineties several economies of Latin America, particularly the largest ones, started a new period of financial opening with a massive entry of capital. On the other hand they had to deal with a huge external debt generated in a previous round of financial opening.<sup>14</sup>

At that moment it was believed that this was the kick-off to a long process of growth in capital flows and financial deepening at a worldwide level. It was thought that this process would lead to a complete integration of the developing countries to the international market. This perspective was motivated by the idea that a crisis was not possible in the context of that period.

This reinsertion process into international markets suffered a sudden stop with the Mexican crisis of 1994/1995<sup>15</sup>. This crisis revealed not only the risk at which the investors were exposed and the volatility of the capital flows but also the importance of the international entities such as the IMF and the World Bank. As a result of the intervention of these international entities the contraction suffered in the capital flows was mild and did not take too long to recover the foreign direct investment flows.

The crises of Asia, Russia and Brazil consolidated the idea that financial globalization was a cyclic process in which, after a phase of reduction in the international capital flows, in the aftermath of a crisis, an incremental phase would ensue. This way of getting out of a crisis worked due to the great ability, of the international agencies of credit, to prevent debt defaults.

However, since 1998 the process began to take a different direction. The net capital flows could not be recovered favorably because the risk premiums (associated to country risk) stayed systematically high.

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<sup>14</sup> The initial opening of the financial markets in Latin America took place in the seventies, and it ended with the financial and external crises of 1981 and 1982.

<sup>15</sup> The Mexican crisis suggested the ideas of sudden stops and contagion effects in Krugman (1997).

In several countries of the region growth in the capital account was not accompanied by increases in net exports, leading to deficits in the current account. The most important part of this problem can be assigned to the gap between the financial position of these countries and their position in the trade of goods in the world economy. Additionally, these countries could not increase their interest rates to attract new investment because the associated risk was excessively high.

By the end of the nineties the countries of Latin America needed to refinance their debts to reduce the deficit in current account due to the heavy debt and the lack of external supply of funds.<sup>16</sup>

To understand how this process could take place it is important to highlight the complete deregulation of the capital flows while the exchange was fixed or almost fixed, the monetary policy was passive, and the real exchange rate appreciated systematically with its toll on the balance of trade. This forced the economies of the region to increase massively their indebtedness and increasing their vulnerability.<sup>17</sup>

It was assumed that the integration to international financial markets of the developing countries would reduce the risk premiums, but this did not happen, at least until 2002. The experiences of the period after the Asian crisis revealed that the integration had been segmented. The interest rates required for attracting capital to these countries were systematically higher than the ones needed in the developed countries.

Another fact which is evident from the above is the importance of a prudential regulation of capital flows, in spite of the claim that more regulation deepens the procyclical character of capital flows.

There are doubts about the incompatibility between a fixed exchange rate and the volatility of capital flows. While there is consensus on the need of flexibility in the exchange rate, the debate is still open. On one hand the fixed exchange rate discourages some specific short term capital flows, favoring a financial strengthening, but at the same time limiting the mechanisms to deal with imbalances. On the other hand, a floating exchange rate in a context of volatility of capital flows can generate uncontrollable increases in the volatility

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<sup>16</sup> This situation affected particularly Argentina and Brazil in 2001, and ...finished with the default of the Argentinean debt and the closure of the credit market in Brazil at the end of 2002.

<sup>17</sup> This path was the one followed by Argentina in the nineties, Brazil from 1994 to 1998 and Mexico until 1995.

of the real and nominal exchange rate. Even though direct controls can help to raise the stability in the short run, the most important goal of a regulation policy should be the generation of capital flows with stable and predictable behavior, mainly in the medium and long run.<sup>18</sup>

#### **IV. Behavior of gross capital flows**

The objective of this section is to focus on the behavior of the capital flows of foreign and domestic agents -CIF: Capital in.ows by foreigners. CID: Capital in.ows by domestic agents- separately.

In most of the databases commonly used the flows appear as entry of capital, whereby a negative CID represents an increase of the foreign assets hold by domestic agents and a positive CID means that domestic agents are reducing their holdings of foreign assets, which represents a repatriation of capitals. On the other hand, a positive value of CIF means that foreign agents are increasing their holdings of local assets, while a negative value of CIF represents a reduction of local assets by foreign agents.

The explanation of why the variables are added to obtain CIF and CID will be presented in a later section of the paper together with an indication of the sources of data.

In the last 40 years the financial globalization grew considerably, inasmuch as CIF had been persistently positive and CID always negative and their magnitudes increased along the period. It can be observed, in most of the databases, that the crisis of 2008 generated a large decrement of capital flows, which reflects in falls of CIF and raises of CID, the former taking negative values and the latter positive ones for several countries, being this behavior typical of capital flows at a period of crisis in the developed countries.

Another important result obtained from the analysis of the information for different countries is a pattern of seemingly negative correlation between CIF and CID. In sum with the increase in financial globalization, the times series confirm that for 40 years, from 1970 up to now, the volatility of financial flows had increased.

Taking into account the economic cycle, in which good times and recessions alternate, the capital flow response of foreign investors is pro cyclic, increasing the flow in periods in which real GDP grows. On the other

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<sup>18</sup> The main institution that promotes this kind of policies is ECLAC.

hand, due to the negative correlation of CIF and CID, the capital flows of domestic agents tend to be counter cyclical, implying that the residents in the country invest more abroad in periods of growth in real terms. The opposite case, in which the domestic agents reduce their flows of investment abroad and prefer to invest in their country during periods of crisis happens mainly in high income countries, while in developing countries can be doubted that this ever happens, mainly because there is a tendency to flight to quality.

The two main stages of the economic cycle can be characterized as shown in table 1.

**Table 1**  
**Behavior of capital flows during the economic cycle**

Increasing phase of the economic cycle	Decreasing phase of the economic cycle
The foreign agents increase their purchases of domestic assets while domestic agents increase their investments abroad.	The foreign agents sell their domestic assets which are purchased by domestic agents that reduce their investments abroad.
Financial globalization increase as a result of the new relationships between the agents of the different countries and their investments.	Financial globalization decreases as a consequence of a reduction of the foreign capitals linked to the country and of the capitals of the country linked to foreign agents.

Source: Author's elaboration.

Previous studies showed a reduction of capital flows, both domestic and foreign, for the whole group of countries during crises. It can be clearly seen that during a period of crisis capital flows of foreigners fall rapidly and that local capital flows to their economy of origin in the year of the crisis, although in the next years their behavior is more volatile, probably because of the influence of structural factors of the economies to which they return that suppress the incentives to “back home” flow. Above all, the most important movement is represented by foreign capital, which not only diminishes its flow during periods of crises, but also remains depressed and does not recover until the second year after the end of the crisis.

These results allow the observation of the possible mechanisms that take place during financial crises. A common explanation of crises is that they

originate in production or terms of trade shocks, but these crises-triggers are inconsistent with the results presented in the previous section since, during crises, there is not a simultaneous reduction of CIF and CID. In addition, not only no evidence exists of domestic agents selling their local assets during a period of crisis but also of domestic capital flying abroad during a crisis in its home country, but rather the local capitals are repatriated during periods of crisis. Also, crises affect asymmetrically foreigners and residents, as in situations like increases of default risk or expropriation of foreign-owned assets, also known as sovereign risk.

Many stylized effects of great importance can be ascertained from the analysis presented in this section. In first place, while the volatility in the capital flows, CIF and CID, have increased over time, this raise did not translate into higher volatility of net capital flows, because CIF and CID are negatively correlated. In second place, the gross capital flows are procyclic, with CIF increasing and CID decreasing during expansions of the product. Finally, during crises the capital flows are significantly reduced, especially during severe crises and systematic crises.

The behavior of gross capital flows can shed light on the source of the fluctuations and of the mechanisms underlying international capital flows.

## **V. Methodology and data**

### **V.1. Structural breaks and stationary tests**

The classic augmented Dickey-Füller (ADF) test with three different specifications (with trend, with drift and no constant) without structural breaks in the analyzed series shows, in general, that the series are not stationary. However, this result is not surprising when working with long time series.

Common unit root test, such as Dickey-Füller (1984) or Perron (1989), tend to not reject the null hypothesis of unit root in presence of structural changes and conclude that the series is not stationary. There are tests that detect where a structural change happens, like Chow's, but they require previous information about the existence of a possible break or use iteration to find them. A different path is followed in Zivot and Andrews' (ZA) test (developed in 1992) which finds endogenously the break.

The ZA test analyzes sequentially the possible presence of a structural change in the series at each of the observations, generating dummies in each period. The dummy with higher significance is taken as indicating the period

in which the series suffers a structural change. Even so, the test still has the format of a test of stationarity like the classic Dickey-Füller.

The problem considered here differs from that considered in several recent works in the econometric literature that analyze the problem of testing for structural change with unknown change point. It is a way of testing for a unit root against the alternative of stationarity with structural change at some unknown point. It is not a test of structural break *per se*.

We analyze three different versions of the test. The first model is specified to find a change in the drift and search for the maximum lag of the series through a t test. The second model is similar to the first one, but allowing changes only in the trend. The third model evaluates the likelihood of changes both in the trend and the drift and uses the AIC test to find the maximum lag of the series. For the three different specified cases we work at a significance level of 5%.

Model I: Model with drift

$$\Delta y_t = \gamma + \alpha y_{t-1} + \beta_t + \Psi DI_t + \sum_{j=1}^k d_j \Delta y_{t-j} + \mu_t \quad (1)$$

Model II: Model with trend

$$\Delta y_t = \gamma + \alpha y_{t-1} + \beta_t + \lambda DT_t + \sum_{j=1}^k d_j \Delta y_{t-j} + \mu_t \quad (2)$$

Model III: Model with both specifications

$$\Delta y_t = \gamma + \alpha y_{t-1} + \beta_t + \Psi DI_t + \lambda DT_t + \sum_{j=1}^k d_j \Delta y_{t-j} + \mu_t \quad (3)$$

where  $\gamma$  is the drift,  $\beta_t$  is the trend,  $\sum_{j=1}^k d_j \Delta y_{t-j}$  are the specified lags and  $\mu_t$  is the disturbance error.

As seen, the specification is similar to Dickey-Füller test and only adds the dummies  $\lambda DT_t$  and  $\Psi DI_t$  to capture a possible structural break, allowing changes in the trend or the drift, and find it endogenously.

The null hypothesis in the three models is that  $\alpha = 1$ , which means that the series is integrated and has no structural break, whilst the alternative hypothesis rejects the stationarity and indicates the presence of a structural break in some part of the time series.



where  $S_T(T_1, \dots, T_m)$  is the sum of the squared residuals resulting from the  $m$  partition selected.

## V.2. Data

All the data used for the estimates of the present paper was extracted from the database of statistics and indicators provided by ECLAC, in its section of CEPALSTAT. Within the information provided by this institution, the data we use is drawn from the section of economic indicators, in the external sector of the economy, where the balance of payments can be obtained in a quarterly disaggregation.

The countries that are part of the sample are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela.

The variables used from the balance of payments are: Direct investment abroad, Foreign direct investment, Investment portfolio assets, Investment portfolio liabilities, Other investment assets, Other investment liabilities and Reserve assets. The rest of the variables presented in the balance of the financial account were not used because their values were almost negligible to be taken into account. All these variables are expressed in millions of dollars at current prices by CEPALSTAT.

To form the Capital In.ows of Domestic agents (CID) we add the variables: Direct investment abroad, Portfolio investment assets, Other investment assets and Reserve Assets. To form the Capital In.ows of Foreign agents (CIF) we add the variables: Foreign direct investment, Portfolio investment liabilities and Other investment liabilities. Both CIF and CID are expressed as a percentage of the GDP, which was obtained from the IMF and the measure used was the GDP in billions of dollars at current prices, of the economy to which they belong to adjust the capital movements to the dimensions of the economy that originated them.

## V.3. Periods covered for each country

Table 2 presents a summary of the periods that are covered for each country. The entries shown in this table are of the form year-quarter. So, for instance, 2001-3 means the third quarter of 2001.

**Table 2**  
**Periods covered for each country**

Argentina	1993-1 - 2010-2	Honduras	2004-1 - 2009-4
Bolivia	1993-1 - 2009-4	Mexico	1980-1 - 2009-4
Brazil	1979-1 - 2009-4	Nicaragua	1993-1 - 2006-2
Chile	1993-1 - 2010-3	Panama	1998-1 - 2009-4
Colombia	1993-1 - 2010-2	Paraguay	2000-1 - 2009-2
Costa Rica	1999-1 - 2010-2	Peru	1993-1 - 2009-4
Ecuador	1993-1 - 2010-1	Uruguay	1999-1 - 2009-4
El Salvador	1999-1 - 2006-4	Venezuela	1994-1 - 2009-4

Source: Author's elaboration.

Note: The first four numbers correspond to the year and the last number to the quarter, numbered from one to four.

## VI. Results of the test ZA and BP

The results found shed light on an important topic: Not only the series are not stationary for the test used, but also it is possible to think that they have suffered regime changes during the studied period.

Table 3 shows the results of ZA test with its suggested break dates. In that table, it can be observed the quarters at which the test suggests possible breaks. Except in some cases (Brazil, Colombia, Panama, Peru and Uruguay) and just for some specifications, it was not significant.

**Table 3**  
**Results of ZA test with its suggested break dates.**

	CIF			CID		
	Drift	Trend	Both	Drift	Trend	Both
Argentina	2005-3**	2002-4**	2005-3**	2002-2**	2005-3**	2006-1**
Bolivia	2006-1**	2005-3**	2004-1**	2005-3**	2004-2*	2006-4**
Brazil	2000-4**	1997-3**	2000-4**	2004-2**	2003-3	2002-2
Chile	2006-1**	2004-1**	2004-3**	2001-4**	2004-3**	2002-3**
Colombia	2000-1**	2004-4**	2000-1**	2000-1	2007-4	2002-4
Costa Rica	2005-3**	2005-3**	2005-4**	2007-4**	2007-1**	1987-4**
Ecuador	2001-1**	2004-1**	2001-3**	2000-1**	2000-3**	2000-1**
El Salvador	2005-2**	2003-4**	2005-3**	2003-4**	2004-3**	2003-4**
Honduras	2007-2**	2006-1**	2007-2**	2005-3**	2006-2**	2005-3**
Mexico	1998-1**	1985-2**	1998-1**	2004-4**	1999-3**	2004-4**
Nicaragua	1996-2**	1998-3**	2000-1**	1997-3**	1999-1**	1998-2**
Panama	2002-2**	2002-3	2003-3	2001-4**	2002-2**	2001-3**
Paraguay	2002-1**	2003-4**	2002-3**	2004-3**	2006-1**	2004-3**
Peru	2004-3**	2004-3**	2002-2**	2007-2	2006-4	2006-3**
Uruguay	2005-4**	2004-3	2005-4	2005-4**	2007-1**	2006-1**
Venezuela	1997-3**	1996-4**	1996-4**	1997-4**	1996-4**	1997-2**

Source: Author's elaboration.

Note: \*\*, \*, 1 and 5% of significance respectively.

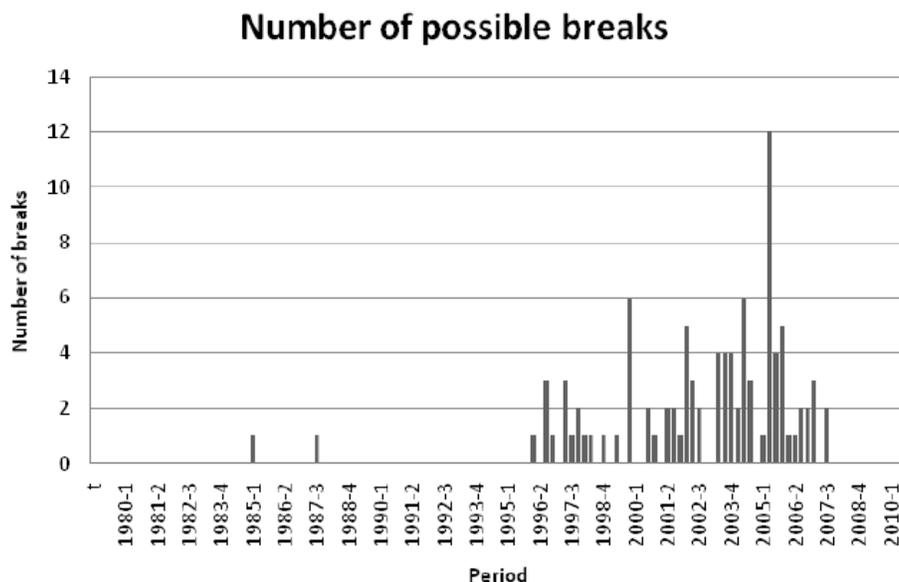
In the particular cases where the break is not significative it can be concluded that we are in presence of a unit root process without any exogenous structural break.

To illustrate the table it is helpful to graph the dispersion of the potential breaks found. At first glance what can be seen are all the quarters suggested by the three models as breaks (adding the foreign and domestic agents' capital flows breaks).

## VI.1. Graph of accumulation of possible breaks

### Graph 1.

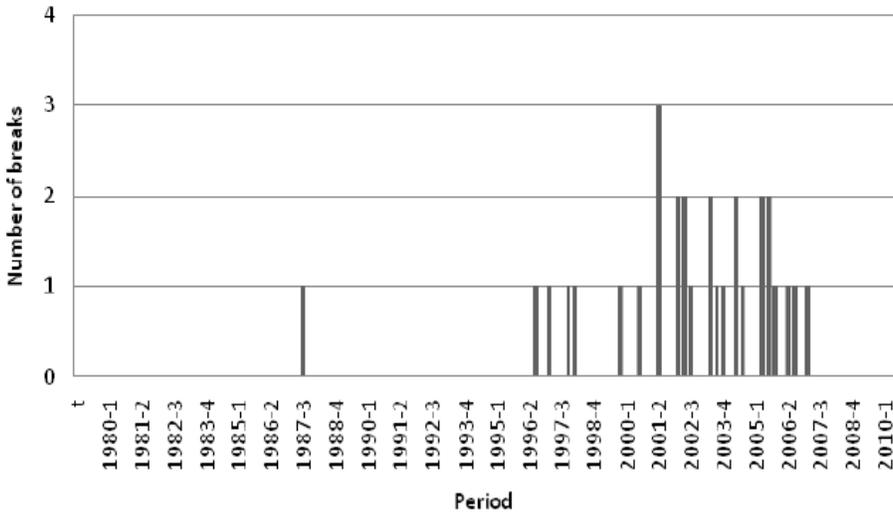
#### Graph of all the breaks suggested by all ZA test' models



Source: Author's elaboration.

Graph 1 is the graph of all the breaks suggested by all ZA test' models. It can be observed how the information is concentrated in the first part of the 2000 decade, especially at the years 2003, 2004 and 2005. This is relative to the data used because for many countries the information was available only after 1995.

By considering just the specification that allows breaks not only in the drift but also in the trend, it gets the following result.

**Graph 2.****Graph of all the breaks suggested by ZA test' mix model****Number of possible breaks**

Source: Author's elaboration.

The second graph presents all the breaks suggested by ZA test's mix model.

As in the previous graph (graph 1), the breaks accumulate in the first part of the 2000s, but the division among years seems more uniform, without too much difference between the numbers of cases. This is due to the fact that in many cases the dispersion graph that included the three specifications the breaks suggested by two different specifications for one country and one type of flow (foreign or domestic agents) were the same. Anyway, with any graph the conclusion is the same: for almost all the countries we studied the ZA test suggested a break point during the first half of the 2000 decade.

**VI.2. Results of the BP test**

As mentioned above in the methodology section, the breaks suggested by the unit root test of Zivot and Andrews are going to be contrasted with Bai and Perron (BP) test.

The results obtained applying the BP test<sup>19</sup> can be observed in the table 4.

**Table 4**  
**Results of BP test with its significant break dates.**

	Capital flows	
	CID	CIF
Argentina	2002-1****	N/S
Bolivia	2002-1*	N/S
Brazil	N/S	1999-3****
Chile	2001-3****	1997-4****
Colombia	2000-2****	1999-4****
Costa Rica	N/S	2008-1***
Ecuador	N/S	N/S
El Salvador	N/S	N/S
Honduras	N/A	N/A
Mexico	N/S	1997-4****
Nicaragua	N/S	1996-1****
Panama	N/S	N/S
Paraguay	N/S	N/S
Peru	N/S	1999-4****
Uruguay	N/S	2003-1****
Venezuela	N/S	N/S

Source: Author's elaboration.

Notes: \*, \*\*, \*\*\*, \*\*\*\*: Significant at 10, 5, 2.5 y 1% respectively. N/A: Not enough data to run the test. N/S: No significant break found.

The series analyzed in the table were in levels. It was also performed the analysis of the series in differences, although no significant breaks were found for any of them.

In this section there were just used those breaks that the sequential procedure of the test found significant (indicating what percentage of significance they have).

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<sup>19</sup> Where the maximum number of structural changes allowed was set to 4.

Those significant breaks keep a distribution across countries similar to the one previously found, which means that they are located mainly at the end of the nineties and the first years of the 2000 decade.

It is important to highlight that there are more significant breaks in the series of the foreign agents capital flows than in the domestic agents' capital flows.

## **VII. Contemporaneity with the crises**

An important analysis that can be made is to confront the potential breaks found with the summary of crises enumerated below. The crises that are taken into account can be of four types: currency, banking, domestic debt and external debt. We consider the year when the crisis begins as a “crisis period” if the same country did not suffer another crisis in the previous two years. Currency crises are defined by Laeven and Valencia (2008) and Frankel and Rose (1996). Banking crises are defined by Honohan and Laeven (2005), Laeven and Valencia (2008) and Reinhart and Rogoff (2008). Domestic debt crises are identified with the year in which Standard & Poor labels the debt in local currency of an economy as being in a state of default and also with the information provided by Reinhart y Rogoff (2008). External debt crises are defined by Laeven and Valencia (2008), Reinhart and Rogoff (2008) and also by the year in which Standard & Poor labels the debt in foreign currency and the loans in foreign currency of the banking system of an economy as being in a state of default.

**Table 5**  
**Episodes of crisis in the countries of Latin America and the Caribbean**

Country	Years in which a crisis was suffered
Argentina	1980 - 1985 - 1995 - 2001
Bolivia	1980 - 1985 - 1994 - 1999
Brazil	1976 - 1982 - 1990 - 1999 - 2002 - 2008
Chile	1975 - 1980
Colombia	1982 - 1985 - 1998
Costa Rica	1981 - 1987 - 1991 - 1994
Ecuador	1980 - 1996 - 2008
El Salvador	1981 - 1986 - 1989 - 1998
Honduras	1981 - 1990 - 1999
Mexico	1981 - 1985 - 1994
Nicaragua	1979 - 1985 - 1990 - 2000
Panama	1983 - 1987
Paraguay	1982 - 1989 - 1995 - 2001
Peru	1978 - 1988 - 1999
Uruguay	1978 - 1981 - 1987 - 2002
Venezuela	1976 - 1982 - 1989 - 1993 - 2002

Source: Author's elaboration.

The episodes of crisis in the countries of Latin America and the Caribbean are shown in table 5. To confront with the crises observed in the table 5 it is important to define contemporaneity. Two events are macroeconomically contemporary if the gap between them is less than two years. In this case the structural breaks will be confronted with the years in which the countries suffered crises. Table 6 presents information on the contemporaneity events between crisis and breaks for each country analysed.

**Table 6**  
**Contemporaneity events between crises and breaks**

Country	Year of crisis	Suggested break (ZA)	Significative break (BP)
Argentina	2001	2003-3 (cid)	2002-1 (cid)
Bolivia	1999	NC	2002-1 (cid)*
Brazil	1999	2000-4 (cid)	1999-3 (cif)
Brazil	2002	2002-2 (cif)	NC
Colombia	1998	2000-1 (cif)	1999-4 (cif) and 2000-2 (cid)*
Costa Rica	1987	1987-4 (cid)	NC
Nicaragua	2000	2000-1 (cif) and 1998-2 (cid)	NC
Paraguay	2001	2002-3 (cif)	NC
Peru	1999	2002-2 (cif)*	1999-4 (cif)
Uruguay	2002	NC	2003-1 (cif)
Venezuela	1993	1996-4 (cif)*	NC

Source: Author's elaboration.

Notes: \*: Extending the contemporaneity to 2 years and a half. NC: No contemporaneity

We can see that the breaks found in the first part of the 2000s may be due to the crises suffered by the Latin American economies in the late nineties and at the beginning of the XXI century.

## VIII. Conclusions

In the last 70 years the world financial architecture underwent huge changes. Even though these changes began mainly with the meeting held in Bretton Woods, the ones with larger impact happened in the eighties and nineties, during which banking disintermediation, concentration of the financial system and the creation of new financial instruments started a new era in the financial arena. In this context one of the largest crises in history began in the USA and spread to the rest of the world. Its aftermath can be observed even today in different economies of the planet.

On the other hand, long before that crisis, and for almost two decades the countries in Latin America have been suffering successive economic crises. In the nineties the economies of the region began a new process of opening to the financial markets, thinking that this process would lead to a global insertion of these economies into international markets. This fact never happened: the risk premiums associated to them were persistently high and new investment was

hard to attract, being short term capitals the only ones that came to the region, increasing its instability.

Analyzing the gross capital flows, dividing them between CID and CIF, it was argued above that the last years witnessed an increase of financial globalization, meaning that the residents of an economy invest more abroad while foreigners invest more in this economy. In addition, the gross capital flows have been procyclic, increasing their volume in booms and decreasing in depressions. Foreigners remove their holdings from an economy in crisis and domestic agents repatriate their investments abroad. As a consequence, it can be seen that a negative correlation exists between CID and CIF.

Using ZA test it was obtained possible breaks that except in some cases (Brazil, Colombia, Panama, Peru and Uruguay) and for only a few specifications they were significant. Whether taking into account all the specifications or just the more general one it can be observed that possible breaks accumulate in the first half of the 2000s.

By comparing the results with the crises selected for the countries under study it is clear that the crises suffered by the Latin American economies toward the end of the nineties and the beginning of this century present contemporaneity with several breaks in the series of capital flows at the beginning of the first decade of the XXIth century.

The idea of contemporaneity was extended by using the BP test of structural break because Uruguay and Bolivia were added to the group of coincidences between crises and breaks, when the time interval is enlarged to two years (or two years and a half).

This paper focuses in determining if the structural breaks found by the ZA and BP tests (suggested or significant) are contemporary (within two years and two years and a half) to the crises suffered by the Latin American countries. It is important to state that it is not an analysis of causality from one variable to the other, it is just temporary precedence. So, it cannot be assessed whether the breaks are produced by the crises or the crises are caused by the breaks (even though all the breaks found were preceded by a crisis).

These arguments shed light on the vital need of establishing a better regulation of the capital flows in Latin America. The world financial architecture is setting weaker limits to international investment, and no substantial change seems in sight which could provide stability to the region. Countries should begin to take into account that successive crises undermine

the confidence they could generate and steady financial flows are necessary if they are seeking a more prosperous future.

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