I-Introduction

The question of when and why countries are forced to abandon fixed exchange rate pegs has gained front-page status during the last months. The recent Mexican peso crisis, and its repercussion on countries under fixed exchange rate regimes like Argentina and Hong Kong painfully reminded investors and policy-makers of the need to better understand the economics of devaluations.

This paper is an empirical study of the determinants of devaluations in Latin America. Consequently, the main purpose of this investigation is to shed light on the factors that precipitate the collapse of exchange rate pegs in the region. Although the approach followed here is predominantly empirical, it is rooted in the theoretical framework of models of speculative attacks à la Krugman (1979). According to these models, devaluations[1] occur due to "bad fundamentals" or "fundamentals' disequilibrium". Investors attack the currency because they anticipate that the behavior of macro variables in the economy is inconsistent with the government's determination to maintain a fixed exchange rate.

Section II of this paper reviews the literature on speculative attacks and devaluations. In particular, the Krugman type of models are compared to models of self-fulfilling devaluations à la Obstfeld.

Section III analyzes the behavior of key macro variables one year before the end of twenty-two fixed exchange rate spells in Latin America. These variables include: reserves, the real exchange rate, the share of domestic credit received by the public sector, a current account proxy and the black market premium. The purpose of this section is to detect regularities in the evolution of these variables that

[1] In the original Krugman (1979) article, perfect foresight is assumed so the when the peg is abandoned the exchange rate cannot jump. However, relaxing this assumption we can justify the real world observation of discrete devaluations at the time a peg ends.

can provide evidence for a fundamentals' disequilibrium interpretation of devaluations in this region.

Section IV discusses the econometric analysis of Latin American devaluations followed in this paper. Part (a) describes the data used and part (b) summarizes the estimation strategy pursued. The empirical estimation of likelihoods of devaluations is done using logit analysis with data on exchange rate pegs from eleven Latin American countries between 1957 and 1988. Part (c) presents the empirical results. Part (d) analyses the goodness of fit of the logit models.

Finally, section V concludes and suggests potential improvements and extensions to the investigation conducted in this paper.

II- Models of Speculative Attacks and Devaluations : A Review of the Literature

The literature on speculative attacks and devaluations has been dominated by two types of models catalogued by Eichengreen, Rose and Wyplosz (1994) as "first generation" and "second generation" models.

The seminal article of the first generation models of speculative attacks is Krugman's 1979 "Balance of Payments Crises" model. Krugman assumes that an exogenous budget deficit financed by monetary expansion is at the core of the balance of payment crisis. The crisis ultimately forces the government to abandon the existing exchange rate peg.

The mechanics underlying crises in Krugman's model are the following: the authorities announce that they are prepared to peg the exchange rate until reserves are exhausted[2]. The government pursues expansionary fiscal policies financed by the creation of domestic credit. As the supply of domestic assets increases, investors exchange some of these assets for foreign exchange

[2] Alternatively, it can be assumed that the government will abandon a peg when the reserves reach a certain pre-established floor.

reserves of the central bank. Because only a portion of the incremental supply of domestic assets is exchanged, the "shadow" exchange rate which would prevail without the peg depreciates over time. In order to rule out arbitrage profits, it must be the case that when the shadow exchange rate (which reflects the behavior of macro variables in the economy) equals the fixed exchange rate, investors attack the currency. Subsequently, reserves are depleted and the peg is abandoned. Therefore, in this model "bad fundamentals", represented by an inflationary budget deficit, cause the erosion of reserves and, ultimately render the existing fixed exchange rate regime unsustainable.

A number of extensions follow from Krugman's framework that describe the behavior of macro variables leading up to devaluations. For example, to the extent that fiscal policies raise the demand for domestic goods, the resulting price increases will lead to real exchange rate appreciations in the period prior to a devaluation. Assuming the real exchange rate has a negative impact on the trade deficit, the deficit will grow as the real exchange rate appreciates before the attack on the currency (Edwards (1989)). Uncertainty about the rate of domestic credit creation, will increase the pace at which the reserves are depleted (Flood and Garber (1984a)). In summary, in the first generation models, an exogenous increase in the budget deficit financed by domestic credit creation affects other variables in the economy making their evolution inconsistent with the fixed exchange rate .

The second generation models of speculative attacks are very different in nature from their first generation counterpart. These models, formalized by Flood and Garber (1984b) and Obstfeld(1986), allow for circumstances in which balance of payment crises and devaluations may be purely self-fulfilling events rather than the inevitable consequence of inconsistent macroeconomic policies. Thus, while in the Krugman type of models, speculation leading to devaluations is a symptom of underlying economic problems, in the self-fulfilling crises models, speculation itself is a cause of problems.

In the models of self-fulfilling attacks, due to speculation, exchange rate regimes that appear

sound according to the behavior of macro variables may still collapse. However, Obstfeld (1986) points out that these self-fulfilling crises "reflect not irrational private behavior, but an indeterminacy of equilibrium that may arise when agents expect a speculative attack to cause a sharp change in government macroeconomic policies". For example, even if fiscal policy is not inflationary today, speculators will attack the currency if they expect the government to adopt a more inflationary policy after the devaluation.

While the models of self-fulfilling crises seem to best explain speculative attacks on EMS currencies (see Eichengreen, Rose and Wiplosz (1994)), a number of studies (see Connolly (1986), Golberg (1990) and Edwards (1989) for example) indicate that devaluations in Latin America are a direct consequence of the state of fundamentals in these economies. Using data for various exchange rate spells in Latin America between 1957 and 1988, the remainder of this paper pursues a "bad fundamentals " empirical model to explain devaluations in this region.

III- Devaluations and the Behavior of Macro Variables

According to the Krugman type of models, devaluations occur because the behavior of macroeconomic variables becomes inconsistent with the fixed peg. In this framework, the conditions faced by countries preceding a devaluation can be summarized as follows: there is a rapid growth of the share of domestic credit received by the public sector, the real exchange rate appreciates steadily; there are large current account deficits, the parallel market premium rises, and reserves decline continuously.

This section evaluates whether the regularities enumerated above are observable in the data for fixed exchange rates pegs and devaluation episodes in Latin America. The behavior of the variables mentioned above is analyzed throughout twenty-two exchange rate spells corresponding to nine Latin

American countries. Each of these spells, which took place during the period 1957-88, were in effect for at least one year. Figures for all variables are reported one year, six months, three months and one month before the devaluation.

Table 1: Evolution of net foreign assets to M1 preceding a devaluation

Country	Duration of Spell	End of Spell	1 yr. prior	6 mo. prior	3 mo. prior	1 mo. prior
Bolivia	84 mo.	Nov. 1979	11.41%	-2.84%	-5.56%	-16.17%
Bolivia	26 mo.	Feb 1982	-17.29%	-43.05%	-56.02%	-51.04%
Brazil	14 mo.	Feb . 1967	18.57%	13.73%	15%	12.93%
Chile	16 mo.	Dec. 1971	41.96%	16.91%	8.31%	6.31%
Chile	13 mo.	Oct. 1973	-20.51%	-18.18%	-32.14%	-26.87%
Chile	35 mo.	June 1982	-47.31%	-131%	-149.59%	-159.54%
Ecuador	108 mo.	Aug. 1970	15.55%	16.26%	11.76%	13.26%
Ecuador	140 mo.	May 1982	28.85%	25.58%	22.83%	22.18%
Ecuador	14 mo.	Dec. 1985	8.58%	7.66%	7.66%	17.59%
Paraguay	281 mo.	Mar. 1984	143.02%	124.47%	105.14%	99.28%
Paraguay	20 mo.	Dec. 1986	67.53%	55.35%	50.24%	50.84%
Paraguay	26 mo.	Mar. 1989	44.57%	50.33%	46.32%	39.76%
Peru	80 mo.	Aug. 1967	32.83%	31.55%	29.38%	27.41%
Peru	94 mo.	Sept. 1975	24.67%	28.37%	9.45%	9.42%
Peru	16 mo.	Jan. 1987	97.22%	59.06%	55.95%	40.95%
Uruguay	43 mo.	Dec. 1971	28.68%	20.55%	8.59%	-2.06%
Venezuela	94 mo.	Dec. 1971	56.65%	67.35%	74.52%	72.61%
Venezuela	13 mo.	Feb. 1973	76.8%	72.77%	73.16%	76.23%
Venezuela	131 mo.	Feb. 1984	62.99%	70.17%	70.38%	72.98%
Venezuela	33 mo.	Dec. 1986	81.52%	80.27%	77.26%	66.61%
Venezuela	26 mo.	Mar. 1989	118.19%	80.84%	58.95%	59.82%
Guatemala	23 mo.	May 1988	-12.52%	-17.29%	-22.17%	23.51%
Mean	-	-	39.67%	27.79%	20.79%	17.89%

Source: International Financial Statistics

Table 1 summarizes the behavior of the percentage share of reserves (net foreign assets) to M1. In 15 out of the 22 spells analyzed, reserves fell consistently as a share of M1. That is, in 68% of the cases, reserves one year before the devaluation were higher than six, three and one month prior to the end of the spells. This confirms the view that currency crises are usually preceded by an important rundown of reserves. On average reserves declined by approximately 55 percent, one year before the devaluation. Chile prior to its 82' devaluation and Bolivia prior to its 79' devaluation exhibit the greatest loss of reserves. In both occasions, reserves fell by more than 200%.

The pattern of deterioration of most countries' current accounts as the d-day approached is evident from table 2. Given that monthly data on the current account is not available, the behavior of the ratio of imports to exports is analyzed. This ratio increases before 13 out of the 22 devaluation episodes considered. In particular, this pattern is clear when comparing the ratio one year versus three months before the devaluation, given that in some cases there was a slight recovery one month before the peg exit. The average increase in the ratio of imports to exports one year before the devaluations was of 52%. Paraguay suffered the biggest increase in the ratio of imports to exports preceding its 1989 devaluation given that its trade deficit increased by 370% throughout the year before the devaluation.

Table 2 also presents data on the percentage share of the domestic credit received by the public sector. The data shows that most countries underwent expansionary fiscal policies while under a fixed exchange rate regime. In fact, this was the case for 14 out of the 22 spells included in the sample. That is, in 64 percent of the cases examined, devaluations were preceded by rapidly growing public sector borrowing. The mean share of public sector domestic credit for all spells is 27.5% one year before the devaluation and 32.1% one month before the end of the spells.

Table 2: Evolution of the ratio of exports to imports and of the % share of public sector domestic

credit preceding a devaluation

	- Ratio of Imports to Exports-				-Share of domestic credit to the public sector-			
Country	1 Yr	6 mo	3 mo	1 mo	1 Yr	6 mo	3 mo	1 mo
Bol. 79'	1.3	0.88	1.14	1.02	36.85%	37.43%	42.99%	45.43%
Bol. 82'	1.03	0.72	0.44	1.02	46%	49.53%	51%	50.64%
Bra. 67'	1.29	1.18	0.94	0.62	34.5%	29.64%	29.27%	31.75%
Chil. 71'	1.09	0.84	1.35	1.82	51.6%	64.69%	65.65%	65.07%
Chil. 73'	1.53	1.05	2.17	0.77	75.32%	78.68%	86.24%	85.25%
Chil. 82'	2.36	1.58	0.88	1.53	5.3%	0.11%	2.01%	0.5%
Ecu. 70'	1.53	1.24	0.91	1.29	27.42%	33.93%	33.81%	35.55%
Ecu. 82'	0.75	0.99	0.95	1.07	8.73%	n.a	7.01%	4.28%
Ecu. 83'	0.74	0.70	0.67	0.47	7.13%	22.575	19.52%	23.61%
Parag.84'	1.55	3.15	2.58	5.64	18.79%	22.54%	26.7%	27.49%
Parag.86'	2.99	1.84	3.14	2.8	31.75%	30.99%	30.29%	31.09%
Parag.89'	0.74	1.42	2.81	3.48	34.17%	29.38%	31.52%	29.82%
Peru 67'	1.2	1.18	1.22	1.14	41.13%	38.83%	43.09%	42.66%
Peru 75'	1.2	1.62	2.2	1.64	54.98%	56.95%	59.64%	61.28%
Peru 86'	0.73	1.28	1.27	1.36	44.92%	43.24%	48.42%	52.76%
Urug. 71'	0.69	0.57	2.29	2.69	26.05%	32.39%	40.35%	44.53%
Vene. 71'	0.6	0.63	0.81	0.65	2.86%	4.1%	8.95%	5.36%
Vene. 73'	0.73	0.78	0.97	1.19	1.87%	4.19%	1.88%	0.16%
Vene. 84'	0.62	0.39	0.49	0.44	14.32%	17.12%	16.53%	14.7%
Vene. 86'	0.55	1.11	0.96	1.17	8.21%	3.49%	7.88%	9.89%
Vene. 89'	1.19	1.22	1.75	2.02	3.89%	15.97%	18.99%	19.81%
Gua. 88'	1.68	1.85	1.19	1.49	29.91%	27.88%	26.12%	24.99%
Mean	1.18	1.19	1.42	1.6	27.54%	29.21%	31.72%	32.1%

Source: International Financial Statistics

According to the Krugman type of models, inconsistent macroeconomic policies in periods of fixed exchange rates will result in real exchange rate appreciations and increases in the black market premium. Table 3 contains data on the evolution of both of these variables. In 15 out of the 22 episodes analyzed, the bilateral real exchange rate index appreciated over the year before the devaluation. For those countries experiencing an appreciation, the average decline in the bilateral real

exchange rate throughout the year before the devaluation was of 15%. Chile's 73' devaluation was preceded by the biggest appreciation in the sample. Throughout the year before this devaluation, the bilateral real exchange rate with the US appreciated by 68%.

The evolution of the black market premium is also presented in table 3. The behavior of the black market premium reflects three interrelated forces. First, in the presence of a freely floating black market rate, expansive fiscal and credit policies will be reflected in a depreciation of the free rate and, consequently, in an increase in the black market premium. Second, these hikes in the premium capture the existence of capital controls since stringent controls prevent official and black market rates from converging. Finally, an increasing black market premium also reflects rising expectations of devaluation.

The increasing trend of the black market premium can be detected in 15 out of the 22 fixed exchange rate episodes. On average, the black market premium rose by 120% over the year preceding devaluations. The largest increase in the black market premium in the sample took place throughout the year preceding Uruguay's 71' devaluation where the black market premium rose from 17% to 182%. This represents an 970% increase. For countries like Venezuela, Chile and Paraguay, the black market premium was large over the course of the year preceding devaluations in these countries yet the change during this period was not as dramatic as that before Uruguay's 71' devaluation. The magnitude of the premiums in the black market for the dollar in the countries mentioned above is an indication of the degree of misalignment of the local currencies, the stringency of capital controls and of rising expectations of devaluations.

Table 3: Evolution of the real exchange rate index and of the black market premium

	-Bilateral Real Exchange Rate Index -				- Black Market Premium -			
Country & Year of Deval	1 Yr prior	6 mo prior	3 mo prior	1 mo prior	1 Yr prior	6 mo prior	3 mo prior	1 mo prior
Bol. 79'	50.22	50.83	49.11	48.67	12.5%	15%	17.5%	17.5%
Bol. 82'	67.01	64.08	65.01	64.23	24%	44%	52%	84%
Bra. 67'	90.72	76.63	73.05	69.30	2%	0.45%	0.45%	0.45%
Chil. 71'	95.25	87.54	85.88	82.12	128.95%	347.26%	476.45%	489.53%
Chil. 73'	71.37	47.95	30.53	22.79	1080%	3100%	7100%	4900%
Chil. 82'	75.01	74.95	75.12	76.65	8.97%	10.26%	17.95%	12.82%
Ecu. 70'	86.66	89.54	90.06	89.52	22.78%	21.39%	23.89%	55.56%
Ecu. 82'	60.28	59.95	59.12	57.77	21.6%	36%	41%	74.4%
Ecu. 85'	93.74	82.25	80.67	79.72	90.91%	86.07%	80.41%	106.68%
Para.84'	52.8	49.83	49.63	48.73	150%	237.3%	177.77%	157.94%
Para.86'	84.73	71.75	70.48	69.5	150%	168.75%	137.5%	112.5%
Para.89'	78.4	72.53	70.6	68.65	100%	131.82%	127.27%	200%
Peru 67'	65.31	64.23	63.19	63.16	2.05%	2.42%	2.05%	2.05%
Peru 75'	79.82	74.36	71.9	68.5	49.87%	67.95%	56.33%	75.71%
Peru 87'	85.76	67.06	60.36	55.84	44.8%	43.37%	44.8%	63.08%
Uru. 71'	67.37	62.64	59.42	55.3	16.94%	101.61%	115.73%	182.26%
Ven. 71'	113.42	114.95	114.98	114.72	1.12%	1.79%	1.35%	1.35%
Ven. 73'	100.57	101.38	100.89	100.55	0.23%	2%	2%	022%
Ven. 84'	84.5	83.58	82.45	82.64	132.56%	318.6%	231.39%	202.33%
Ven. 86'	84.24	80.26	78.9	76.32	140%	151.6%	200%	300%
Ven. 89'	76.37	66.1	57.35	55.49	174%	168.97%	189.66%	203.45%
Gua. 88'	93.93	91.41	89.59	90.45	33.6%	32.8%	33.2%	34%
Mean	79.88	74.26	71.74	70.03	108.5%	231.34%	414.94%	330.72

Source: International Financial Statistics and World Currency Yearbook.

In summary, this section confirms that for the majority of the Latin American devaluation

episodes analyzed: reserves fall, the real exchange rate appreciates, the current account deficit worsens and the black market premium rises during the year before the pegs are abandoned. Finally, as Krugman's model assumes, the data confirms a substantial increase in the share of domestic credit received by the public sector prior to the devaluations.

While the focus of this section was to verify some of the regularities in the behavior of macro variables predicted by the devaluation models of "bad fundamentals" à la Krugman, the next section uses logit analysis to determine whether any of the variables whose behavior was examined significantly affect the likelihood of a devaluation.

IV- Econometric Analysis of the Determinants of Devaluations

(a) The data

Pooled monthly data for exchange rate spells corresponding to eleven Latin American countries is used. The sample covers the period between 1957 and 1988. A spell is defined as a period of time when there is a fixed exchange rate between a country's currency and the US dollar. The data on exchange rates along with data for other variables was kindly provided by Klein and Marion[3]. They identify exchange rate spells by examining end-of-the-month exchange rate data published in the International Monetary Fund's International Financial Statistics (IFS). All spells were in effect for at least three months. The original Klein and Marion study includes 61 spells. Data availability for some variables used in this study dictate that at most 41 spells are included in the estimations reported in this paper.

Other data, compiled by Klein and Marion, used in this study include: a dummy to record

[3] This is the same data set they used in their 1994 NBER paper "Explaining the Duration of Exchange Rate Pegs".

whether a country had multiple official exchange rates over the course of a spell[4] and two political dummy variables that measure whether there were any regular and/or irregular executive transfers of power during a given spell. Both political variables originally came from the World Handbook of Social and Political Indicators (1983).

Monthly data on the share of domestic credit received by the public sector, net foreign assets, M1, the real exchange rate, exports and imports were obtained from the IFS. Black market premium percentages were constructed from raw data from various issues of the World Currency Yearbook[5].

(b) The estimation strategy

Logit analysis is used to estimate monthly probabilities of devaluation. The dependent variable, **EXIT**, is obviously a dichotomous one. EXIT equals zero in months when the exchange rate peg is in effect and it equals one the month before the country abandons the peg. Given this setup, variables from month t are used to determine the probability of abandoning a peg in month t+1. This probability corresponds to EXIT taking a value of one in months t.

Given the logistic distribution, the probability of exiting a peg in month t+1 is:

(1) Prob $(EXIT_t=1/Z_t)= \exp(\beta Z_t) / (1+\exp(\beta Z_t))$

Similarly, the probability the peg is in effect in period t+1 is

(2) Prob $(EXIT_t=0/Z_t)= 1 / (1+\exp(\beta Z_t))$

[4]This data also came from the IFS.

[5] This publication was previously denominated Pick's Currency Yearbook.

The ratio of (1) over (2) is simply the odds ratio in favor of a devaluation. Taking natural logs of this ratio, it should be clear that the log of the odds ratio is not only linear in Zt but also linear in the parameters β.

(3) $\ln \{Prob (EXIT_t=1/Z_t)/ Prob(EXIT_t=0/Z_t \}= \beta Z_t$

Given (3), β measures the change in the log-odds ratio for a unit change in Zt.[6] For example, a positive β indicates that as Zt increases, so do the odds in favor of a devaluation. However, the marginal effect of a regressor on the dependent variable, the usual interpretation for coefficients in the ordinary least squares setup, is different from β (although it still depends on it). Namely,

(4) $\{dProb(Exit_t=1/Z_t)/dZ_t\} = \beta*(\exp(\beta z_t)/(1+\exp(\beta z_t))*(1/(1+\exp(\beta z_t))$

Note that (4) will vary with Z_t. In practice, the marginal effects are calculated at the means of the regressors. Thus, the marginal effect of a regressor measures the change, in terms of probability points, of the likelihood of a devaluation given a change in one unit of the regressor from its mean. In this paper, the impact of a given variable on the probability of a devaluation will be evaluated by focusing on its marginal effects.

Z_t is a matrix of determinants of devaluation[7]. The choice of variables to be included in Z_t crucially depends on the theoretical framework considered relevant in explaining devaluations. This study attempts to explore the view pioneered by Krugman that a currency peg collapses when

[6] It should be fairly obvious that (3) cannot be estimated linearly since the log of one over zero or vice versa is undefined. Thus (3) needs to be estimated by maximum likelihood.

[7] Zt can include a constant.

fundamentals become inconsistent with the government's objective of maintaining a fixed exchange rate. Under such circumstances, speculators attack the currency, reserves are exhausted and the peg is abandoned.

Both the share of domestic credit received by the public sector and the current account deficit are considered relevant fundamentals in the Krugman sense. A rise in these variables over the course of a spell indicates an increasing imbalance in the economy. Therefore, both variables are expected to positively and significantly affect the likelihood of a devaluation.

Expansionary fiscal policies put upward pressure on prices. As a result, the real exchange rate appreciates over time. An appreciation of the real exchange rate, ceteris paribus, exacerbates the degree of misalignment of the currency relative to its long run equilibrium level. Furthermore, appreciations of the real exchange rate increase the likelihood of a devaluation because of their negative effect on the current account. Since a real appreciation is represented by a lower real exchange rate index, this variable is expected to have a negative coefficient in the logit estimations. Assuming a "bad fundamentals" model of devaluations, the erosion of reserves is one of the main symptoms that an exchange rate peg is in trouble. A drop in reserves, within this framework, should increase the likelihood of a devaluation. Thus, this variable is expected to have a negative coefficient in the logit estimations. To account for differences in country sizes, the measure of reserves is defined as the ratio of net foreign assets to M1.

In economies under fixed exchange rate regimes, the percentage black market premium captures macroeconomic imbalances as well as the stringency of existing capital controls. Thus, this variable is expected to be significant in predicting probabilities of devaluation. However, it is not clear a priori what its expected sign ought to be. As domestic credit policies become increasingly expansive and reserves begin to be eroded, the parallel exchange rate depreciates to reflect the increasing

imbalances in the economy and the black market premium rises. In this sense, the black market premium is expected to enter with a positive sign in the logit estimations. However, to the extent that larger black market premiums reflect effective capital controls, it is possible that the sign on this variable is negative. This is due to the fact that capital controls discourage speculation and, therefore, reduce the probability of an attack on the currency.

The role of multiple official exchange rates as a deterrent factor against devaluations is also evaluated. The co-existence of multiple official rates allows the government to correct the currency misalignment for certain transactions[8]. Therefore, to the extent that some of the official rates are closer to the shadow exchange rate, the presence of multiple rates is expected to reduce the pressure for a devaluation. Thus, in the logit regressions, the dummy which records whether a country had multiple exchange rates is expected to have a negative coefficient.

The question of whether most devaluations occur following a political transfer of power is explored by looking at the effect of two dummies, RET and IET. These variables take a value of one in a given month if there was an executive transfer (regular or irregular, respectively) and zero otherwise. Both variables are expected to have a positive effect on the likelihood of a devaluation to reflect the observed regularity that devaluations follow executive transfers of power.

The potential impact that the reputation and credibility of a government can have on the duration of a fixed exchange rate peg is also addressed in this study. Expectations of devaluation are largely affected by the reputation and/or ability of the government to commit to its promise of maintaining a peg. Past experiences can be a good predictor of the credibility of a government. To explore this issue, a variable which measures the number of exits in the last 12 months prior to the

[8] For example, Brazil's exporters of coffee (one of the country's main export) usually had access to more competitive rates than those in effect for other transactions.

current peg is included in the logit regressions. The coefficient on this variable is expected to be positive, since the greater are the number of times the government has recently abandoned a peg, the larger are the chances it will do it again.

Also to capture the credibility of a peg, some of the logit specifications include a variable which records the number of months that a given peg has been in effect so far. Controlling for other factors, the duration of a peg to the present date is expected to have a negative effect on the probability of a devaluation. That is, ceteris paribus, the longer the country maintained a given peg, the more credible it becomes. Thus, the lower is the likelihood of a devaluation.

Finally, the potential effect of country and time specific effects is taken into account by including the relevant dummies.[9]

To summarize, aside from the fixed effect dummies[10], the following variables are included in the logit regressions as potential determinants of devaluations:

- RES: % net foreign assets to M1.
- RERINX: bilateral real exchange rate index between the country on the peg and the U.S.
  .
- IMEX: ratio of imports to exports. Proxy for current account deficits.
- BMKTP: black market premium.
- PSCRED: percentage share of domestic credit received by the public sector.
- MULTEX: dummy which takes a value of one when more than one official rate is in effect.
- RET: dummy which equals 1 in months when regular executive transfers took place.
- IET: dummy which equals 1 in months when irregular executive transfers took place.
- PR1: number of exits in the last 12 months prior to current spell.
- MONTHS: number of months (up to the present observation) a spell has been in effect.

[9] Following a similar procedure to Marion and Klein's, I experimented with a range of possible calendar-year dummies. Only years after 1981 were found to be significant. To save degrees of freedom, the dummy variables were combined in groups. Finally, two dummies were included. One grouping the years 1982-85, and a second dummy including the years 86-90.

[10] Dummies were included for the following countries: Argentina, Brazil, Bolivia, Chile, Ecuador, Jamaica, Paraguay, Peru, Uruguay and Venezuela.

(c) Empirical results

Table 4 presents the estimates for various logit specifications over the entire sample period, 1957-1988. Monthly data for 41 exchange rate spells which took place in 11 Latin American countries is included in these regressions. Coefficient estimates and marginal effects, calculated for the mean values of the regressors, are reported for all specifications. Detailed results, including country and time dummies, are presented in the appendix.

Table 4 : Logit estimates over the entire sample

	Equation (4.1)		**Equation (4.2)**		**Equation (4.3)**		**Equation(4.4)**	
Variable	Coef. (t-stat.)	Marginal Effect	Coef. (t-stat.)	Marginal Effect	Coef. (t-stat.)	Marginal Effects	Coef. (t-stat.)	Marginal Effect
constant	1.193 (0.779)	0.031	1.523 (0.942)	0.039	1.856 (1.118)	0.048	1.012 (0.459)	0.026
RERINX	-0.089 (-4.781)	-0.002	-0.086 (-4.545)	-0.002	-0.092 (-4.443)	-0.002	-0.092 (-4.45)	-0.002
RES	-2.465 (-3.703)	-0.065	-2.146 (-3.164)	-0.056	-2.126 (-3.128)	-0.055	-2.046 (-2.984)	-0.053
IMEX	0.312 (1.832)	0.008	0.319 (1.877)	0.008	0.368 (2.002)	0.009	0.369 (2.007)	0.009
PSCRED	5.232 (3.382)	0.137	6.716 (3.386)	0.174	6.411 (3.071)	0.165	6.698 (2.989)	0.173
BMKTP	-0.0008 (-2.132)	-0.00002	-0.0009 (-2.138)	-0.00002	-0.0009 (-2.161)	-0.00002	-0.0009 (-2.129)	-0.00002
MULTEX	-	-	-1.096 (-1.303)	-0.028	-0.959 (-0.986)	-0.025	-0.798 (-0.798)	-0.021
RET	-	-	1.047 (1.022)	0.027	1.037 (0.98)	0.027	1.045 (0.989)	0.027
IET	-	-	1.347 (1.422)	0.035	1.381 (1.452)	0.036	1.37 (1.436)	0.035
PR1	-	-	-	_	-0.033 (-0.074)	-0.0008	-0.029 (-0.067)	-0.0007

MONTHS	-	-	-	-	-0.005 (-0.809)	-0.0001	-0.004 (-0.631)	-0.00009
OPEN	-	_	-	-	-	-	0.005 (0.118)	0.0001
XMUS	-	-	-	-	-	-	0.033 (0.659)	0.0008
pseudo-R2	0.174	-	0.193	-	0.19	-	0.192	_
Log-likelihood	-126.75	-	-124.8	-	-124.5	-	-124.2	-

The dependent variable is the variable EXIT which equals 1 in the month prior to a devaluation. All of the specifications were estimated including time and country dummies. Table 4B in the appendix repeats these results including also coefficients, t-statistics and marginal effects for these dummies.

Equation (4.1) primarily includes variables that are intended to capture the state of macroeconomic fundamentals (RES, RERINX, IMEX, PSCRED and BMKTP). According to a Krugman type of model, these variables are the main factors that determine whether a country is forced to abandon a fixed exchange rate peg at a given point in time.

All variables, except for the ratio of imports to exports, IMEX, are statistically significant at the 5% significance level. IMEX is significant at the 10% significance level. The direction of the effect of these variables on the odds of a devaluation can be inferred by examining the signs on their coefficient estimates. For example, a negative coefficient for RES indicates that a drop in reserves increases the odds of a devaluation. However, the magnitude of the effect of these variables on the likelihood of a devaluation is determined by their marginal effects. The marginal effect of a variable measures the change in terms of probability points, caused by a change in one unit of the regressor from its mean. For example, in equation (4.1), a one percent drop in the average ratio of net foreign assets to M1 (RES) increases the probability of exiting a peg by 0.06 probability points. The index of real exchange rate appreciation, RERINX, also has a statistically significant and negative impact on the probability of

a devaluation, but its effect is quantitatively smaller. A one point increase in the degree of appreciation (which is captured by a decline in the index) increases the probability of devaluation by 0.002 points.

Both the current account proxy , IMEX, and the share of domestic credit received by the public sector, PSCRED, have a positive and significant effect on the probability that a country will abandon a fixed exchange rate peg. However, the marginal effect of PSCRED is substantially larger than that of IMEX. In fact, PSCRED is the variable which has the biggest impact on the probability of a devaluation. A one percent increase in the share of domestic credit received by the public sector, rises the likelihood of devaluation by 0.13 probability points. On the other hand, a one unit increase in the ratio of imports to exports from its mean value, rises the probability of a devaluation by only 0.008 points. Finally, the percentage black market premium (BMKTP) is statistically significant, but has a negligible effect on the probability of exiting a peg. The marginal effect of this variable is -0.00002.

Equation (4.2) adds the political variables, RET and IET, and the multiple exchange rate dummy, MULTEX, to the specification in (4.1). RET and IET take a value of one in months in which regular and irregular executive transfers of power took place, respectively. Even though their coefficients on the political dummies are positive as expected, neither of these variables have a statistically significant effect on the likelihood of a devaluation. Thus, the empirical results do not seem to support the common belief that most devaluations occur following a transfer of power. Similarly, the presence of multiple exchange rates does not have a statistically significant effect on the probability of a devaluation. However, as expected, this variable has a negative impact on the odds of a devaluation.

Equation (4.3) explores the marginal contribution of PR1 and MONTHS, the variables proxying for the credibility of the pegs. As expected, the coefficient on MONTHS is negative. Thus, controlling for other variables, the longer a country has been in a spell, the smaller is the probability that it will devalue. However, this variable does not significantly reduce the likelihood of a

devaluation. Similarly, PR1, the number of past exits in the 12 months prior to the current spell, is insignificant both statistically and because its marginal effect is almost zero. Furthermore, contrary to what was predicted on the basis of reputational and credibility issues, the sign on the coefficient of this variable is negative.

Klein and Marion (1994) estimate a logit model of Latin American devaluations where the timing of an attack is determined by the decisions of an optimizing government who weighs the costs and benefits of ending a peg. Thus, their choice of regressors does not follow directly from a Krugman type of model of devaluations like the one estimated here.They find that the real exchange rate, the level of reserves and structural variables like the degree of openness and trade concentration with the U.S. significantly affect the likelihood of a devaluation.

Following Klein and Marion (1994), specification (4.4) adds to the list of regressors in the logit specifications the degree of openness of the economy, OPEN[11], and its trade concentration index with the US, XMUS[12]. Data for both variables was provided by Klein and Marion. The authors argue that both variables capture important structural aspects of a country's economy which can affect the duration of a fixed exchange rate regime. They contend that the more open an economy, the less likely is the event of a devaluation. This is because a devaluation would impose the burden of higher import prices on a very exposed economy. Also, they argue that given that all countries in their sample are pegging their currencies to the dollar, the likelihood of a devaluation increases with the countries' degree of trade concentration with the United States. They attribute this conclusion to the fact that countries which rely heavily on exporting to the US prefer to see their currencies drop in value in order

[11] The degree of openness of an economy, OPEN, is defined as the ratio of imports + exports to GDP.

[12] XMUS, the degree of a country's trade concentration with the US is defined as the share of its trade going to the US.

to gain relative competitiveness.

While Klein and Marion find that both variables significantly explain monthly probabilities of devaluation, neither of these variables are statistically significant in this paper (see equation (4.4)). Klein and Marion's result that structural variables such as the openness of the economy and its geographical trade concentration significantly affect the monthly likelihood of a devaluation is puzzling for two reasons. First, neither of these variables are representative of the fundamentals' disequilibrium approach. Second, because there are no monthly figures for these variables, the authors use annual data. That is, OPEN and XMUS are constructed so that the same annual figures are repeated twelve times for a given year within a spell. Thus, from a purely statistical standpoint it seems odd that these variables could significantly influence the monthly probability of a devaluation since they do not exhibit any monthly variation.

The puzzle is resolved by noting that one key difference between the specification in this paper (equation (4.4)) and Klein and Marion's, is that they leave out country dummies. On the other hand, equation (4.4) was estimated including country dummies. Also, the specification estimated here includes variables like the share of domestic credit to the public sector, the ratio of imports to exports and the black market premium. Coefficients, t-statistics and marginal effects for all country dummies are reported in Table 4B of the appendix.

By construction, neither OPEN nor XMUS exhibit any monthly variation, yet they capture structural aspects of a country's economy. Thus, a possible explanation for why they are significant in Klein and Marion's study is that both variables proxy for country dummies. This explains why once country fixed effects are accounted for by introducing the corresponding dummies, neither variable has any significant power in explaining monthly likelihoods of devaluations. In fact, when Klein and Marion include country dummies in their specifications, as in equation (4.4) above, they too find that

these variables are insignificant in the presence of these country fixed effects. (see Marion and Klein (1994) Table 2 specification (3) p.12)

The results presented in Table 4 support a "bad fundamentals" explanation of devaluations in Latin America. In all of the specifications, the level of reserves, the share of domestic credit received by the public sector, the proxy for current account deficits, the degree of real appreciation of the local currency and the black market premium are significant determinants of the likelihood of a devaluation. However, in order to analyze the robustness of these results several variations on the specifications in Table 4 are estimated. Equation (4.1) which includes the variables mentioned above together with the country and time dummies is taken as the base equation.

The experiments conducted to study the robustness of the result that devaluations in Latin America are a function of the state of fundamentals in these economies are the following[13]:

(1) Equation (4.1) is estimated separately for spells ending before and after the fall of the Bretton Woods System to evaluate the robustness of the results over different historical periods.

(2) Equation (4.1) is estimated including lags and the changes in the regressors to determine the sensitivity of results to the particular form in which the fundamentals are introduced in the logit estimations.

(3) The results from estimating equation (4.1) over the complete duration of spells are compared to those obtained from estimating this specification including only observations corresponding to the last year prior to devaluations.

To explore whether the determinants of peg duration differ across historical periods, separate regressions were run for spells that took place before and after the Bretton Woods era. The results of

[13] These robustness tests follow those conducted by Klein and Marion (1994). Note, however, that the variables included in the specifications here are different from those in the study mentioned above.

this exercise are reported in Table 5. Once again, country dummies are included to allow for cross-country fixed effects. Equation (5.1) includes spells ending in the Bretton Woods period while equation (5.2) includes spells taking place after March 1973.

For spells ending during the Bretton Woods period, the behavior of all variables is similar in terms of the sign of their coefficients and the size of their marginal effects to the case where the full sample is considered. However, given that most of the variables are less precisely estimated for this period, only the index of real exchange rate appreciation (RERINX) is statistically significant. Finally, even though the share of public sector domestic credit is statistically insignificant (because it is very imprecisely estimated), it still has the largest marginal effect on the probability of a devaluation. A one percent increase in the average share of domestic credit received by the public sector brings about a 0.18 point increase in the probability of devaluation.

Table 5: Logit estimates for spells before and after the collapse of Bretton Woods

	Equation (5.1)		**Equation (5.2)**	
Variables	Estimates (t-statistic)	Marginal Effects dp/dx	Estimates (t-statistics)	Marginal Effects dp/dx
Constant	7.415 (1.405)	0.243	2.418 (1.116)	0.049
RERINX	-0.102 (-2.014)	-0.003	-0.147 (-4.806)	-0.003
RES	-1.129 (-0.847)	-0.037	-4.811 (-4.121)	-0.098
IMEX	0.747 (0.987)	0.025	0.379 (1.811)	0.008
PSCRED	-5.545 (-0.803)	-0.182	7.605 (2.905)	0.155
BMKTP	0.003 (1.203)	0.0001	-0.0008 (-1.652)	-0.00002
pseudo-R2	0.136	_	0.271	-

log likelihood	-41.83	-	-70.78	-

The dependent variable is EXIT which equals 1 in the month prior to a devaluation and zero otherwise. Both specifications include country and time dummies.. Table 5B in the appendix repeats the results and also includes estimates, t-statistics and marginal effects for these dummies.

For spells ending in the post-Bretton Woods era, the real exchange rate index, the share of net foreign assets to M1 and the share of public sector domestic credit are significant at the 5% significance level. At the 10% significance level, both the ratio of imports to exports and the black market premium are significant. All variables' coefficients have the predicted signs. The marginal effects of all regressors are almost the same in magnitude to the full sample case. Once again, the marginal effect of the black market premium variable is almost nil. The share of domestic credit received by the public sector is still the regressor which has the greatest marginal effect on the likelihood of a devaluation.

So far, the results discussed referred to the effects that the levels of period t fundamentals have on the probability of a devaluation in period t+1. In Table 6, equation (6.1) presents the results of estimating the logit model of devaluations including the changes in the fundamentals together with the country and time dummies. This specification excludes the levels of the fundamentals. For those variables that are defined as ratios, like reserves and the share of domestic credit received by the public sector, only the changes in the numerators are used as regressors. Thus, the percentage change in net foreign assets held by the central bank and the percentage change in public sector domestic credit are included in the logit specifications. According to equation (6.1), at 5% level of significance, none of the changes in the fundamentals are significant.

Equation (6.2) includes both the changes and the levels of the fundamentals together with the country and time dummies. At 5% significance level, only the levels of the fundamentals are significant. Thus, it seems that only the levels of the fundamentals are the relevant factors explaining

devaluations. A possible interpretation of this result is that in terms of describing the state of fundamentals, the levels of the regressors capture all the relevant information which investors need to determine the optimal timing of the speculative attack.

In equation (6.3), the explanatory power of period t-1 fundamentals (one period lag) in predicting probabilities of devaluation in t+1 is analyzed. These variables are indicated by adding the term "lag" to the name of each regressor. The results show that lagged values of the fundamentals are statistically significant in predicting monthly probabilities of devaluation. However, the explanatory power of these lagged variables is lower than that of the current values of the regressors. This is reflected by the fact that the R-squared of equation (4.1) (R2=0.17) is larger than that for equation (6.3) (R2=0.15).

Table 6 : Evaluating the effects of incorporating the changes and lags of fundamentals

	Eq. (6.1)	**Eq. (6.2)**		**Eq. (6.3)**	**Eq. (6.4)**
Variables	Estimates (t-statistics)	Estimates (t-statistics)	Variables	Estimates (t-statistics)	Estimates (t-statistics)
constant	-2.782 (-2.779)	1.097 (0.641)	Constant	0.775 (0.496)	1.337 (0.784)
CHRERINX	-0.041 (-1.382)	0.003 (0.169)	RERINXLAG	-0.071 (-4.006)	-0.035 (-0.966)
CHNFA	-0.0008 (-0.344)	-0.0007 (-0.252)	RESLAG	-2.315 (-3.556)	-1.374 (-0.869)
CHPSDC	-0.002 (-1.224)	-0.002 (-1.186)	PSCREDLAG	4.065 (2.632)	-0.476 (-0.108)
CHIMEX	0.001 (0.325)	-0.0002 (-0.038)	BMKTPLAG	-0.0003 (-1.093)	0.0008 (0.861)
CHBMKTP	0.0004 (0.68)	0.0002 (0.352)	IMEXLAG	0.408 (2.489)	0.323 (1.751)
RERINX	-	-0.094 (-4.578)	RERINX	-	-0.06 (-1.734)
RES	-	-2.562 (-3.648)	RES	-	-1.415 (-0.884)

PSCRED	-	5.81 (3.529)	PSCRED	-	6.27 (1.347)
BMKTP	-	-0.0008 (-2.158)	BMKTP	-	-0.002 (-1.625)
IMEX	-	0.294 (1.443)	IMEX	-	0.198 (1.045)
pseudo-R2	0.071	-	pseudo-R2	0.159	0.22
log likelihood	-140	-	log-likelihood	-123.021	-116.67

The dependent variable is EXIT which 1 the month prior to a devaluation and 0 otherwise. Country and time dummies are included.. Table 6B in the appendix, repeats these results and also presents the estimates, t-statistics and marginal effects for these dummies.

Equation (6.4) shows that introducing lags of the fundamentals reduces the significance of the current values of these variables. Furthermore, none of the lagged variables are significant at the 5% level of significance. The fact that neither the current levels nor the lags of the fundamentals are significant while the pseudo r-squared has increased is a consequence of the high multicollinearity between the current and lagged values of the regressors.

A final test of the robustness of the result that fundamentals are the main factors explaining devaluations is to analyze whether the effects of these variables change over the course of a fixed exchange rate spell. This possibility is investigated by comparing the results from estimating the probability of abandoning a peg using data only from the last year of the peg with the results obtained when using data for the full duration of the peg. The results from this exercise are reported in table 7. The logit specifications include only spells that lasted one or more years while all the specifications considered so far have included spells that lasted at least three months.

Table 7: Comparing the effect of fundamentals over the full spell vs. 1 year prior to a devaluation

	Equation (7.1)		**Equation (7.2)**	
variables	Estimates (t-statistics)	Marginal Effects dp/dx	Estimates (t-statistics)	Marginal Effects dp/dx

constant	-0.637 (-0.283)	-0.009	-1.383 (-0.654)	-0.099
RERINX	-0.112 (-3.159)	-0.002	-0.078 (-2.1)	-0.006
RES	-3.534 (-2.883)	-0.055	-3.276 (-2.285)	-0.236
IMEX	0.282 (1.18)	0.004	0.182 (0.697)	0.013
PSCRED	7.493 (2.875)	0.116	5.979 (2.146)	0.43
BMKTP	-0.0009 (-1.865)	-0.00002	-0.0008 (-1.426)	-0.00006
pseudo-R2	0.21	-	0.12	-
log-likelihood	-69.79	-	-58.76	-

The dependent variable is EXIT which equals 1 in the month prior to a devaluation. All the specifications include time and countries dummies. Table 7B in the Appendix repeats the results including also t-statistics and marginal effects for these dummies.Eq. (7.1) includes all observations for spells 1 or more years long.Eq. (7.2) includes only observations corresponding to the last year of spells 1 or more years long.

In Table 7, Equation (7.1) shows the results for the full length of the spells while equation (7.2) was estimated including only observations for the last year of the spells. Two main conclusions can be drawn from comparing (7.1) to (7.2). First, in terms of the significance of the regressors, the results from both specifications are very similar. This is encouraging since the whole point of this exercise was to confirm the robustness of the result over different samples. Second, even though the t-statistics for all variables in equation (7.2) are lower, because the estimates are less precise, the marginal effects of most fundamentals are larger. Compare for example the marginal effect of the share of domestic credit received by public sector for the full sample to the effect of this variable the year before devaluations. For the full sample the marginal effect of PSCRED is 0.116 while it equals 0.43 for the specification including observations for the last year of each spell! The result that the marginal effects for all variables are larger for the specification including observations corresponding to the last year of each spell is also very encouraging and intuitive. The rationale behind this result is that as the

devaluations draw closer and the state of the fundamentals deteriorates, these variables should exhibit greater explanatory power in predicting devaluations.

(d) Analyzing the goodness of fit of the logit models

In the ordinary least square setup, the usual measure of goodness of fit of linear models is the coefficient of determination or R-squared. The R-squared is the ratio between the regression variance and the total variance of the dependent variable. For the logit models, an analog to the R-squared in a conventional regression model is the likelihood ratio index or the pseudo R-squared.

pseudo R-squared= 1-ln L*/ln Lo

This ratio takes values between 0 and 1. ln L* is the maximized value of the log-likelihood function while ln Lo is the log- likelihood for a model including only a constant as a regressor. Thus, the likelihood index or pseudo R-squared is a normalized measure of the improvement in the fit resulting from the model estimated relative to a model that only includes a constant as an explanatory variable. For the specifications reported in table 4, the pseudo R-squared averaged 0.19.

Two other criteria are used to analyze how well the logit specifications discussed in the last section fit the data. In the first place, it should be the case that the fitted probabilities are good predictors of actual events which carry a discrete probability of 0 or 1. Second, the time series of the fitted probabilities should peak as the date of the devaluations is approached. Both criteria are applied to the specification corresponding to equation (4.1) estimated for spells of one year or longer duration.

A useful summary of the predictive ability of the logit models is a 2x2 table of the hits and misses of a prediction rule like: assume the model predicts a 1 if the predicted probability is greater than a certain threshold value T, otherwise assume the model predicts a zero. The usual threshold value is T=0.5, under the logic that a 1 is predicted if the model says a 1 is more likely than a 0. However, in

cases when the sample is relatively unbalanced, i.e. there are many more zeros than ones or vice-versa, this rule will fail almost every time to predict a one. Thus, inferences using this rule will be biased. For these type of cases, the threshold to be used is the average sample probability (Greene (1993)).

The data in this study is quite unbalanced. There are 21 spells that last more than a year, 19 of which are complete before 1988, the last year in the data set. Out of 1080 observations, 1061 are zeros corresponding to months in which a given peg is in effect. For the remaining 19 observations, the dependent variable takes a value of one. These observations correspond to the months when the authorities devalued. Thus, for this data set, the appropriate threshold to use is the average sample probability. In this case, the threshold, T, equals 0.01795.

Table 8 below presents the 2x2 table of hits and misses constructed by applying the threshold T=0.01795 to the probabilities predicted by the logit specification corresponding to equation (4.1) above. This specification includes a constant, the real exchange rate index, the ratio of reserves to M1, the ratio of imports to exports , the share of public sector domestic credit and the black market premium as regressors. Also, country and time dummies are included as explanatory variables. Coefficients and marginal effects for this specification, estimated only for spells longer than one year, can be found in the appendix.

Table 8: Predicted vs. actual probabilities.
Prediction rule: predict 1 if the predicted probability is > than T=0.01795

Predicted/Actual	Actual 1	Actual 0	Totals
Predicted 1	**848**	4	852

Predicted 0	213	**15**	228
Totals	1061	19	**1080**

The model predicts correctly 863 out of the 1080 observations. Thus, almost 80% of the observations are correctly predicted. This is hardly suggestive of no fit despite the fact the pseudo R-squared for this regression is only 0.21.

The second issue related to the goodness of fit of the logit specifications estimated is how well these models capture the dynamics of the probabilities of devaluations over the course of a spell. In this respect, it must be the case that the probabilities predicted by the model increase as the date of a devaluation approaches.

Once again, the analysis focuses on the estimation of equation (4.1) for spells which lasted one or more years. Given that plotting against time the estimated probabilities for each spell in the sample would be too cumbersome, summary statistics on the estimated probabilities are presented for the full sample, for the year and for every month, six months prior to a devaluation.[14] These summary statistics are presented in Table 9.

Table 9: Estimated probabilities by number of months before actual devaluation
Spells 1 year or longer

Predicted Prob.	Full Smpl.	12 mo.	6 mo.	5 mo.	4 mo.	3. mo	2 mo.	1 mo.
Mean	0.018	0.019	0.04	0.05	0.07	0.08	0.11	0.16

[14] This analysis follows Klein and Marion (1994)

Std. deviation	0.042	0.024	0.03	0.04	0.06	0.06	0.1	0.15

Table 9 shows that the average of the estimated probability over the entire length of the spells is 0.018. The average estimated probability one year before a devaluation is 0.019, still close to the average for the full sample period. However, this probability rises rapidly as the d-day approaches. For example, six month before the devaluation the probability of exiting the pegs is 0.04. This probability increases by 0.01 every month up through three months before the end of the pegs when it reaches 0.08. The probability then jumps to 0.11 two months before the end of the pegs and to 0.16 the month before the devaluation.

V- Conclusions and Extensions

The main objective of this paper has been to shed light on the factors that affect the probability that a county might be forced to abandon a given fixed exchange rate peg. Most of the analysis has been based on the literature of speculative attacks caused by "bad fundamentals" à la Krugman.

Using logit analysis, this study confirmed most of the predictions of this kind of models for Latin American fixed exchange rate episodes. As expected, fundamentals like: the level of reserves, the current account deficit, the degree of real exchange rate appreciation and the share of public sector domestic credit were found to have a statistically significant effect on the likelihood of a devaluation.

The paper also investigated the impact of political transfers of power, both regulars and irregular, on the probability of devaluations. The regression results indicated that neither of these variables have a statistically significant effect on the likelihood of devaluations.

Issues of credibility and reputation were explored by looking at the effect of two variables : the number of exits in the 12 month prior to the current exchange rate spell and the to-date duration in months of a spell. Once again, neither of these variables were found to significantly affect the probability of abandoning a peg. However, it would be wrong to conclude that the reputation or credibility of a government trying to maintain a peg does not matter. On the contrary, the doubts should most likely be placed on the explanatory variables used in this study to capture these factors.

The robustness of the result that devaluations in Latin America are a consequence of the state of fundamentals in these economies was analyzed by (1) estimating separate regressions for spells which took place before and after the fall of Bretton Woods, (2) comparing the effects of fundamentals over the full length of the spells relative to the last year in the spells and finally (3) by exploring the impact of the changes and lags of the fundamentals on the probability of exiting a peg. In general, results proved to be robust to the historical sample period considered. Also, whether the logit specifications were estimated for the full length of the spells or their last year did not seem to significantly affect the empirical results. Finally, the current levels of the fundamentals were found to be more significant in explaining devaluations when compared to their changes and/or lagged values.

The logit models used in this paper to estimate monthly probabilities of devaluations performed well both in terms of: (a) the accuracy with which they predicted actual events and (b) in terms of their ability to trace the time dynamics of rising probabilities of devaluation as the end of pegs approached.

A number of extensions can be suggested to improve the analysis in this paper. In studying the effect of a government's credibility and reputation on the likelihood of a devaluation, it seems relevant to analyze and to incorporate the impact of institutions. For example, it would be interesting to determine whether countries with more independent central banks and/or which have set up currency boards stand a greater chance of avoiding speculative attacks. Being able to incorporate these issues

into the present study would require monthly data for these variables for an extended period.

This study made an attempt at exploring the role of political variables in causing devaluations. In particular, the focus was to determine whether devaluations take place following executive transfers of power. However, there are other political considerations which might be interesting to contemplate. For example, it would be interesting to asses whether the probability of a devaluation increases with the degree of political instability in a country or if the tendency of the party in office has any effect on the odds of devaluations. Given the data and time constraints faced, these and other issues mentioned above are left for future research.

Finally, the question of what factors determine a government's decision regarding exchange rate policy after the fall of a peg is left unanswered. This is a potential avenue for future research.

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APPENDIX

Tables includes estimates, t-statistics and marginal effects for country and time dummies

Table 4B: Logit Estimates over the entire sample.

	Equation (4.1)		**Equation (4.2)**		**Equation (4.3)**		**Equation (4.4)**	
Variable	Estimate (t-stat.)	Marginal Effects	Estimates (t-stat.)	Marginal Effects	Estimates (t-stat.)	Marginal Effects	Estimates (t-stat.)	Marginal Effects
constant	1.193 (0.779)	0.031	1.523 (0.942)	0.0395	1.856 (1.118)	0.048	1.012 (0.459)	0.026
RERINX	-0.089 (-4.781)	-0.002	-0.086 (-4.545)	-0.002	-0.092 (-4.443)	-0.002	-0.092 (-4.45)	-0.002
RES	-2.465 (-3.703)	-0.065	-2.146 (-3.164)	-0.056	-2.126 (-3.128)	-0.055	-2.046 (-2.985)	-0.053
IMEX	0.312 (1.832)	0.008	0.319 (1.877)	0.008	0.368 (2.002)	0.009	0.369 (2.001)	0.0009
PSCRED	5.232 (3.382)	0.137	6.716 (3.386)	0.174	6.411 (3.071)	0.166	6.697 (2.989)	0.173
BMKTP	-0.0008 (-2.132)	-0.00002	-0.0009 (-2.138)	-0.00002	-0.0009 (-2.161)	-0.00002	-0.009 (-2.129)	-0.00002
MULTEX	-	-	-1.096 (-1.303)	-0.028	-0.959 (-0.986)	-0.025	-0.798 (-0.797)	-0.021
RET	-	-	1.047 (1.022)	0.027	1.037 (0.98)	0.027	1.045 (0.989)	0.027
IET	-	-	1.347 (1.422)	0.035	1.381 (1.452)	0.036	1.371 (1.436)	0.035
PR1	-	-	-	-	-0.033 (-0.074)	-0.0008	-0.029 (-0.067)	-0.0007
MONTH.	-	-	-	-	-0.005 (-0.809)	-0.0001	-0.004 (-0.631)	-0.00009
OPEN	-	-	-	-	-	-	0.005 (0.118)	0.0001
XMUS	-	-	-	-	-	-	0.033 (0.659)	0.0008
Bolivia	-2.654 (-2.352)	-0.069	-4.028 (-2.583)	-0.104	-3.836 (-2.421)	-0.099	-4.179 (-2.216)	-0.108

Brazil	2.159 (1.726)	0.057	1.156 (0.808)	0.029	1.486 (0.988)	0.038	1.038 (0.63)	0.027
Chile	-1.069 (-0.887)	-0.028	-1.41 (-1.116)	-0.037	-1.221 (-0.941)	-0.032	-1.346 (-0.971)	-0.035
Variables	Estimate (t-stat)	Marginal Effects	Estimates (t-stat.)	Marginal Effects	Estimates (t-stat.)	Marginal Effects	Estimates (t-stat.)	Marginal Effects
Ecuador	1.135 (0.946)	0.029	1.082 (0.919)	0.028	1.414 (1.11)	0.036	0.416 (0.207)	0.01
Paraguay	-0.312 (-0.225)	-0.008	-0.647 (-0.463)	-0.017	-0.139 (-0.091)	-0.004	-0.294 (-0.188)	-0.008
Peru	-0.165 (-0.144)	-0.004	-0.994 (-0.773)	-0.026	-0.618 (-0.454)	-0.016	-1.292 (-0.745)	-0.033
Uruguay.	0.502 (0.425)	0.013	0.246 (0.204)	0.006	0.419 (0.327)	0.011	0.654 (0.487)	0.017
Venezuela.	3.34 (2.091)	0.087	3.215 (2.055)	0.083	3.609 (2.129)	0.093	2.499 (1.028)	0.065
Jamaica.	-10.262 (-3.24)	-0.269	-9.55 (-3.019)	-0.247	-9.138 (-2.837)	-0.236	-10.013 (-2.63)	-0.26
Yrs 82-85	1.225 (2.196)	0.032	1.388 (2.348)	0.036	1.411 (2.308)	0.036	1.508 (2.407)	0.039
Yrs 86-90	1.619 (3.107)	0.042	1.954 (3.419)	0.051	1.679 (2.558)	0.043	1.767 (2.611)	0.045
log-likelihood	-126.75	-	-124.803	-	-124.454	-	-124.236	-
pseudo-R2	0.174	-	0.193	-	0.19	-	0.192	-

The dependent variable is the variable EXIT which equals 1 in the month prior to a devaluation. Yrs 82-85 and yrs 86-90 are dummy variables that take a value of 1 in the years denoted.
The base country is Argentina.

Table 5B: Logit Estimates for spells before and after the collapse of Bretton Woods

	Equation (5.1)		Equation (5.2)	
Variables	Estimates (t-statis.)	Marginal Effects	Estimates (t-statis.)	Marginal Effects
Constant	7.414 (1.405)	0.243	2.418 (1.116)	0.049
RERINX	-0.102 (-2.014)	-0.003	-0.147 (-4.806)	-0.003
RES	-1.129 (-0.847)	-0.037	-4.811 (-4.121)	-0.098
IMEX	0.747 (0.987)	0.025	0.379 (1.811)	0.008
PSCRED	-5.545 (-0.803)	-0.182	7.605 (2.905)	0.155
BMKTP	0.003 (1.203)	0.0001	-0.0008 (-1.652)	-0.00002
BOLIVIA	-	-	-3.913 (-2.484)	-0.079
BRAZIL	-	-	3.383 (1.574)	0.069
CHILE	-0.596 (-0.203)	-0.019	-3.014 (-1.691)	-0.061
ECUADOR	-1.991 (-1.474)	-0.065	3.693 (2.079)	0.075
PARAGUAY	-	-	2.244 (1.167)	0.046
PERU	-2.51 (-1.812)	-0.082	1.14 (0.681)	0.023

URUGUAY	-2.235 (-1.963)	-0.073	-	-
VENEZUELA	-0.282 (-0.113)	-0.009	6.568 (2.653)	0.134
JAMAICA	-	-	-19.656 (-3.982)	-0.4
Yrs. 82-85	-	-	2.033 (2.585)	0.041
Yrs. 86-90	-	-	2.967 (4.075)	0.06
psuedo-R2	0.136	-	0.271	-
log-likelihood	-41.83	-	-70.78	-

The dependent variable is EXIT which equals 1 in the month prior to a devaluation.
Eq. (5.1) includes spells that took place before 1973. Eq. (5.2) includes spells that took place after 1973.

Table 6B: Evaluating the effects of incorporating the changes and lags of fundamentals

Eq. (6.1) Eq. (6.2) Eq. (6.3) Eq. (6.4)

Variables	Estimates (t-statis.)	Estimates (t-statis.)	Variables	Estimates (t-statis.)	Estimates (t-statis.)
Constant	-2.782 (-2.779)	1.097 (0.641)	Constant	0.775 (0.496)	1.337 (0.784)
CHRERINX	-0.041 (-1.382)	0.003 (0.169)	RERINXLAG	-0.071 (-4.006)	-0.035 (-0.966)
CHNFA	-0.0008 (-0.334)	-0.0007 (-0.252)	RESLAG	-2.315 (-3.556)	-1.374 (-0.869)
CHPSDC	-0.002 (-1.224)	-0.002 (-1.186)	PSCREDLAG	4.065 (2.632)	-0.476 (-0.108)
CHIMEX	0.001 (0.325)	-0.0002 (-0.038)	BMKTPLAG	-0.0003 (-1.093)	0.0008 (0.861)
CHBMKTP	0.0004 (0.68)	0.0002 (0.352)	IMEXLAG	0.408 (2.489)	0.323 (1.751)
RERINX	-	-0.094 (-4.578)	RERINX	-	-0.06 (-1.734)
RES	-	-2.562 (-3.648)	RES	-	-1.415 (-0.884)
PSCRED	-	5.81	PSCRED	-	6.27

		(3.529)			(1.347)
BMKTP	-	-0.0008 (-2.158)	BMKTP	-	-0.002 (-1.625)
IMEX	-	0.294 (1.443)	IMEX	-	0.198 (1.045)
BOLIVIA	-1.079 (-1.054)	-2.769 (-2.218)	BOLIVIA	-2.881 (-2.522)	-2.999 (-2.418)
BRAZIL	-0.049 (-0.044)	2.388 (1.759)	BRAZIL	1.231 (1.013)	2.112 (1.587)
CHILE	-0.437 (-0.4)	-1.046 (-0.791)	CHILE	-2.102 (-1.705)	-1.562 (-1.182)
ECUADOR	-1.545 (-1.459)	1.41 (1.072)	ECUADOR	0.151 (0.13)	1.151 (0.896)
PARAGUAY	-2.609 (-2.286)	-0.095 (-0.063)	PARAGUAY	-1.581 (-1.118)	-0.893 (-0.576)
PERU	-1.185 (-1.1)	-0.048 (-0.037)	PERU	-0.703 (-0.617)	-0.377 (-0.302)
URUGUAY	-0.177 (-0.155)	0.746 (0.575)	URUGUAY	0.098 (0.084)	0.376 (0.297)
Variables	Estimates (t-statis.)	Estimates (t-statis.)	Variables	Estimates (t-statis.)	Estimates (t-statis.)
VENEZUEL	-2.642 (-2.325)	3.274 (1.892)	VENEZUELA	1.487 (0.967)	3.233 (1.875)
JAMAICA	0.131 (0.082)	-10.127 (-3.027)	JAMAICA	-10.359 (-3.222)	-11.804 (-3.404)
Yrs. 82-85	1.85 (3.897)	1.54 (2.612)	Yrs. 82-85	1.536 (2.712)	1.433 (2.445)
Yrs. 86-90	1.948 (3.788)	1.783 (3.289)	Yrs. 86-90	1.935 (3.651)	1.857 (3.377)
pseudo-R2	0.07	0.193	psuedo-R2	0.159	0.221
log-likelihood	-140	-118.754	log-likelihood	-123.021	-116.67

The dependent variable is EXIT which equals 1 in the month prior to a devaluation and zero otherwise. In all specifications, the base country is Argentina.

Table 7B: Comparing the effect of fundamentals over the full spell vs. 1 year prior to a devaluation

	Equation (7.1)		Equation (7.2)	
Variables	Estimates (t-statistics)	Marginal Effects	Estimates (t-statistics)	Marginal Effects
constant	-0.637 (-0.283)	-0.009	-1.383 (-0.654)	-0.099
RERINX	-0.112 (-3.159)	-0.002	-0.078 (-2.1)	-0.006
RES	-3.534 (-2.883)	-0.055	-3.276 (-2.285)	-0.236
IMEX	0.282	0.004	0.183	0.013

	(1.181)		(0.697)	
PSCRED	7.494 (2.875)	0.116	5.979 (2.146)	0.43
BMKTP	-0.0009 (-1.866)	-0.00002	-0.0008 (-1.426)	-0.00006
BRAZIL	4.841 (2.812)	0.075	3.635 (1.923)	0.262
CHILE	0.216 (0.142)	0.003	0.104 (0.073)	0.008
ECUADOR	3.789 (2.239)	0.059	4.074 (2.026)	0.293
PARAGUAY	2.539 (1.389)	0.039	4.083 (1.588)	0.294
PERU	2.132 (1.614)	0.033	2.143 (1.563)	0.154
URUGUAY	1.828 (1.315)	0.028	1.322 (0.934)	0.095
VENEZUELA	7.268 (2.786)	0.113	7.454 (2.354)	0.536
Yrs. 82-85	1.745 (2.117)	0.027	0.37 (0.442)	0.027
Yrs. 86-90	1.831 (1.995)	0.028	0.301 (0.303)	0.022
pseudo-R2	0.21	-	0.115	-
log-likelihood	-69.793	-	-58.76	-

The dependent variable is EXIT which equals 1 the month prior to a devaluation.
Equation (7.1) includes all observations for spells 1 or more years long.Equation (7.2) includes only the observations correspoding to the last year of spells 1 or more years long.Bolivia is the base country.