

DEFAULT AND DEVALUATION RISKS IN ARGENTINA: LONG-RUN AND EXOGENEITY IN DIFFERENT SYSTEMS

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Abstract

This study analyses the effect of devaluation risk on the default risk of Argentina, a critical question for the “dollarization debate”. The integrated nature of both series is taken into account to analyse the long run relationship and to evaluate “weak exogeneity” using a “cointegrating vector” system approach. First a bivariate system is considered and then the default risk in the region and indicators of macroeconomic performance are included. The results show that only devaluation risk adjusts to reach the equilibrium with the default risk. Once this risk is free from the effect of Latin American default risk, the solvency of the government (measured as the ratio of government debt to GDP) is the only factor that can be detected in the long run. Conclusions about weak exogeneity do not change when the information set is expanded.

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DEFAULT AND DEVALUATION RISKS IN ARGENTINA: LONG-RUN AND EXOGENEITY IN DIFFERENT SYSTEMS

1. Introduction

Argentina's default risk is nowadays in the core of empirical analysis as understanding its behaviour is essential for the "dollarization debate"¹. One of the main benefits of adopting the US dollar as local currency -often pointed out- is that the elimination of domestic currency risks would substantially diminish the difference between interest rates for home and foreign borrowers. Thus, this spread is supposed to be dependent on devaluation risk, as can be perceived from either casual discussions or econometric modelling.

Visual inspection of the cross plot for country risk -measured as the interest spread between government bonds of Argentine (in foreign currency) and U.S.A- and devaluation risk -defined as the interest spread between government bonds of Argentine in domestic and foreign currency- reveals the positive correlation under analysis (Figure1). So does plotting them on time (Figure 2) where the time-series behaviour can also be observed. Several questions are suggested by this relationship. First of all, the positive correlation looks so strong that the presence of at least a long run "attractor" between both risks merits to be investigated taking into account time series properties. However, in such a case, nothing could be said about the presence of a valid conditional model of country risk on devaluation risk and nothing preclude simultaneous responses or even the converse way of conditioning. This issue can be then considered by testing "weak exogeneity" (as proposed in Urbain (1992) and Johansen (1992)). Yet, concentrating on the bivariate correlation leaves open more deep questions: if other determinants are behind default and devaluation risks and their correlation. The purpose of this paper is to try to answer them using a "cointegrating vector" system approach, first bivariate and then widening the information set to analyse long run relationships and exogeneity.

Next section presents a methodological discussion. Section 3 reports results for the bivariate system of default and devaluation risks. Section 4 and 5 analyses the extended models. Section 6 evaluates the effect of devaluation on default risks controlling for different determinants. Section 6 concludes.

Figure 1

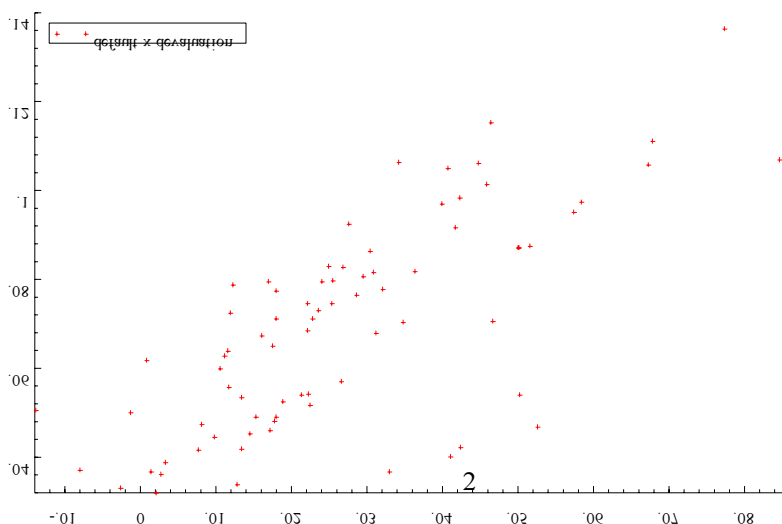
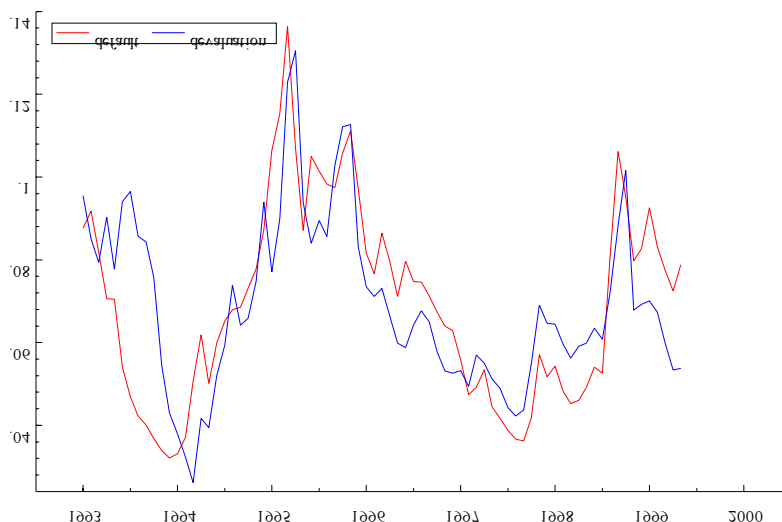


Figure 2



2. A methodological discussion.

Any one-equation regression of y_t on x_t supposes that we can appropriately model y_t “given” x_t without losing information for a specific purpose. Inference, forecasting and policy analysis require different definition of “exogeneity”: Weak, Strong and Super, according to the typology proposed by Engle, Hendry and Richard (1980). Weak exogeneity is essential since it is a necessary condition for the other two definitions².

Taking “ x_t ” as given is in general a conjecture mainly based on economic theory or - just beliefs- but nothing can be concluded from strong correlations since all depends on the normalization.

In the case of country and devaluation risks it is difficult to justify the conditional model of the first on the second as “a priori” valid. Powell and Sturzenegger (2000) call attention on this issue: “such correlation does not imply causation” and to solve this causality problem they undertake an “event study” to measure the impact of currency shocks. We follow a different approach. We concentrate on “weak exogeneity”, a concept different from “causality” which in turn -econometrically defined- means “Granger causality” (or just anticipations) neither necessary nor sufficient for valid conditioning (see, Engle, Hendry and Richard, 1980). In the context of event studies “causality” is interpreted as significant prediction errors resulting from news on perception of exchange rate risks (on daily basis). Our objective instead is to isolate the short run impact of such news and focussed on the “persistent effects” even “dummy-out” turbulent episodes (Hendry, 2000). The approach also takes into account the integrated - I(1)- nature of the series. (Appendix 2 shows the usual Dickey-Fuller statistics) and it can be summarised for the (simplest) two-variable one-lag case, as follows.

Let be (1a) and (1b) the VAR representation (joint system) of y_t and x_t (which can also be interpreted as a reduced form),

$$(1a) \quad y_t = \pi_{11} y_{t-1} + \pi_{12} x_{t-1} + \varepsilon_{1t}$$

$$(1b) \quad x_t = \pi_{21} y_{t-1} + \pi_{22} x_{t-1} + \varepsilon_{2t} \quad \varepsilon_t \sim \text{IN}(0, \Omega)$$

where $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})'$ and $\Omega = \{\omega_{ij}\}$, $i, j = 1, 2$.

It is under this parameterisation (or in differences of the original variables if the variables are $I(1)$) that Granger noncausality (say $H_0: \pi_{21} = 0$) is usually tested. However, for $I(1)$ variables a reparameterisation of the system allows testing both the presence of cointegration (the long run relationship between y_t and x_t if integrated) and the weak exogeneity (for the parameters of interest to study) given cointegration. The number of cointegration relationships can be evaluated through the rank of a matrix closely related to Π (of order $p.p$, here $p=2$), which is obtained rewriting equations (1) in the next form,

$$(2a) \quad \Delta y_t = \pi_{11}^* y_{t-1} + \pi_{12}^* x_{t-1} + \varepsilon_{1t}$$

$$(2b) \quad \Delta x_t = \pi_{21}^* y_{t-1} + \pi_{22}^* x_{t-1} + \varepsilon_{2t}$$

where $\Pi = \{\pi_{ij}^*\}$ and $\pi_{ij}^* = \pi_{ij} - 1$ if $i=j$ and $\pi_{ij}^* = \pi_i$, if $i \neq j$.

If Π is not the full rank ($r < p$), it can be factorised as the outer product of α and β (matrices of $p.r$),

$$(3) \quad \Pi = \alpha \cdot \beta'$$

where β' are "cointegrating vectors" (the long run relationships) and α the weights that each relationship enters each equation. Note that this factorisation is not unique since: $\Pi = \alpha \cdot \beta' = \alpha P \cdot P^{-1} \beta' = \alpha^* \cdot \beta^*$. For the bivariate case, finding cointegration implies $r=1$ and α and β' vectors 2.1 and 1.2, respectively: $\alpha = (\alpha_1, \alpha_2)$ and $\beta' = (\beta_1, \beta_2)$. The second vector can be written without loss of generality as $\beta' = (1, -\delta)$ (normalising the coefficient of y_t) and then the system of equations (2) expressed in a cointegrating vector form becomes,

$$(4a) \quad \Delta y_t = \alpha_1 (y_{t-1} - \delta x_{t-1}) + \varepsilon_{1t}$$

$$(4b) \quad \Delta x_t = \alpha_2 (y_{t-1} - \delta x_{t-1}) + \varepsilon_{2t}$$

where $\alpha_1 = \pi_{11}^*$; $\alpha_2 = \pi_{21}^*$; $\delta = -\pi_{12}^* / \pi_{11}^* = -\pi_{22}^* / \pi_{21}^*$.

This is a joint model of y_t and x_t (conditional on their past) which can be expressed (factorised) in terms of conditional (5a) and marginal models (5b) as follows,

$$(5a) \Delta y_t = \gamma_1 \Delta x_t + \gamma_2 (y_{t-1} - \delta x_{t-1}) + v_{1t}$$

$$(5b) \Delta x_t = \alpha_2 (y_{t-1} - \delta x_{t-1}) + \varepsilon_{2t}$$

where $\gamma_1 = \omega_{12} / \omega_{22}$ and $\gamma_2 = \alpha_1 - (\omega_{12} / \omega_{22}) \alpha_2$. Equation (5a) is also an Equilibrium Correction (EC) model, which implies and is implied by cointegration. In this representation weak exogeneity requires $\alpha_2=0$ and therefore (5a) is a valid conditional model. The parameters of the conditional model can be estimated from (5a) alone. Note that when $\alpha_2=0$ the equilibrium correction terms are the same in the conditional form (equation (5a)) and in the first equation of the cointegrating vector form (4a).

Johansen (1988) and Johansen and Juselius (1990) provide the methodology which allows testing the number of cointegration relationships (from the numbers of eigenvalues different from zero) and the basis for testing the restriction $\alpha_2=0$. This approach is next applied to analyse cointegration and valid conditional models in systems which includes both risks.

3. Default and Devaluation risks: studying the bivariate relationship.

The cointegration analysis between country, default or Sovereign risk (SR from now on) and currency, devaluation or Exchange rate risk, measured as the spread of government bonds (ER) is presented in Table 1. Both variables are expressed in logs of $(1+r)$ where r is 0.0001 times the usual measure of risks in basic points. We control by dummies (entering unrestricted in the system) for two months in 1995 (year of the effects of the Mexican devaluation, "Tequila effect") and a permanent change in the constant term after 1993 (see Figure1)⁴.

Inspecting the eigenvalues and their associated statistics (Maximum and Trace) we can reject that the rank is zero in favour of one, that is one cointegration relation in this case. Thus, the bivariate system gives statistically support to what we observed in Figure 1: country and devaluation risks have a long-run (cointegration) relationship with coefficient of $(1, -1.3)$.

However, matters are different about the assumption of the validity of modelling SR on ER at least weak exogeneity is concerned.

TABLE 1**SR and ER SYSTEM** 1993 (3) to 1999 (5)

(2 lags and d93;d95,1;d95,4 and constant unrestricted)

λ_i	Ho:r=p	MAX λ_i			Tr		
0.222	p==0	18.88**	17.88*	14.1	22.6**	21.4**	15.4
0.048	p<=1	3.717	3.519	3.8	3.717	3.519	3.8

MAX λ_i is the maximum eigenvalue statistic ($-\text{Tln}\lambda_i$) and Tr is the Trace statistic ($-\text{Tln}\Sigma(1-\lambda_i)$) for each statistic the second column presents the adjusted by degree of freedom and the third the 95% (Osterwald-Lenum,1992)critical values (See Hendry and Doornik (1997)).

	α		β'	
			SR	ER
Δ SR	-0.072787	-0.053795	1.0000	-1.3032
Δ ER	0.26162	-0.041111	0.87400	1.0000

α is the matrix of standardized weight coefficients and β' the matrix of eigenvectors (cointegration vectors and their weights in bold)

LR test (r=1)Ho: $\alpha_1=0$; Chi²(1) = 0.68454 [0.4080]Ho: $\alpha_2=0$; Chi²(1) = 7.7462 [0.0054] **LR is the likelihood ratio statistics assuming rank =1

Given such long run relationship (one cointegration vector) we can evaluate which risk (or both) adjusts to the disequilibrium (the deviations from the long-run). LR statistics indicate that we cannot reject $\alpha_1=0$ (the weight for the cointegration relation in SR equation) whereas we can $\alpha_2=0$ (the weight for the cointegration relation in ER equation).

Therefore, evidence is consistent with a conditional model of ER adjusting to the deviation from the long run relationship between both risks. We can condition on SR and not the converse way. Normalising in this direction (a unit coefficient for ER), the equilibrium correction term becomes,

$$(6) \quad \Delta ER_t = -0.34 [ER_{t-1} - 0.77 SR_{t-1}]$$

This suggests that when the default risk increases 1%, devaluation risk increases 0.8% in “equilibrium” and it would be reached in about 3 months.

Several observations can be made. Firstly, the results obtained only indicate that -as far as the bivariate analysis is concerned- we can start modelling ER on SR (and not

in the other direction) for inference purposes. Forecasting is a different matter, here we considered only a necessary condition.

Secondly, can these results be due to an inappropriate measure of the devaluation risks? We tried a different definition: the spread between interest rate of saving deposits in the domestic banking system in pesos and dollars (for 30 day-deposits) denoted as DER. Although we have used more dummies variables (that reduce but not eliminate nonnormal residuals), the basic results still remain: one cointegration relationship and ER adjusting to disequilibrium. This can be seen in Table 2 (comparing with Table 1). For the spread on deposits the coefficient is somewhat smaller (1.06).

TABLE 2

SR and DER SYSTEM 1993 (3) to 1999 (5)

(2 lags and d95,1;d95,4; d95,6; d98,8; d98,9; d98,10 and constant unrestricted)

λ_i	Ho: r=p	MAX λ_i	Tr
0.191	p==0	15.29*	14.44* 14.1 18.5* 17.47* 15.4
0.043	p<=1	3.204	3.026 3.8 3.204 3.519 3.8

MAX λ_i is the maximum eigenvalue statistic ($-\text{Tln}\lambda_i$) and Tr is the Trace statistic ($-\text{Tln}\Sigma(1-\lambda_i)$) for each statistic the second column presents the adjusted by degree of freedom and the third the 95% (Osterwald-Lenum, 1992) critical values (See Hendry and Doornik (1997)).

	α	β'
		SR DER
Δ SR	0.0127 0.00063	1.0000 -1.0593
Δ DER	0.22172 0.00081	106.25 1.0000

α is the matrix of standardized weight coefficients and β' the matrix of eigenvectors (cointegration vectors and their weights in bold)

LR test (r=1)

Ho: $\alpha_1=0$; $\text{Chi}^2(1) = 0.90628 [0.3411]$

Ho: $\alpha_2=0$; $\text{Chi}^2(1) = 11.335 [0.0008] **$

LR is the likelihood ratio statistics assuming rank =1

Normalising on DER, the equilibrium term becomes,

(7) $\Delta\text{DER}_t = -0.23 [\text{DER}_{t-1} - 0.94 \text{SR}_{t-1}]$

In this case the adjustment is slightly slower, taking a bit more than 4 month.

Finally, a critical issue arises from this bivariate analysis: are the conclusion dependent on the particular information set used? This will be analysed in the following sections. Widening the number of variables seems desirable but at the same time the difficulties to interpret cointegration relationships in a larger system grows (see Juselius, 1994). This is particularly relevant in this case since there is no clear guide from economic theory as discussed in section 5. Therefore, we separately study the systems that result from adding the risk in the region and some indicators of domestic performance. The aim is to reconsider the effect of devaluation on default risk controlling for other determinants.

4. Adding Latin America risk

The first step to widen the information set but maintaining financial variables was motivated to answer: how much of these results are due that both spreads are reacting to global risk of emerging countries in the region? Are in the long run differences of Argentina and Latin America as a whole for investors? We analyse these issues including the aggregate Latin American default risk (LAR) to the previous one⁵. Results for the three-variable system (four lags are included since systems with shorter lags show residual autocorrelation) are presented in Table 3, normalising by ER which show further insights of the relationship.

Even in this case, only one long run relationship are obtained according to the eigenvalues statistics (at traditional significance levels). We test again the weights by LR statistics and -from them- conclude that only devaluation risk adjusts to the cointegration relationship taken into account the three variables. In addition we evaluate no effect of Latin America in the long run relation but it was rejected⁶.

TABLE 3**ER, SR and LAR SYSTEM** 1993 (3) to 1999 (5)

(2 lags and d93;d95,1;d95,4 and constant unrestricted)

λ_i	Ho:r=p	MAX λ_i			Tr		
0.318	p==0	28.01**	23.41*	21.0	41.96**	35.06**	29.7
0.147	p<=1	11.62	9.706	14.1	13.95	11.66	15.4
0.031	p<=2	2.332	1.949	3.8	2.332	1.949	3.8

MAX λ_i is the maximum eigenvalue statistic ($-\ln \lambda_i$) and Tr is the Trace statistic ($-\ln \sum (1-\lambda_i)$) for each statistic the second column presents the adjusted by degree of freedom and the third the 95% (Osterwald-Lenum, 1992) critical values (See Hendry and Doornik (1997)).

	α			β'		
				ER	SR	LAR
ΔER	-0.22232	-0.02799	-0.0003	1.0000	-2.4050	1.3805
ΔSR	0.08973	-0.00336	-0.0004	5.5707	1.0000	-4.2968
ΔLAR	-0.0238	0.002434	0.0005	114.99	85.253	1.0000

α is the matrix of standardized weight coefficients and β' the matrix of eigenvectors (cointegration vectors and their weights in bold)

LR test (r=1)Ho: $\alpha_1=0$; $\text{Chi}^2(1) = 7.3952$ [0.0065]**Ho: $\alpha_2=0$; $\text{Chi}^2(1) = 1.6721$ [0.1960]Ho: $\alpha_3=0$; $\text{Chi}^2(1) = 0.075033$ [0.7841]

LR is the likelihood ratio statistics assuming rank =1

To sum up both –Latin American and idiosyncratic argentine- default risks and devaluation risk enter in one cointegration relation. Equation (8) reports the equilibrium correction term. A reparameterisation of the cointegration vector (the relation in the long run) shows a more clear interpretation of the coefficient estimated,

$$(8) \Delta ER_t = -0.22 \{ER_{t-1} - [2.4 (SR - LAR)_{t-1} + 1.02 LAR_{t-1}]\}$$

We found a long run elasticity which differs depending on what default risks is: “country” specific or aggregate for the region: a 1% increase in the region risk implies the same increase in devaluation risk in equilibrium but “argentine” 1% is transmitted to devaluation spread as a 2,4% rise. The adjustment takes place in about 4 months and a half.

5. Indicators of macroeconomic performance

So far the study has concentrated on the “financial interactions”: devaluation risk and Argentine vis.a.vis. Latin American default risks. Other variables more related to real sector of the Argentine economy were included to see if they could explain the country-specific default risk and to evaluate weak exogeneity with the expanded data set. There are several difficulties to do so. One is that there is no economic theory -which in a partial equilibrium framework- derives the variables to include in the system. It is also difficult to link financial and real sectors. Only we can consider the effect of some indicators of macroeconomic performance, often analysed in practice. Even in this case, there are some problems related to data availability for a suitable period. We tried four of them: the stock of (liquid) foreign assets to money base (the ratio “backing” the “Convertibility” regime); the ratio of external debt to cumulative exports (in the last year); the (national government) deficit as percentage of GDP and public debt also as percentage of GDP. All these measures are rough approximations of what is attempted to capture and also few of them are available on monthly basis so, when necessary, we have ad hoc transformed the data to concentrate on the long run effects (see appendix 1)⁷.

Different systems incorporating such “country” indicators were evaluated. Two long run relationships were obtained for default risk net of that of Latin America (SRN) with the last two indicators from bivariate analysis. However, for larger systems only one cointegration vector can be detected. When the ratio of external debt to exports and government debt to GDP are put into one system the estimated coefficient of one of them shows the wrong sign. No effect of the other indicators can be observed at least from the long run perspective. Given that such indicators may be -in a way- substitutes one from each other (due to the large participation of public debt in the aggregate external debt) we focussed on the effect of public debt to GDP (in logs denoted as Govdebt). The other system also shows extremely nonnormal residuals, which a large set of dummies diminishes but does not eliminate⁸. Results are present in Table 4.

TABLE 4**SRN and Govdebt SYSTEM** 1993 (5) to 1999 (5)

(4 lags and d93; d95,1;d98,12 and constant unrestricted)

λ_i	Ho:r=p	MAX λ_i			Tr		
0.222	p==0	17.93*	15.97*	14.1	18.88*	16.81*	15.4
0.013	p<=1	0.95	0.85	3.8	0.95	0.85	3.8

MAX λ_i is the maximum eigenvalue statistic(-Tln λ_i)and Tr is the Trace statistic(-Tln $\Sigma(1-\lambda_i)$) for each statistic the second column presents the adjusted by degree of freedom and the third the 95% (Osterwald-Lenum,1992)critical values (See Hendry and Doornik (1997)).

	α		β'	
			SR	Govdebt
Δ SR	-0.22647	0.00222	1.0000	-0.025737
Δ Govdebt	-0.63179	-0.043512	0.64029	1.0000

α is the matrix of standardized weight coefficients and β' the matrix of eigenvectors (cointegration vectors and their weights in bold)

LR test (r=1)Ho: $\alpha_1=0$; Chi²(1) = 15.282 [0.0001]**Ho: $\alpha_2=0$; Chi²(1) = 2.6182 [0.1056]LR is the likelihood ratio statistics assuming rank =1

One cointegration relation is obtained from this system according to the eigenvalues statistics⁹. And only the net default risk seems to adjust to the long run deviation at traditional levels. In this case we can model net default risk on the ratio of public debt to GDP. The equilibrium correction term in this case is,

$$(9) \Delta SRN_t = -0.23 [SRN_{t-1} - 0.026 Govdebt_{t-1}]$$

In this long run relationship a 33% increase in the ratio (say from 0.30 to 0.40) supposes about 0.9 % in the default risk over that of Latin America (which was in the sample between -3% and 1%,as here measured). The adjustment takes about 4 month and a half.

The deviations from the last long run equation (the default risk and the ratio of public debt to GDP) are considered in the next section to evaluate the effect of devaluation risk on default risk taking into account a larger information set.

6. Testing the effect of devaluation on default risk in an expanded system

Either from a bivariate system or from one that also includes the default risk in the region as a whole, no effect of ER on SR can be detected. Can this result change when indicators of “country performance “ are taken into account? We considered this in a multivariate framework as proposed in Juselius (1994)¹⁰ who models inflation taking the deviation from equilibrium in different system (corresponding to different markets: money, labour and external). That is the approach is to concentrate on one of the equation of the VAR system (written as (4a)) but extended to jointly include different deviation of equilibrium -as well as the differences of the variables entering in each system- maintaining an I(0) form. We considered the equilibrium correction terms lagged one period and the differences of the risks four-lagged since four lags were used in the systems¹¹. We started from a “general” model, which also included different indicators. Despite they did not enter in the long run relationship, we also tried the other indicators (one-lagged): external assets over money base (first difference of logs) and national government deficit to GDP (level) (see appendix 2 for order of integration). However, they were either not significant or with the wrong sign. Two forms of evaluation were performed: firstly, using the (no net) default risk and secondly, the Latin American net one.

In the first case we tried for the financial variables both the deviation from the three variable systems and separated effects of Latin America and the devaluation risk (bivariate forms). After being insignificant the adjustment coefficient of the system with three variables we attempted to separate the effects from ER and LAR. In the case of ER we take the deviation from the bivariate system discussed in section 2 (normalised as in Table 1 and denoted as EqCSRER). For the effect of LAR we considered a bivariate system too (although it showed somewhat heteroskedastic residuals). One cointegration vector (1 -0.75) can also be supposed (from the eigenvalues statistics not reported)¹². This deviation is denoted as EqCLARER. They were included along with the deviation of the last section, EqCSRNGovdebt. Given the LR statistic of bivariate system and that of Table 3 the model was formulated conditioning on LAR (the difference is included contemporaneously, as in equation (5a)). After the simplification, the resulting equation is,

$$(10) \Delta SR_t = -0.00098 - 0.193 \text{ EqCSRLAR}_{t-1} + 0.053 \text{ EqCSRER}_{t-1} + 0.77\Delta LAR_t$$

(0.0011) (0.067) (0.029) (0.044)

$R^2=0.82$ $F(3, 68)=104.48$ [0.0000] $SER= 0.0044$ $DW = 1.94$
72 observations(1993,6 to 1999,5)

AR 1- 1	F(1, 67) =	0.0058957	[0.9390]
ARCH 1	F(1, 66) =	0.26793	[0.6065]
AR 1- 5	F(5, 63) =	0.63626	[0.6728]
ARCH 5	F(5, 58) =	1.2455	[0.2999]
Normality	Chi ² (2)=	5.9068	[0.0522]
Xi ²	F(6, 61) =	1.3046	[0.2688]
Xi*Xj	F(9, 58) =	1.0188	[0.4361]
RESET	F(1, 67) =	5.5814	[0.0211]
Reduc.	F(16, 52) =	1.6604	[0.0857]

where LM statistics of autocorrelation, heteroskedasticity (ARCH and square of regressors); Normality and Specification (RESET) statistics and the Wald statistic for valid reduction of variables (Reduc.) are reported (see Hendry and Doornik, 1996).

As can be observed, SR only reacts to the deviation from the long run relationship with LAR. No effect can be detected from the deviation of the equilibrium between SR and ER at traditional levels considering the expanded information set. Even the estimated coefficient shows the wrong sign to be interpreted as an equilibrium correction term, given the normalization chosen. We cannot conclude here nothing different from the previous analysis about the effect of the devaluation risk on default risk.

Then, the next step was to evaluate if the Latin American net default risk could react to ER taking in this case the deviation from the three variable system (analysed in Table 3) but normalised taking SR coefficient as 1. The simplified equation is,

$$(11) \Delta SRN_t = 0.0049 - 0.206 \text{EqCSRGovdebt}_{t-1} - 0.026 \text{EqCSRLARER}_{t-1}$$

$$(0.0013) \quad (0.058) \quad (0.071)$$

$$+0.230 \Delta SRN_{t-2} + 0.226 \Delta SRN_{t-3} - 0.14 \Delta ER_{t-1} - 0.023 d98,12$$

$$(0.113) \quad (0.110) \quad (0.050) \quad (0.005)$$

$R^2=0.414$ $F(6, 65)= 7.65[0.0000]$ $SER= 0.0043$ $DW = 1.73$
72 observations (1993,6 to 1999,5)

AR 1- 1 $F(1, 64) = 1.4743 [0.2291]$
ARCH 1 $F(1, 63) = 0.0296 [0.8640]$
AR 1- 5 $F(5, 60) = 0.31413 [0.9026]$
ARCH 5 $F(5, 55) = 0.29229 [0.9152]$
Normality $\text{Chi}^2(2)= 0.12867 [0.9377]$
 $\text{Xi}^2 \quad F(11, 53) = 1.3896 [0.2053]$
 $\text{Xi}*\text{Xj} \quad F(21, 43) = 1.3987 [0.1729]$
RESET $F(1, 64) = 0.0002692 [0.9870]$
Reduc. $F(6, 59) = 1.0662 [0.3930]$

Again, Argentine default risk only reacts to the disequilibrium term with the ratio of public debt to GDP and not to devaluation one, in spite of the extended set of variables considered. A lagged effect of the difference of the ER enters as part of the dynamics but with a negative sign.

Therefore, all the evidence suggests that devaluation risk (as obtained in section 3 and 4) adjusts to reach the equilibrium with the default risk. For the default risk, instead, the effect of the region risk can be supposed as its long run determinant. Once the default risk is free of this effect, the solvency of the government (measured as the

ratio of government debt to GDP) is the only factor that can be detected in the long run. The results of previous sections about weak exogeneity cannot be reversed in a multicointegration analysis at least taken into account the indicators of macroeconomic performance considered in this work.

7- Conclusions

This study considered the exogeneity of the devaluation risk for the default risk of Argentina, a critical question for the “dollarization debate”. The integrated nature of both series was taken into account to analyse the long run (cointegration) relationship and to evaluate “weak exogeneity” which is the appropriate concept to validate a conditional (one equation) model of the first given the second spread. Nothing can be inferred about it from the observed strong correlations.

The approach followed was to analyse cointegrating vectors systems starting from a bivariate one including both risks and then extending the information set. From this two-variable system a conditional model of devaluation on default risk, instead, can be found (rejecting the null of no adjustment to the deviation from the long run relationship for the first spread and not rejecting for the second). Then the effect of the aggregate default risk of Latin America was included to consider the common effects in the region. One cointegration vector was also detected for this three-variable system and again, the devaluation risk was the only variable that reacts to the disequilibrium. In this case the long run relationship can be interpreted as one between devaluation risk and the Latin American net default risk of Argentine, that is a “country specific” spread.

Next some -often used- indicators of macroeconomic performance was introduced in the analysis to investigate their relationship with this net default risk. Some both theoretical and data difficulties were discussed. However a long run relation can be present when a measure of government solvency (the ratio of public debt to GDP) is included. From this bivariate system, the results indicate that the Latin American net default risk adjusts to the deviation from such cointegration relationship.

Finally, the different equilibrium correction terms were reconsidered to analyse the effect of devaluation risk on default risk in a multicointegration framework. No other effects were detected and the same conclusions about no adjustment of the default to devaluation risks were maintained in the extended information set used in this work.

¹Besides the discussion in international organisations, several seminars and conferences in Argentina have been devoted to analyse the dollarization proposal, among others: at the National Academy of Science (published in 2000), Exchange Regime panel at University of La Plata (may 2000) and the brainstorming meeting at University Di Tella(may 2000). We would like to thank several suggestions during the latter seminar. We are also indebted to Fernando Navajas for insightful discussions.

²For a clarifying exposition of the concepts, in particular in relation to cointegrated systems see Ericsson (1994). This section is mainly based on his presentation.

³Note that for a VAR with more lags the write-hand side of equations (2) would include lagged differences apart from levels.

⁴Data for 1993 were included to have a longer period under analysis; also, no change in the slope can be perceived from visual inspection.

⁵We thank Federico Sturzenegger and Matias Gutierrez Girault for providing us this series.

⁶For all variables the null of no effect in the cointegration relationship is rejected.

⁷Just to mention two: how revenues from deposits of this assets abroad are allocated, only central government and transfers to the provinces but not their deficits are registered.

⁸The deviations of that system was also taken into account for the unrestricted analysis of the next section but the adjustment coefficient was either not significant or positive, indicating not "equilibrium correction".

⁹This system includes a dummy for December, 1998, the previous month to the Brazilian devaluation.

¹⁰Metin (1995) and Hendry (2000) also follow similar approaches.

¹¹For govdebt we use one-lagged four differences due it is on quarterly basis.

¹²Note that if this relationship is $I(0)$ then a vector (1 1) as the embodied in the definition of Latin American net default risk is $I(1)$.

Appendix 1: Data definitions and sources

Exchange Risk (ER): Computed from BOCON PRE2 (in dollars) and BOCON PRE1 (in pesos). Carta Economica (Estudio Broda).

Default Risk (SR): EMBI of Argentina. Carta Economica (Estudio Broda).

Exchange Risk from interest rate deposits (DER): Computed from interest rate of 30 – day deposits in dollars and pesos. Central Bank of Argentina.

Latin American Default Risk (LAR): Aggregate Index of Latin American EMBI (Business Department, Di Tella University).

Deficit / GDP (DEF/GDP). Statistical Appendix of Economic Ministry and F.I.E.L. *

Liquid Foreign Assets / Money Base (FASSET/MONEY). Statistical Appendix of Economic Ministry and Central Bank.

External Debt / Exports (EXTDEBT): Exports measured as average of last 12 month. Statistical Appendix of Economic Ministry and Carta Economica (Estudio Broda).

Public Debt/ GDP (GOVDEBT). Statistical Appendix of Economic Ministry. *

*Quarterly data repeated in each month of the corresponding quarter.

Appendix 2 Unit –Root Tests

Serie	ADF(j)
SR	ADF(2)=-1.759
ER	ADF(1)=-2.831
LAR	ADF(1)=-2.045
GOVDEBT	ADF(1)=-1.215
DEF/GDP	ADF(1)=-3.216*
EXTDEBT	ADF(2)=-2.606
FASSET/MONEY	ADF(1)=0.1742

All cases include the constant and j indicates the lags of the Augmented Dickey-Fuller (ADF) test.

*indicates significance at 5 per cent.

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