

Argentina in default: the renegotiation game

La crónica de la quita anunciada

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“Definió la negociación como un partido de póquer”, *La Nación* 10 December 2003, entrevista con Guillermo Calvo (Banco Interamericano de Desarrollo)

Abstract

High sovereign spreads on the Argentinean debt from 1998 onwards implied that creditors were aware of the risk that their dollar investment could be devalued. Now that the *Convertibilidad* has ended, an appropriate write-down has to be agreed. In Dubai, the Argentinean government proposed a 75% write-down – i.e. “pesification plus” as the peso now stand at a 66% discount to its value in 2001. The creditors are naturally hoping for a much smaller hit (so as to come out close to even, taking account of the high ex-ante sovereign spreads).

What does bargain theory suggest? Using the information implicit in these two offers, we use the alternating offers bargaining game of Rubinstein (1982) and find that (i) a simple “split-the-difference-rule” implies a 69% write-down and (ii) non-cooperative bargaining implies a 65% write-down, taking into account the high interest rate in Argentina and the currently favourable bargaining position that the country enjoys. To implement either of these outcomes however bargaining theory requires a credible threat of tough sanctions by creditors and international financial institutions. Perhaps this is what we are now observing?

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Introduction: Emerging market debt restructuring: ‘the renegotiation game’.

“The volume of claims eventually involved in work-out situations have also increased dramatically during the last decade. The current indebtedness of the state of Argentina [is equivalent to] the aggregate amount of so-called Brady Bonds issued in the aftermath in of the 1980s crisis.” Daniel Marx (2003b)

After a delay of more than a year and a half, the Argentine government announced its initial bargaining position in Dubai on September 2003 - a 75 % reduction in the face value of its debt. As an incentive for prompt negotiation, the proposal also involves non-accrual of interest from December 2001 to the settlement date (i.e. investors will suffer a penalty for delay). About of the third of the debt to be restructured is held by European citizens.

This is but the opening bid of what may be a protracted process of debt restructuring, as market sentiment backs a write-down of only 40%. Daniel Marx (2003a) argues that the main threat to successful restructuring is the action of “holdout” investors who refuse to participate in debt exchange offers in the expectation of collecting the full face value, possible by legal action to “attach” sovereign assets / payments¹. Already a well-known “vulture” fund has acquired distressed Argentinean bonds and is proceeding in the New York courts (Judge Thomas P. Griesa) to recover a 100% of their face value of \$700m. But the judge has so far put a stay on these vulture funds in order to allow for “good faith” bargaining to proceed.

Even when a settlement is finely agreed with the majority of creditors, there is a device that may be adopted by the Argentinean government to outwit the vultures. They could offer a bond swap with “exit-consents”, Bucheit and Gulati (2000). This permits existing bondholders who are willing to accept some write-down to block “holdouts”-- by restructuring the bonds they exit by introducing sovereign immunity from legal proceedings, for example. This “exit-consent” strategy should make it possible to implement a settlement.

But what will this settlement look like? We turn to Rubinstein’s model of alternating-offers to see what it predicts.

In the section that follows, we first indicate the government proposal in Dubai (as subsequently defined by Guillermo Nielsen in the “road-show”) and the key assumptions underlying it. There follows an account of the market’s counter-proposal. These two offers provided us with information in formulating the alternating-offers game in the second part of the paper.

¹ In a widely known case involving Peru, a holdout attached the cash intended for Brady bondholders. Currently the same strategy is using in the case of Nicaragua (although this is being challenged by the Belgian government).

SECTION I Restructuring Argentinean debt

(Tables and quotations below are taken from Ministry of Economy and Production, 2003).

1.1. The Government's economic projections

If public debt now standing at 150% of GDP can be reduced to a sustainable level, the government reckons that the economy should be able to grow at 4% per annum without much inflation and to generate a primary surplus of 3% per annum. Though the creditors would like a larger surplus, the IMF has indicated that 3% is acceptable. Defining debt sustainability is not easy. In the Maastricht Treaty the fiscal conditions applying to would-be entrants to the European Monetary Union were based on a medium term target of 60% for the Debt/ GDP ratio. Since emerging market countries are subject to much greater volatility in interest rates and in their terms of trade, a smaller figure is called for: Fischer(2002) has suggested 40%, the figure that the Argentine Government has apparently adopted as "internationally accepted".

Public Debt as a % of GDP: w/o restr.	160% (2003) -> 300% (204/5)
with restr.	-> 40% (204/5)
Fiscal Primary surplus as % of GDP	3% (2004-2006)
GDP real growth rate	4% (2004-2006)
RER (using CPI index 2001=1)	2.06 (2003) -> 1.69 (2006)

Table 1 Government projections for the economy

1.2. The restructuring proposal of the Argentine government

The key to the Argentine offer is as follows:

"The menu of options will be designed to produce an over-all reduction of 75% of nominal stock of eligible debt. These restructuring guidelines contemplate the non-accrual of interest from December 2001 to settlement date."

The stock of eligible debt is defined as excluding holdings by multilaterals and to compulsory holdings of various domestic creditors who have already been subjected to haircuts. These debts are to be honoured in full once settlement is achieved.

Structure for the negotiation:

Global Coordinator: Republic of Argentina (ROA)

• Syndicate of Banks

Invitation to leading financial institutions in emerging markets placements to join syndicate and select Regional Managing Banks (RMB)

Next steps:

- End-October 2003 : banks to submit proposals
- Mid-November 2003: ROA chooses RMBs
- ROA+RMBs Select with the placement banks
- Definition of the terms of Restructuring Proposal
- Filings and regulatory approvals,

- Launching of the Offer,
- Implementation of the swap.

Debt to be restructured (57.9% of the total debt)

Public Debt Stock

Estimate of the Debt Stock at End-2003 (USD Billion)

	Principal Value (Residual FV and Arrears on Principal)	PDI's	Total	%
DEBT TO BE RESTRUCTURED				
Eligible Debt (Bonds) *	81,2	18,2	99,4	53,7%
Bilaterals	4,9	0,4	5,3	2,8%
Commercial Banks	1,6	0,1	1,8	1,0%
Other Creditors	0,3	0,0	0,3	0,2%
Subtotal	88,0	18,7	106,7	57,6%
EXCLUDED DEBT				
National Guaranteed Loans	14,6	0,0	14,6	7,9%
Provincial Guaranteed Bond	10,0	0,0	10,0	5,4%
BODENs	20,6	0,0	20,6	11,1%
IFIs	30,8	0,0	30,8	16,6%
Others	2,5	0,0	2,5	1,4%
Subtotal	78,5	0,0	78,5	42,4%
TOTAL	166,5	18,7	185,2	100,0%

Table 1: Official estimate of debt to be restructured.

Breakdown by governing law:

New York: 51% England: 18% Germany 17 % Arg: 11% ..

Geographical Distribution:

Arg: 39% Italy: 16% Switzerland: 10 % US: 9% Germany: 5%

bonds: 152

Implementing the write down

“A variety of types of new bonds will be issued:

1. “Discount” bonds, with face value reduction
2. “Par” bonds, with no reduction of face value, or bonds with a small reduction, but comparatively lower coupons and longer maturities
3. Also, Capitalization Bonds (“C Bonds”) may be issued

Variants of all bonds above with a lower base coupon and with a premium that depends on the GDP growth may be offered”

“Based on the previous guidelines, and taking into consideration the input from the CWG, the Republic and the RMB, will jointly define: Coupon, Maturities and equivalence of all new bonds”

Type of Bond	Principal reduction (*)	Type of interest rates	Range of Interest rates	Average Life	Currencies
Discount bond	75%	step up	1-5%	8 - 32 years	Options available as explained before
Par Bond	0%	Fixed	0,5 - 1,5%	20 - 42 years	
QuasiPar Bond	30%	Fixed	1 - 2%	20 - 42 years	

Table 2: Implementing the write down: three different types of bond on offer

1.3. Reactions from the market

Some quotations from Euroweek(26.9.2003 Issue 822):

“This offer is scandalous.” Rome consumer association.

“It is going to force a lot of bondholders to consider their options.” Portfolio manager New York.

“If you only need to get a small primary surplus, you are paying nothing on your debt right now and you won’t pay past due interest, what is your incentive to restructure your debt?” New York banker.

Creditor Claims in the New York Courts:

The Government expresses the hope that recourse to courts may be avoided: “Litigation is not a superior means, solution should be reached through negotiations.” Nevertheless, the Dart family are suing to collect full face value on \$700m worth of bonds (and others are doing the same). In the initial judgement, Argentina was awarded a 45 day stay: and subsequently the Judge imposed a 90 day stay on litigation i.e. until the end of January 2004. But to continue this stay Argentina has to show that it is participating in negotiating in good faith. This presumably precludes the unilateral strategy of leaving the Dubai offer on the table on a take-it-or-leave-it basis.

What settlement will these negotiations lead to? Before seeing what game theory might imply, we indicate various estimates of the write-down:

	Recovery Rate	Write-down
Dubai proposal	\$0.25	75%
Creditors assessment of the Argentinean proposal	\$.15 - \$.20	80%-85%
Creditors response		
Current market price (Global 08)	\$.28 - \$.29	70%
D. Marx's ex-ante assessment		35%

Table 4: Some estimates of the write down

SECTION 2. The renegotiation game: alternating-offers by Government and bondholders.

We adopt the Rubinstein(1982) two-person, alternating-offers approach to analyse the current debt negotiations between the bondholders and the Argentine government. As there are hundred and fifty-two different types of bonds and more than two hundred thousand bondholders, this is clearly a gross simplification: nevertheless, it may capture some of the strategic factors at play. Assuming full information with common knowledge of payoffs, options, etc., we look for subgame perfect equilibria (SPE) in the presence of the various options available to the debtor. (We intend to consider the asymmetric information case later.)

For present purposes, we follow Bulow and Rogoff (1989) in describing the game as one where debtor and creditor make alternating offers for shares of a pie which consists of a fraction of GDP, see also Obstfeld and Rogoff (1996)². In Dubai, for example, Argentina made an offer of 3% of its GDP to be used for debt service. Given the precommitment that multilateral creditors and holders of newly issued bonds be repaid in full (see table above), this implied³ a **figure of only 0.8% of GDP available to service restructured debt**. Precommitting to paying almost 60% of creditors in full is a key strategic decision; and it has in fact been challenged by some creditors. In what follows, however, we take it to be fully credible and use the alternating-offers approach to determine the division of the pie that remains for creditors holding restructured debt.

We interpret the Dubai proposal as offering a little under 1% of GDP to creditors facing restructuring. But this was presumably something in the nature of an opening offer not an estimate of the pie to be divided, defined as the capitalised value of the gain available to Argentina by acting in good faith towards the creditors –*either* by remaining current with its debt service *or* by bargaining actively to renegotiate the debt. This gain includes the benefits of access to funding from the World Bank for infrastructure reform and to IMF liquidity support, for example and possibly access to private FDI ; in short, it includes all the funding opportunities which would be denied to Argentina if the government simply refuses to negotiate or pay. How can this flow be estimated?

We can get an idea from the creditors' response to the opening bid by the Argentine government in Dubai. Assuming that creditors ask for the maximum they can expect receive provides a crude estimate of the annual flow available, namely 2% of Argentine GDP.

[This estimate is obtained as follows: the Argentine opening bid of 0.8% of GDP which was said to correspond approximately to 25% of the face value. Given that the creditors' counter-offer was aimed to achieve a recovery rate of 60% of the face value, the flow value of the creditors offer is $0.8 \times (60 / 25) = 1.9\%$, i.e. **approximately 2% of Argentine GDP**.] In order to use the Rubinstein full information results, we

² The key features of their application are that (i) the amount of debt outstanding is largely irrelevant to the outcome, (ii) the outcome depends mainly what sanctions the creditors can apply to the debtor

³ Given that the latter constituted 40% of total debt this implied an average write down of 45% of the total debt, but a 75% write down for other bondholders.

treat these opening bids as preplay “cheap talk”. (In fact determining the size of the cake is, maybe, part of negotiations under uncertainty.)

A first shot at the division of the pie

How is this pie to be divided? This depends crucially on the options that available to Argentinean government, Muthoo(1999). We begin by assuming that, in the absence of agreement in any period, Argentina has the option of paying no interest while sacrificing *all* access to the funding opportunities described above *or* the (inside) option of continuing negotiations with *restricted* access to funding due to sanctions being applied. What outcomes do these options imply?

The prospective division of the pie is shown in Figure 1, where the pie is measured as 1, and the origin represents the disagreement payoff of both players. The share accruing to Argentina (U_{Arg}) is plotted on the horizontal axis, the share accruing to creditors (the flow of debt service) on the vertical axis as U_C .

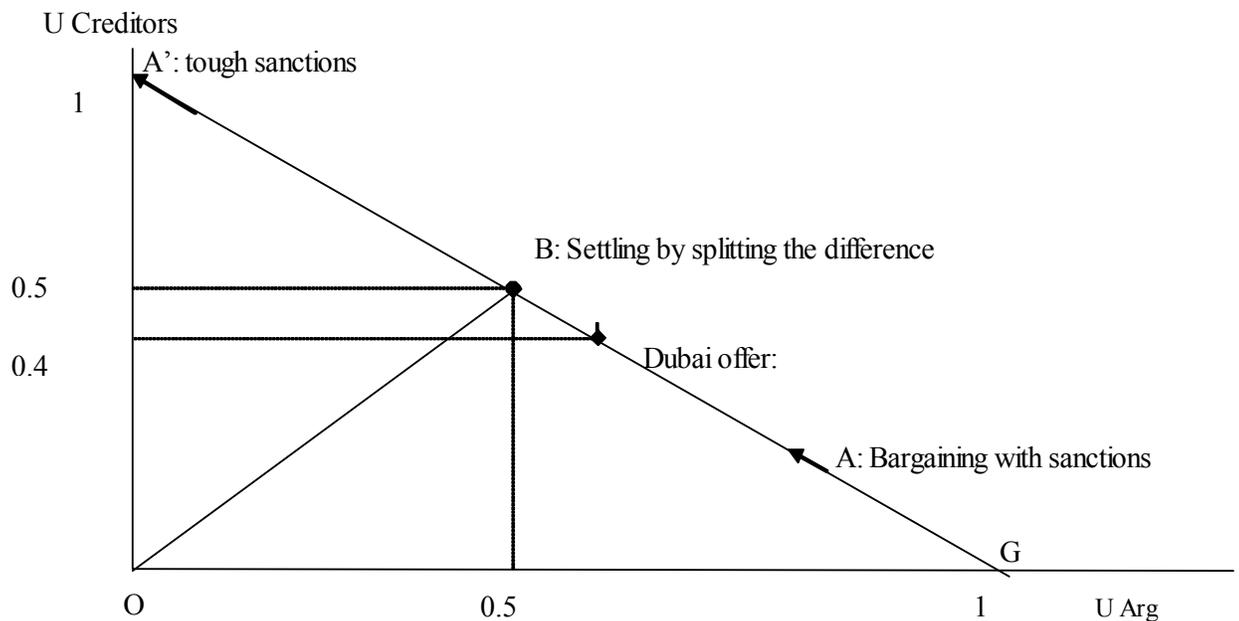


Figure 1: "Splitting the difference"

a. Continued negotiation: the current state of play

No agreement has yet been reached, Argentina is negotiating in good faith, paying no interest on debt and suffering little by way of sanctions .i.e. sanctions are close to zero. We represent the current state of play at point A in the figure (where for convenience legal cost borne by the creditors is assumed to be very small, as in Muthoo (1999,p145).

b. Possible settlement:

If there is to be a settlement what will it be? On the assumption both creditors and debtor are equally impatient, the settlement would be to “split the difference” , i.e. divide the pie in half , so private creditors would in this case receive 1% of Argentinean GDP. This outcome is shown as point B in the figure. But note that for this settlement to be implemented, sanctions have to credibly threaten the debtor with losses of at least 2% of GDP.

Will settlement be reached?

If sanctions remain at their current low level forever, it is clear that bargaining rather than settling is the predicted outcome, i.e. this simple application of game theory predicts that Argentina will never pay anything to the creditors and will only pay its lawyers Cleary, Gottlieb, Steen and Hamilton in New York to hold the vultures at bay! Is this credible?

The main reason to doubt that this is a sustainable equilibrium is that it involves deliberate non-payment of funds that have already been declared as available for the purpose in Argentina’s initial offer. Persistent delay in reaching a settlement will surely lead the New York courts to revise their view that Argentina is bargaining in good faith. This will free the vultures to claim their payments of full value from funds belonging to Argentina in NY and London; which might be interpreted to include IMF disbursements to the Argentine government. (If the IMF were to try to avoid this, there could even be efforts to sue the IMF for aiding and abetting non-payment by debtors.) And once other creditors see the vultures succeed they could adopt the same strategy. In short, the equilibrium involves a deliberate flaunting of the power of New York courts to protect the rights of the creditor⁴.

These considerations lead us to believe that *the harshness of the sanctions can and will be increased sufficiently to enforce a settlement*, i.e. Argentina will be credibly threatened with transferring at least 2% of GDP to its creditors. (In the figure, this involves moving the payoff on the sanctions from point A up the line GG’ until it reaches or passes the vertical axis). How any settlement is to be implemented is another issue: the answer may well lie in the use of “exit consent swaps described above – possibly using two-stage swaps in the manner described by J.P.Morgan

⁴ A legal judgement that the debtors were not bargaining in good faith, would put the IMF and World Bank under great pressure to cease the policy of ‘lending into arrears’, a factor we consider further below.

(2002). It is interesting to note that Lee Bucheit, one of the pioneers in designing and using this legal device, also works for Gottlieb, Steen and Hamilton.

Given the prospect of harsh penalties, therefore, the preliminary prediction would be a settlement in which the creditors will about 1.0% of Argentinean GDP, a small increase on the Dubai offer of 0.8% GDP. This also happens to be the outcome of a Nash cooperative bargain with equal power between creditor and debtor, Muthoo(1999).

A refined prediction

We now indicate how the calculation can be revised to allow two key features of the bargaining situation not yet incorporated, namely Argentina's "relative impatience" and the enhanced "inside option" which we believe Argentina currently enjoys.

Argentina impatient

The fact that Argentina uses a high real discount rate in its debt calculations suggests that the debtor may well be more impatient than the creditor. In the Rubinstein game, such "impatience" leads to a smaller share of the pie. If the discount rate relevant for the debtor is one and a half times that of the creditor, assumed to be 4%⁵, then the slope of the line giving the division of the pie increases to 1.5:1. Dividing the payoffs in these proportions implies a share of sixty percent of the pie for the creditor, i.e. a settlement of worth about one and one sixth of a percent of Argentine GDP, an increase of almost a half over the Dubai offer.

But in the light of the currently favourable situation, where Argentina is not paying interest and is suffering relatively little disruption of trade or creditor sanctions, this is probably an overprediction.

Evaluating the inside option

"En las ultimas semanas los acreedores emprendieron gestiones tendientes a influir sobre el F.M.I., para que éste a su vez presione a la Argentina para que acelere los tiempos de la salida del default" *Clarín* 15 December 2003.

To capture the current state of play, one needs to acknowledge that Argentina is able to consume most of the pie even as it bargains over the final division!

In a recent paper, Kohlscheen and O'Connell (2003) have demonstrated how the imposition of credit restrictions can increase the bargaining power of the creditors, and they calculate how this will affect the equilibrium settlement. For current purposes, we assume that, while the negotiations continue, Argentina does suffer some loss due to financial restrictions imposed by the creditors. But, we assume that otherwise Argentina enjoys all the benefits of trade and finance despite being in

⁵ Note that the discrepancy of real interest rates may be even greater, as real rates indexed government debt in the UK and the US are currently closer to 2%.

default. Specifically, we assume that the credit restrictions involve a loss of only a quarter of the 2% of G.D.P. which we are using as a measure of the gains from trade. Thus Argentina is in the attractive position of enjoying most of the gains of trade while renegotiating its debt and paying no interest. (Technically, allowance should be made for an enhanced Inside Option available to the debtor.)

While the current state of play may be highly favourable to the debtor, it is not likely to remain so for long. Specifically, the IMF may well have to cease its policy of “lending into arrears” if the New York courts revise their views that Argentina is bargaining in good faith; and in any case the IMF is now under increasing pressure to get Argentina to settle. In other words, it appears that Argentina is currently enjoying a “grace period” which will probably end by the middle of 2004. (Technically the Inside Option is dated.)

	Argentine impatience (relative to Creditors)	
	$r_A = r_C = 0.05$	$r_A = 1.5r_C = 0.06$
No Inside Option	0.5	0.60
Permanent Inside Option	0.12	0.14
Three Period Inside Option*	0.48	0.58

* $\varepsilon - \gamma = 0.75$

Table 5: Argentine Impatience and its Inside Option:
calibrating the creditor’s share of the pie

Using the formulae in Appendix 2 we obtain the results shown in table 5 above. While the first row shows how “impatience” on the part of the debtor increases the share of the pie going to the creditor, the next two rows show the offsetting effect of the

attractive bargaining position currently enjoyed by Argentina. Assuming that it were to last for ever, the second line shows that debtor would be forced to settle for only about a sixth of the pie, much less than the Dubai offer. (This is presumably what the above-cited New York banker was getting at when he complained that Argentina had no incentive to settle.)

When the “grace period” only lasts three quarters – after which the division of the pie reverts to that shown in the top row – the bargaining position of the debtor is not much enhanced: as the entry in the bottom right hand corner shows the creditors share of the pie in a settlement is not far short of two thirds – 0.58 to be precise.

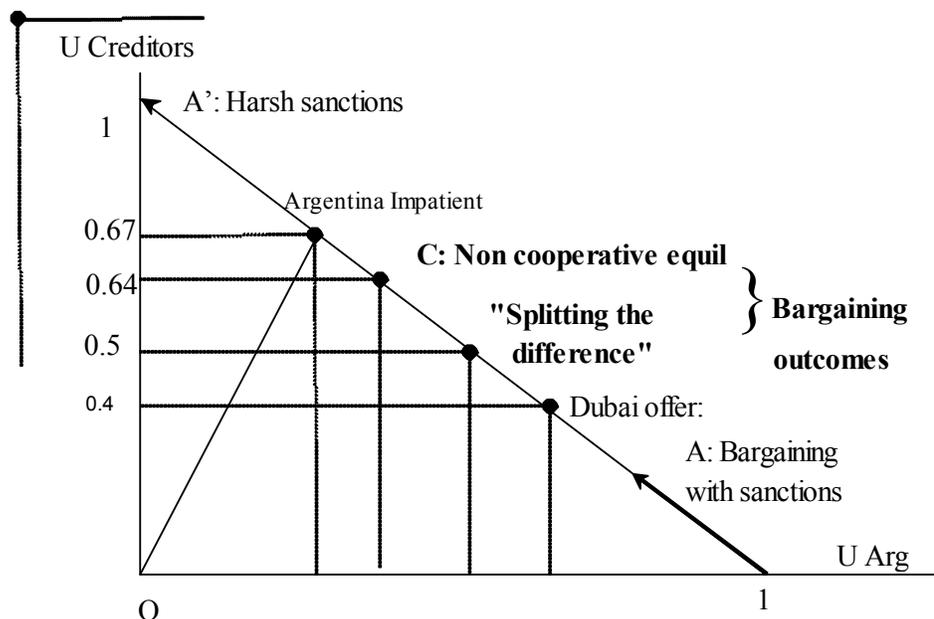


Figure 2: Bargaining outcomes with Argentine impatience and temporary inside options

The new inside option makes settling more favourable to Argentina, as indicated by point C in the figure, where the settlement payout⁶ has fallen to 1.34% of Argentine GDP. While the current level of sanctions is not sufficient to enforce the settlement, the comments above suggest that settlement will nevertheless be achieved.

Our revised prediction, assuming the credible threat of harsh sanctions, is that there will be a settlement in which the creditors will get 1.12% of GDP - a write-down of 65% of the face value. This settlement reflects the balance between the

⁶ Note that ignoring Argentine impatience and “splitting the difference” would involve paying only about 1% of the GDP to the creditors, quite close to the Dubai offer.

favourable inside option currently enjoyed by Argentina and the relatively greater patience of the creditors. It involves

The renegotiation game – a summary

We bring the various elements of the bargaining together in Table 6, which shows what any given share of the pie for the creditors' means in terms of their claim on Argentine GDP (line 2), in terms of the 'Recovery Rate' on their investment (line 3), and finally in terms of the 'write-down' (bottom line).

In column 1, the Argentine offer at Dubai is denoted as "Pesification Plus", since a write down of 75% is rather more than simple pesification (when the peso is trading at approximately three to the US dollar). The label captures the idea that the offer is an attempt to reduce the value of debt relative to GDP measured in pesos.

In the last column is the creditors response - to limit their losses to about 40% and achieve a Recovery Rate of 60%; which we have taken to be the size of the pie (i.e. the creditors go for as much as they think is feasible). When account is taken of the high interest rates paid on dollar debt ever since September 1998, however investor losses will be a lot less. With this recovery rate, investors who rolled over their investments at the sovereign spread since late in 1998 should not be far from breaking even - i.e. they will have gambled without significant loss!

	Dubai offer "Pesification plus"	"Splitting the difference"	Non cooperative bargaining	Creditors' Response
Creditors fraction of the "pie"	0.4	0.5	0.58	1.0
Creditors annual claim on Argentine G.D.P.	0.8 %	1.0%	1.16 %	2%
Recovery rate (percentage of face value)	25%	31%	35%	63%
Percentage write down (quita de la deuda)	75%	69%	65%	37%

Memo item: depreciation of peso 66% since leaving the peg

Table 6: The renegotiation game

The outcomes we derive in this paper lie somewhere between these two. First, in column 2, is the result of “Splitting the Difference”, i.e. dividing the pie down the middle. (This would be the outcome of a cooperative Nash bargain where bargaining power was equally divided, Muthoo(2000).) The write-down in this case, namely 69%, is very close to the pesification: so private investors who bought pesos paying high sovereign spreads bear the consequences of the peso leaving its dollar peg – no more, no less. To finance this settlement would involve creditors getting more than in the Dubai offer, but the increase is only 1/5 of one percentage point of GDP (from 0.8 to 1% of GDP).

Finally, in column 3, is the outcome of non-cooperative bargaining taking into account both the different rates of discount used by creditor and debtor - where the debtor is penalized for impatience – and the temporarily favourable bargaining position enjoyed by Argentina (what we refer to as a “grace period” , assumed to last 9 months). The write-down of 65% is a little less than full pesification, and involves a significant increase in the transfer to private creditors relative to the Dubai offer – an increase of one third of one percent of GDP. It is important to note that in deriving this outcome we assume that Argentina’s bargaining position deteriorates significantly as time passes. Effectively creditors and the International Financial Institutions need to have a credible threat of imposing significant sanctions on Argentina if it fails to settle: these would presumably include denial of trade credit, permission for creditors to attach sovereign assets, no lending into arrears by the IMF, World Bank and the IADB. Why would the courts, the creditors and the International Financial Institutions be motivated to apply such sanctions? Because , if not , the outcome of negotiations will be much more favourable to Argentina than its initial Dubai offer!

Several cautionary remarks are in order. First that these calculations are sensitive to the assumptions made, particularly on the size of the pie, and on the ratio of discount factors, i.e. different outcomes are consistent with the same bargaining theory by varying these assumptions. Second that the Rubinstein bargaining game predicts an efficient outcome where there is no avoidable loss of output, and it predicts immediate settlement: real time bargaining time may lead to significant losses as the example of labour strikes makes clear. (We hope to take into account some of these factors as described in the appendix .)

Perhaps the biggest caveat of all is that the Rubinstein framework is a two person game where there are no problems of creditor coordination. In practice there will be enormous problems given the number and heterogeneity of creditors in this case: it will take a lot of legal ingenuity and goodwill to implement any settlement given the presence of ‘hold out creditors’, Marx (2003a,b). It was to help resolve this issue that the IMF proposed its Sovereign Debt Restructuring Mechanism. This proposal found little favour in Latin America, and even less in the US. So restructuring Argentine debt, both in terms of the principles used to resolve conflict and the techniques used to implement a settlement, must be carried out without the help of anything resembling an International Bankruptcy Court.

3 Conclusions (Tentative)

High sovereign spreads on the Argentinean debt from 1998 onwards implied that creditors were aware of the risk that their dollar investment could be devalued. Now that the *Convertibilidad* has ended, an appropriate write-down has to be agreed. In Dubai, the Argentinean government proposed a 75% write-down – i.e. “pesification plus” as the peso now stand at a 66% discount to its value in 2001. The creditors are naturally hoping for a much smaller hit (so as to come out close to even, taking account of the high ex-ante sovereign spreads).

Using the information implicit in these two offers, and using the alternating offers bargaining game of Rubinstein (1982), we find that (i) a simple “split-the-difference-rule” implies a 69% write-down and (ii) non-cooperative bargaining implies a 65% write-down, taking into account the high interest rate in Argentina and the currently favourable bargaining position that the country enjoys. To implement either of these outcomes bargaining theory requires a credible threat of tough sanctions by creditors and international financial institutions. These estimates are surrounded with considerable uncertainty, however, as discussed above.

There is an obvious risk that over-zealous creditors could push Argentina back into recession. How can one try to insure that Argentina gets a “fresh start”? One interesting proposal is to make creditors payoffs income contingent, Burstein (200x). If half of the creditors’ settlement (of about one percent of GDP) was denominated in bonds and half in GDP linked securities, for example, this would avoid the downside risk for the debtor and give creditors a call option on future economic growth in Argentina. Could this be the shape of the final outcome?.

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Appendices

Appendix 1: Dividing the pie

1 (a) Notation

We use the notation:

g_i : IOprofit

Δ : time between offers

ε : legal cost

s : Sanctions

x_i : Payment received by player i

x_i^* : Payment received by player i in SPE

1 (b) “Splitting the Difference”

Following Muthoo(1999,p145) we calculate:

Inside option profit (as annual flow)

$$g_{Arg}, g_{cred} = \begin{cases} (0, 0) & s > 2\%GDP \\ (2\%GDP - s, s - \varepsilon) & s \leq 2\%GDP \end{cases}$$

Assuming $r_{Arg} = r_{cred}$, and $\varepsilon \rightarrow 0$

Thus the SPE is that, with harsh sanctions, settlement is reached immediately and Argentina will agree to pay 1.5% GDP; otherwise there will no agreement and Argentina will live with the sanctions.

$$(x_{Arg}^*, x_{Cred}^*) = \begin{cases} (1\%GDP, 1\%GDP) & s > 2\%GDP \\ 2\%GDP - s, s & s \leq 2\%GDP \end{cases}$$

These formal outcomes are illustrated in the text.

1 (c) Differences in Impatience

Following Muthoo (1999) we model the inside option profit (as an annual flow) as:

$$g_{Arg}, g_{cred} = \begin{cases} (0, 0) & s > 2\%GDP \\ (2\%GDP - s, s - \varepsilon) & s \leq 2\%GDP \end{cases}$$

assuming that $r_{Arg} = 8\%$, $r_{cred} = 4\%$, $\Delta \rightarrow 0$, and $\varepsilon \rightarrow 0$.

Thus the SPE is that, with harsh sanctions, settlement is reached immediately and Argentina will agree to pay 1.3% GDP; otherwise, there will no agreement and Argentina will live with the sanctions.

$$(x_{Arg}^*, x_{Cred}^*) = \begin{cases} (0.67\%GDP, 1.33\%GDP) & s > 2\%GDP \\ 2\%GDP - s, s & s \leq 2\%GDP \end{cases}$$

Appendix (2) Evaluating the dated inside option

2 (a) The notation.

$x_A(t)$, Argentina's offer to Creditors at time t .

$x_C(t)$, Creditors' residual when they make an offer to Argentina

r_A , Argentina's interest rate

r_C , Creditors' interest rate

δ_A , Argentina's discount factor

δ_C , Creditors discount factor

$r_A \varepsilon$, per period benefit to Argentina of negotiating without losing benefits of trade

$r_A \gamma$, per period cost to Argentina of the disruption of trade credit

0 , Argentina's outside option when She or Creditors offer

0 , Creditors' outside option when They or Argentina offer

z , final Creditors' pay off when time of negotiation has expired

$1-z$, final Argentina's pay off when time of negotiation has expired

$$x_A(t) = \max[0; \delta_C \cdot x_C(t+1)] \quad (1)$$

$$x_C(t) = \max\left[0; 1 - \left(\delta_A \cdot (1 - x_A(t+1)) + r_A \varepsilon - r_A \gamma\right)\right] \quad (2)$$

2(b) Analytical results when Argentina makes the first offer.

Using equation (1) and equation (2) one obtains a second order difference equation:

$$x_A(t) = \max\left[0; \delta_C \cdot \max\left[0; 1 - \left(\delta_A \cdot (1 - x_A(t+2)) + r_A \varepsilon - r_A \gamma\right)\right]\right].$$

If parameters are such that no outside option is chosen, this equation reduces to:

$$x_A(t) = \delta_C \cdot (1 - \delta_A - r_A \cdot \varepsilon + r_A \cdot \gamma) + \delta_C \cdot \delta_A \cdot x_A(t+2).$$

If negotiation continues until T , the solution of the latter equation is:

$$x_A(t) = \delta_C \cdot (1 - \delta_A - r_A \cdot \varepsilon + r_A \cdot \gamma) \cdot \frac{1 - (\delta_C \cdot \delta_A)^T}{1 - \delta_C \cdot \delta_A} + (\delta_C \cdot \delta_A)^T \cdot x_A(t+2.T).$$

If $T \rightarrow \infty$, then (because $x_A(t+2.T)$ is a fixed number between 0 and 1):

$$\lim_{T \rightarrow \infty} x_A(t) = \delta_C \cdot (1 - \delta_A - r_A \cdot \varepsilon + r_A \cdot \gamma) \cdot \frac{1}{1 - \delta_C \cdot \delta_A}$$

If there are three negotiations and no agreement until $t=3$, and the the game ends with a payoff of z to Creditors and a pay off of $l-z$ to Argentina, then:

$$x_A(0) = \delta_C \cdot (1 - \delta_A - r_A \cdot \varepsilon + r_A \cdot \gamma) + \delta_C^2 \cdot \delta_A \cdot z.$$

2 (c) Analytical results when Creditors make the first offer.

Using equation (1) and equation (2) it's possible to obtain a second order difference equation:

$$x_C(t) = \max \left[0; 1 - \left(\delta_A \cdot (1 - \max [0; \delta_C \cdot x_C(t+2)]) \right) + r_A \cdot \varepsilon - r_A \cdot \gamma \right]$$

If parameters are such that no repudiation is chosen, this equation reduces to:

$$x_C(t) = 1 - \delta_A - r_A \cdot \varepsilon + r_A \cdot \gamma + \delta_C \cdot \delta_A \cdot x_C(t+2)$$

If negotiation continues until T , the solution of the latter equation is:

$$x_C(t) = (1 - \delta_A - r_A \cdot \varepsilon + r_A \cdot \gamma) \cdot \frac{1 - (\delta_C \cdot \delta_A)^T}{1 - \delta_C \cdot \delta_A} + (\delta_C \cdot \delta_A)^T \cdot x_C(t+2.T)$$

If $T \rightarrow \infty$, then (because $x_C(t+2.T)$ is a fixed number between 0 and 1):

$$\lim_{T \rightarrow \infty} x_C(t) = (1 - \delta_A - r_A \cdot \varepsilon + r_A \cdot \gamma) \cdot \frac{1}{1 - \delta_C \cdot \delta_A}$$

If there are three negotiations and no agreement until $t=3$, when the game ends with a payoff of z to Creditors and a pay off of $l-z$ to Argentina, then:

Appendix 3: Extensions, modifications, etc.

3 (a) Commitment tactics

How credible is the tactic of Argentina to commit most of the 3% of GDP allocated for debt service to the benefit of the IFIs and other “excluded” debtholders?

Private investors have proposed widening the debt to be restructured and so reduce the write-down they face (IAMC, 2003): and the Argentine government itself has a is itself throwing doubt on this precommitment by arguing that the IFIs ese pritself Would the Elliot case against Peru. provide a mechanism for undoing the precommitment made by the Argentinean government? Those included could claim *pari-passu* with those excluded from restructuring. If so, efforts by the Belgian government to reverse the Elliot case could prove crucial.

3(b) Three-way bargaining.

Bulow and Rogoff(1998) have emphasised participation of *other players* in the game, as has Bhattacharya. Should we interpret the end of the inside option in this way? i.e. the IMF takes action in the game if it believes that negotiation are not making sufficient progress.

3 (d) Other aspects to include:

- a. Risk of breakdown
- b. Asymmetric information.
- c. stochastic evolution of pie.