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Haircuts: Estimating investor losses in sovereign debt restructurings, 1998–2005

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Abstract

We calculate investor losses (''haircuts'') and recovery values in recent debt restructurings in Russia, Ukraine, Pakistan, Ecuador, Argentina, and Uruguay. Haircuts are computed as the percentage difference between the present values of old and new instruments, discounted at the yield prevailing immediately after the exchange. Recovery value means value received in terms of outstanding principal. We find average NPV haircuts ranging from 13% (Uruguay external exchange) to 73% (2005 Argentina exchange); recovery values range from 30% to about 75%. We also find within-exchange variations in haircuts and recovery values, depending on the bond tendered. With a few exceptions, domestic residents do not appear to have been treated systematically better (or worse) than foreign residents.

JEL classification: F34

Keywords: Sovereign debt; Debt restructuring; Financial crises; Recovery values

1. Introduction

This paper calculates investor losses – or ''haircuts'', in market parlance – associated with the generation of sovereign debt restructurings that started with Russia's 1998 default and ended with the 2005 Argentina external debt exchange. We examine both a number of well-known

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exchanges involving mostly nonresident creditors and externally issued debt, and several domestic debt restructurings. The former include bond exchanges conducted by Pakistan, Russia, Ukraine, Ecuador, Uruguay and Argentina between late 1999 and early 2005. The latter include the 1999 Russian GKO/OFZ restructuring; the restructurings of Ukraine's debt during 1998 and 1999; the November 2001 "Phase 1" exchange of Argentine bonds; the 2002 "*pesification*" of Argentine debt; and the portion of the May 2003 Uruguayan bond exchange that dealt with domestic issues.

Understanding how much investors lost as a result of the exchanges and what proportion of the original principal they were able to recover is important for several reasons. First, assumptions about recovery values figure implicitly or explicitly in both bond pricing models and in the minds of many investors. They are also often imposed in order to "back out" default probabilities from observed bond prices. Second, the extent to which private creditors suffered losses in recent debt restructurings is an important input in the policy debate on how debt crises should be resolved, and whether the current framework for doing so is appropriate or not. On the one hand, a debt restructuring that is perceived as letting private creditors off too easily may raise concerns about "investor moral hazard", if it occurs in the context of official crisis lending or official debt forgiveness (as was the case for most of the restructurings studied in this paper). On the other hand, a restructuring that involves high investor losses may raise concerns about *debtor* moral hazard, and the future of the sovereign debt market. To evaluate whether such concerns were justified, one needs to begin with an assessment of the losses that investors were actually forced to take. This paper provides the first such assessment for all major debt restructurings of the 1998–2005 period.

Our work is related to two literatures, which differ in terms of motivation and methodology, and rarely take note of each other. The first of these has studied the financial outcomes of sovereign debt crises from the perspective of economics and economic history. A small group of papers – including Eichengreen and Portes (1986, 1989), Lindert and Morton (1989), and Klingen et al. (2004) – examines how creditors fared over the long run, that is, over time periods that included both debt restructurings and returns in good times. Suter (1992) studies the terms of debt restructurings from 1820 through 1975. Jorgenson and Sachs (1989) compute investor losses in four Latin American defaults in the 1930s, comparing the present value of the principal outstanding at default to the present value of actual repayment after default. Several studies, including Eichengreen and Rühl (2001), Lipworth and Nystedt (2001), IMF (2001, 2003), World Bank (2002), Rieffel (2003), and Cline (2004) have discussed the terms of more recent debt restructurings in the 1980s and 1990s, and sometimes the market performance of bonds before and after restructuring events.

More recently, a small but growing empirical finance literature has attempted to estimate *expected* recovery values based on bond prices – both for bonds that were restructured, and bonds that ended up being repaid in full – after imposing an identifying condition that allows separating default probabilities and recovery values (Merrick, 2001; Sosa Navarro, 2002; Duffie et al., 2003; Andritzky, 2005). Merrick (2001) uses the information provided by that fact that bonds sometimes include cross-default clauses (thus having the same default probability) to achieve this identification. He finds that for the Russian default, recovery values were substantially lower than those of US corporates, while recovery values implicit in Argentine bonds during the 1998 Russian crisis remained high and similar to a senior unsecured US corporate. Using a similar approach, Sosa Navarro (2002) estimates recovery values for Argentina in 2001 using data up to the crisis, and finds sharply falling expected recovery values, to just over 20%. Andritzky (2005) disentangles default probabilities and expected recovery values for Argentina

over the 2000–2002 period, using the assumption that bonds receive equal compensation after a default, with broadly similar results.

Like the first of these two literatures, this paper takes an ex post approach, but uses concepts that make the results comparable with those of the recovery value literature. We propose a particular measure of investor losses associated with a restructuring, namely, the percentage difference between the net present value of the original and the new (restructured) instruments, using the immediate post-exchange (''exit'') yield of the new instrument to discount both payments streams. For each debt restructuring, we compute bond-by-bond ''haircuts'' according to this measure. In addition, we use the same underlying data to compute realized recovery values, defined as the net present value of the new payments stream relative to the *face* value of the outstanding original principal. These can be compared with the expected recovery values just before a restructuring estimated by the empirical finance literature. The latter depend on particular pricing models and identifying assumptions, while our results do not.

Our main result is that there were large differences between average net present value losses across debt restructurings, ranging from 13% (Uruguay, 2003) to 73% (Argentina, 2005), with most restructurings clustered in the 25–35% range. Recovery values per dollar of principal varied from 74% on average (Uruguay, 2003, external exchange) to 33% (Argentina, 2005). Moreover, some (but not all) exchanges exhibit substantial variations in the haircut even within the same exchange, depending on the instrument tendered. Thus, in most cases, ''intercreditor equity'' was violated ex post, at least in a present value sense. A related finding is that exchanges generally offered different terms to resident and nonresident investors; in some cases, restructurings were designed with a particular group of creditors in mind. However there does not appear to have been a systematically harsher treatment of nonresidents relative to resident investors (or vice versa).

The paper is organized as follows. Section 2 explains the methodology. Section 3 summarizes some features of the debt exchanges studied, and presents the main results in summary form, and Section 4 concludes. The Appendix documents the terms of each exchange, and describes how specific data problems were dealt with in each case.

2. Measuring investor losses

In this paper, ''investor losses'' are defined as the percentage difference between the market value of new instruments received by the investor (inclusive of any cash payments) and the net present value (NPV) of the remaining contractual payments on the old instruments (inclusive of any principal or interest arrears), discounted using the yield of the new instruments (r_{new}) after the results of the exchange became public information. Hence:

$$H_{\text{NPV}} \equiv 1 - \frac{\text{NPV}(\text{new}, r_{\text{new}})}{\text{NPV}(\text{old}, r_{\text{new}})}. \tag{1}$$

Two aspects of this definition require elaboration.

First, this concept of ''haircuts'' differs somewhat from a popular related concept, namely, the percentage difference between the market value of the new debt (plus cash received) and the sum of the outstanding *face value* of the old debt and past due interest (PDI),

$$H_{\text{FV}} \equiv 1 - \text{RV} \equiv 1 - \frac{\text{NPV}(\text{new}, r_{\text{new}})}{100}, \tag{2}$$

(ignoring PDI for simplicity). Definition (2) is natural if one is interested in the recovery value (RV) of debt for a given outstanding *face value* of principal (as opposed to the value of a future promised payment stream). It is also easier to compute than haircuts in definition (1), because it does not require any information about the payments' terms of the old bonds. However, we find definition (1) more attractive as a measure of investor losses in a default, since it compares the value of the new instruments to a (net present) *value* of the old debt in a situation in which the sovereign would not have defaulted.[1] This said, haircuts in definition (2) can easily be computed using a subset of the information that we need for definition (1), and it yields results that are comparable to those of the recovery value literature. We hence present results using both definitions.

The other aspect of definition (1) that requires justification is the use of the same, post-exchange yield to discount both old and new promised payments flows. The consequence of this is that haircuts in definition (1) may be very different from the mark-to-market loss experienced by investors at the time of the exchange – that is from the change in the market value of the basket of bonds held by investors as a result of the debt exchange. To measure the mark-to-market loss, the NPV of the old instruments would have to be discounted at the (generally higher) interest rate prevailing before a debt exchange, resulting in a much smaller haircut than under definition (1). Indeed, in a world of perfect foresight, in which the terms of the expected exchange are reflected in the pre-exchange secondary market prices of the old debt, the value of the old instrument just before a debt exchange would be identical to the value of the new instruments just after the exchange, and the mark-to-market loss would be zero. For this reason, the mark-to-market loss is not a meaningful concept for our purposes: it measures the extent to which the result of the exchange was incorrectly anticipated rather than the harshness of the exchange. Large reductions in coupon payments or face value, for example, need not imply a high mark-to-market loss at the time of the exchange since the anticipation of these tougher terms would have depressed the pre-exchange value of the old instruments.

Hence, haircuts in definition (1) do not reflect the actual loss (if any) that investors experienced as a consequence of accepting the exchange offer. Rather, our "haircuts" describe the loss that was incurred by participating investors – at the margin, i.e. conditioning on the actions of others – compared to a hypothetical situation in which debtor government would not have discriminated against investors that chose not to participate (this is implicit in the fact that both old and new instruments are discounted with the same rate r_{new}). In other words, H_{NPV} measures the *temptation to free ride* that each investor would have felt if it had expected the government to continue servicing his or her claim in the same way as the newly issued instruments. In actual fact, since these exchanges generally achieved high participation, this temptation to free ride must somehow have been overcome, for example, by threatening not to repay holdouts, or by changes in the non-payment terms of the old bond contracts. Hence, for successful exchanges, positive haircuts in the definition of Eq. (1) measure the pressure that must have been applied to investors in order to solve the free rider problem associated with the exchange.

[1] If payments due under the old bonds are accelerated in a default situation, then the contractual right of the creditor shifts from a future payment stream to the right to immediate repayment of the principal, the present value of the old instrument becomes equal to its face value, and the two definitions collapse into one. However, most debt exchanges that are studied in this paper (the exceptions being Argentina, Russia, and Ecuador) took place ahead of formal defaults, so that the debt was not, in fact, accelerated at the time of the exchange, so that H_{NPV} and H_{FV} differ in general.

Hence, haircut definition (1) allows us to rank exchanges according to their "harshness" to creditors.

To see this more formally, let $u_i(\text{accept}|\{a_j\}_{j\neq i})$ denote the expected payoff from accepting the exchange offer, conditioning on the actions of other investors (i.e. accept or reject), and $u_i(\text{reject}|\{a_j\}_{j\neq i})$ the expected payoff from holding on to the old debt instrument. For investors that accepted the exchange offer, it must have been true that:

$$u_i\left(\text{accept}|\{a_j\}_{j\neq i}\right) - u_i\left(\text{reject}|\{a_j\}_{j\neq i}\right) \geq 0, \tag{3}$$

$u_i(\text{accept}|\{a_j\}_{j\neq i})$ is just the market value of the new instrument, that is, the price that can be observed in the secondary market after the exchange. By definition this is equal to the net present value of the cash flow promised by the new instrument, discounted by the secondary market yield of these new instruments. Thus, $u_i(\text{accept}|\{a_j\}_{j\neq i}) = \text{NPV}(\text{new}, r_{\text{new}})$. Using Eqs. (1) and (3), one obtains:

$$H_{\text{NPV}} = 1 - \frac{u_i\left(\text{accept}|\{a_j\}_{j\neq i}\right)}{\text{NPV}(\text{old}, r_{\text{new}})} \leq 1 - \frac{u_i\left(\text{reject}|\{a_j\}_{j\neq i}\right)}{\text{NPV}(\text{old}, r_{\text{new}})}. \tag{4}$$

$u_i(\text{reject}|\{a_j\}_{j\neq i})$ is the (unobservable) utility, or value, of holding on to the old instrument, conditioning on the outcome of the exchange, given expectations about what might happen to old instruments that were not traded in. $\text{NPV}(\text{old}, r_{\text{new}})$ is the net present value of the cash flow associated with the old instrument discounted at the yield of the *new* instrument – that is, assuming "equal treatment", or no discrimination. Hence, the expression to the right of the inequality sign describes the percentage difference between what the old instruments would have been worth in the absence of discrimination, and the value that investors holding on to such instruments were *actually* expected to receive. Eq. (4) says that in order to persuade investors to accept the exchange offer, this percentage difference must have been at least as large as the observed "haircut" H_{NPV}. Hence, H_{NPV} is a measure for the extent to which discrimination was expected by investors – that is, for the perceived "toughness" of a (successful) exchange offer.

Computing H_{NPV} as defined in (1), H_{FV} as defined in (2), or both, involves a number of practical complications. The most difficult problem is that in a few instances – including the 1999 Russian domestic debt restructuring, the Ukraine treasury bill restructuring of 1998, and the November 2001 Argentine exchange – the new instrument was not traded; hence, there was no market value and no "exit yield". In these situations, our approach was to estimate what r_{new} might have been using available interest rate information. In the case of Russia's 1999 GKO/OFZ exchange, we used information contained in current and future 90-day interbank rates. In the case of Argentina (2001), old bonds continued to be traded after the exchange, and the new instruments were eventually traded, albeit after a substantial time lag. As explained in detail in the Appendix, the implicit yields of these two groups of bonds were used to compute upper and lower bound estimates for the true haircut. Fortunately, these are sufficiently close to be informative.

A second and more routine problem for computing H_{NPV} is that the maturities of the new and old instruments were typically not the same. Suppose, as will generally be the case, that the maturity of the new instrument is longer than that of the old instrument, and that the term structure is upward sloping (as one might expect if the debt exchange puts an end to the perceived crisis).

Then, the yield of the actual new instrument will be higher than that of a new instrument with the length of the old instrument. By discounting the old instrument with this higher yield, we will tend to underestimate the NPV(old) that we would have obtained by discounting with a yield corresponding to the maturity of the old instruments, and hence the extent of the haircut.

To deal with this problem, we attempted to estimate the "new" yield corresponding to the average length of the old instrument by interpolating the yields on all performing instruments trading in the market after the exchange (there are usually more than one). When this was not possible – for example, because all new instruments were longer than the old one in terms of remaining maturity – we used the yield on the new instrument that was closest to the old bond in terms of average length, and made an adjustment using the yield curve on US treasury bills. As a robustness check, we also used the yield of the instrument actually obtained in exchange for the old one, i.e. ignoring any maturity adjustment, bearing in mind that this could introduce a bias as described above.

A third complication arose when the exchange involved a change in the currency of denomination of the two instruments. In this case, old and new instruments cannot be discounted at the same rate. Fortunately, typically both foreign and domestic currency exit yields were available to us, so it was just a matter of applying the discount factor of the relevant currency in each case, adjusted by maturity when necessary. Once the present value of the two instruments was obtained, the exchange rate at the time of the exchange was used to express both in a single currency and compute the haircut.

Fourth, by applying the new instrument yields to the old instrument we are assuming that both instruments were of the same seniority. However, in some cases – for example, the Russian 2000 exchange in which new instruments were upgraded to debt of the Russian Federation as opposed to debt owed by a state-owned bank – the sovereign resorted to security enhancements to make new instruments more attractive. By discounting the old instrument's cash flow with the yield of the new instruments we would be incorrectly applying these enhancements to the old instrument. In this case, we may be overestimating the haircut with respect to the true old instruments.

Fifth, in a few cases we had to deal with incomplete information about the terms and outcomes of the exchange. Bondholders could often choose among several new bonds. In some cases, there is little information on which new bonds where actually exchanged for a particular old instrument. When faced with such lack of information we computed two bounds, assuming that the bondholder received either the best possible or worst possible set of instruments. In most cases, these alternatives did not generate substantially different results.

Finally, some instruments (old and new) envisaged coupon payments tied to future market interest rates such as the US LIBOR. When computing the net present values of these instruments, one must hence assume an expected interest path based on information available at the time of the exchange. For an interest rate such as LIBOR – with well developed swap and futures markets – this is easy to do; and forward LIBOR rates based on interest swap rates can in fact be downloaded directly from Bloomberg. In a few cases, however, bonds were indexed to local interest rates for which forward rates cannot be computed. In such cases we generally projected that last available rate forward.

3. Results

We now summarize the general characteristics of the debt restructurings covered in this paper (particularly relative to earlier periods) and present our main results. The Appendix contains the terms of each exchange, and describes how the methodology discussed in the previous

section was implemented in each case, and what discount rate assumptions were made. Bond-by-bond results are available in a database that can be downloaded with the online version of this article (see also Sturzenegger and Zettelmeyer, 2005).

3.1. Characteristics of the 1998–2005 debt restructurings

The debt restructurings examined in this paper had a number of common characteristics, particularly compared to earlier periods. Unlike "the" debt crisis of the 1980s, almost all restructurings concerned bonds, rather than bank loans. Related to that, the restructurings generally did not take the form of formal, closed-door negotiations with creditor representatives, like the "bank advisory committees" of the 1980s and early 1990s. Instead, public take-it-or-leave-it offers were made, usually preceded by informal meetings with some creditors.[2] Creditor participation was high – over 90% – except for the two most recent Argentina restructurings, namely the 2005 exchange, and *pesification*.[3] (Though only 65% on average, participation in Argentina's earlier "Phase 1" was in fact high among the domestic claim-holders that were targeted by the exchange; see Table 1.)

Though almost all restructurings between 1998 and 2005 focused on bonds, they differed with respect to creditor type and the class of instrument that was restructured. The Russian GKO restructuring and the Ukraine OVDP restructuring involved domestically issued, short term instruments denominated in domestic currency (though in the case of Ukraine some instruments held by nonresidents were combined with an exchange rate guarantee). Residents and nonresidents were offered different terms in these exchanges. A few restructurings (the Russian MinFin3 exchange, the Uruguay domestic exchange, and Argentina's *pesification*) concerned domestically issued instruments denominated in foreign currency. All others focused on foreign currency, international bonds which were mainly in the hands of external creditors.

Two cases were unusual in this context. Russia's 2000 external debt restructuring involved dollar denominated, securitized Soviet-era bank loans, called "Principal Notes" (Prins) and "Interest Arrears Notes" (IANs). Among the restructurings covered in this paper, it is the only one that was negotiated with a bank advisory committee. Argentina's "Phase 1" restructured international bonds, but was directed at domestic residents (particularly banks and pension funds) holding these bonds.

In terms of scope, the restructurings summarized ranged from the small and simple, with just a few exchanged instruments and small face values in cases like Pakistan (1999), to operations of enormous volume and complexity, involving hundreds of instruments, in Argentina's 2001–2005 restructurings (Table 1). The technical and legal design also varied widely. Several restructurings – the Ukraine (1998) domestic exchanges, the Pakistan (1999) Eurobond exchange, the Argentina (2001) "Phase 1"exchange, and the Uruguay (2003) exchange – were pure maturity-lengthening operations. Others also involved reductions in face value. A few led to changes in the currency denomination of the debt (see table), but most did not.

[2] The main exception was the restructuring of Russia's "Prins" and "IANs"; see below.

[3] As far as *pesification* is concerned, the relatively low participation rate reflected mainly resistance from the pension funds, while the 2005 participation rate of 76% was attributable to low participation by nonresident creditors (63%; among residents, participation was 98%) Though comparatively low, participation was significantly higher than many market observers had been predicting in view of the tough terms of the exchange offer (see, for example, Economist Intelligence Unit, *Argentina*: *Finance Outlook*, November 10, 2004).

Table 1
Sovereign debt restructurings, 1998–2005: summary of characteristics

	Exchange dates	Face value eligible (US$ billion)	Participation (%)	Number of eligible instruments	Number of new instruments	Number of options offered	Was there past due principal?	Was there past due interest?	Was cash paid?	Was there face value reduction?	Was there currency conversion?
Russia											
GKO/OFZs-residents	1-Mar-99	4.81[a]	95[c]	21	9	1	Yes	No	Yes	Yes	No
GKO/OFZs-nonresidents	1-Mar-99	3.50[b]	89[c]	21	9	1	Yes	No	Yes	Yes	No
MinFin3	1-Feb-00	1.31	75[d]	1	2	2	Yes	No	No	No	Optional
PRINs/IANs	23-Aug-00	29.08	99	2	2	1	No	Yes	Yes	Yes	No
Ukraine											
OVDPs-residents	26-Aug-98	4.47[e]	84[f]	All T-bills	1	1	No	No	No	No	No
OVDPs-nonresidents	22-Sep-98	0.42[g]	82	All T-bills	1	3	No	No	Yes	No	Optional
Chase loan	20-Oct-98	0.11	100	1	1	1	No	No	Yes	No	No
ING loan	20-Aug-99	0.16	100	1	1	1	Yes	No	Yes	Yes	No[h]
International bonds	7-Apr-00	2.60	97	33	2	2	Yes	Yes	Yes	Yes	No
Pakistan											
International bonds	13-Dec-99	0.61	99	3	1	1	No	No	No	No	No
Ecuador											
International bonds	23-Aug-00	6.51	98	6	2	1–2	Yes	Yes	Yes	Yes	No
Argentina											
"Phase 1" (residents)	6-Nov-01	64.37	65[i]	79	106	1–3	No	No	No	No	No
Pesification	3-Feb-02	57.55	65[j]	107	107	1	No	No	No	Yes	Forced
2005 International	1-Apr-05	79.70	76	156	11	1–3	Yes	Yes	Yes	Yes	Optional

(*continued on next page*)

Table 1 (*continued*)

	Exchange dates	Face value eligible (US$ billion)	Participation (%)	Number of eligible instruments	Number of new instruments	Number of options offered	Was there past due principal?	Was there past due interest?	Was cash paid?	Was there face value reduction?	Was there currency conversion?
Uruguay											
External[k]	29-May-03	3.38	90	19	19	2	No	No	Yes	No	No
Domestic	29-May-03	1.62	99	46	15	2	No	No	Yes/no	No	No

[a] Corresponds to 110 billion rubles, converted into US$ at the exchange rate at the time of the exchange (22.86 Rub/US$).
[b] Corresponds to 80 billion rubles, converted into US$ at the exchange rate at the time of the exchange (22.86 Rub/US$).
[c] As of May 31, 2000.
[d] As of mid-August 2000. Exchange was open-ended, and final participation rate was significantly higher.
[e] Corresponds to 10.05 billion hyrvnias, evaluated at the exchange rate at the time of the exchange (2.25 Hrv/US$).
[f] Average of full exchange of National Bank holdings (about 75% of resident holdings of OVDPs) and exchange of about one-third of OVDP holdings of commercial banks.
[g] Corresponds to 1.3 billion hyrvnias at the rate at the time of the exchange.
[h] Except in the sense that a US$ denominate loan was converted into a DM-denominated bond, at market exchange rates.
[i] Refers to participation with respect to total eligible face value. Participation among domestic residents, to whom exchange was targeted, was much higher.
[j] Debtholders (including the pension funds) that rejected both pesification and the offer to return to original pre-Phase 1 instruments are counted as non-participating.
[k] Numbers cited are inclusive of Yen bond which was restructured in parallel to the external debt exchange, using collective action clauses.

The bond restructurings of 1998–2005 included a number of "firsts" and legal innovations:

- The Pakistan (1999) debt exchange was the first time Eurobonds – or any bonds issued in international markets – were restructured, destroying the *de facto* seniority that such bonds appeared to enjoy until that point. (International bonds were not restructured in the wake of the 1980s debt crisis, being of secondary importance compared to bank loans; and while Russia's 1999–2000 restructurings affected some foreign currency instruments, its Eurobonds were not restructured.)
- Brady bonds were restructured for the first time by Ecuador (2000), and subsequently by Uruguay (2003) and Argentina (2005).
- Collective action clauses changing the payment terms of sovereign bond contracts were utilized for specific bond issues in the Ukraine (2000) and Uruguay (2003) restructurings.
- "Exit consents" changing the non-payment terms of bond contracts were used in Ecuador (2000) and Uruguay (2003).
- Argentina's (2001, 2005) restructurings included "most favored creditor" clauses that gave creditors the right to participate in future bond exchanges, to reassure creditors that holdouts would not received better terms.

All restructurings occurred in the context of economic crises (see IMF, 2002, and Sturzenegger and Zettelmeyer, 2006, for details). With one exception – Argentina's "Phase 1" restructuring in November of 2001, that took place just ahead of a devaluation – all restructurings were preceded by currency crises. Furthermore restructurings were usually *followed* by banking crises of varying severity. In several cases, a currency crisis led to a sovereign debt crisis (as currency mismatches in sovereign balance sheets made the sovereign insolvent, or high domestic interest rates made it difficult to roll over domestic currency debt) and finally a banking crisis (as exposures of the domestic banking system to sovereign debt triggered insolvencies and sometimes bank runs). But there were other variants, too. In Ecuador, the banking crisis came first, triggering a currency crisis (due to central bank liquidity support) which led to a sovereign debt crisis (due to dollar denominated debt). Uruguay's crisis began with a currency crisis which was first followed by a run on banks (in part as a consequence of the crisis in neighboring Argentina) and finally a sovereign debt restructuring.

3.2. Haircuts

Table 2 presents our main results. For each exchange and each of the two haircut definitions discussed in Section 2, the table shows the mean haircut (on a weighted average basis) as well as the standard deviation of haircuts across individual instruments tendered.[4] It also shows some correlations between haircuts and the average outstanding maturity of the instruments tendered. The main findings are as follows.

First, there are large differences in the average level of haircuts (regardless of definition) across debt restructuring episodes. Among the exchanges targeted to nonresidents, Uruguay's

[4] An alternative way of expressing the average haircut for each exchange would be to add new and old values across instruments and apply formulas (1) and (2) to these aggregates. In most cases, they are close to the mean haircuts shown in Table 2, with differences of less than a percentage point. The main exception is the Argentina 2005 exchange, where the average haircut based on aggregate values is 75%, compared to a mean haircut of 72.9%.

Table 2
Sovereign debt restructurings, 1998–2005: summary of haircuts

	Number of instruments[a]	Average discount rate	Haircuts in definition (1) (H_{NPV})[b]				Haircuts in definition (2) (H_{FV})[c]			
			Mean[d] (%)	Standard deviation	Correlation weight length		Mean[d] (%)	Standard deviation	Correlation weight length	
					Coefficient	*p*-Value			Coefficient	*p*-Value
Russia										
GKO/OFZs-residents[e,f]	21	71.3[g]	46.0	0.7	0.92	0.00	43.1	1.4	0.93	0.00
GKO/OFZs-nonresidents[e,f]	21	97.8[g]	59.1	0.8	−0.56	0.01	59.1	2.4	1.00	0.00
MinFin3[h]	1	20.8	63.2	–	–	–	61.0	–	–	–
Prins/IANs	2	16.4	52.6	1.4	–	–	69.2	0.7	–	–
Ukraine										
OVDPs-residents[i]	5	60.0[g]	6.9	1.5	−0.83	0.08	18.2	12.6	1.00	0.00
OVDPs-nonresidents[j]	2	74.1[g]	56.3	1.9	–	–	59.2	1.9	–	–
Chase loan	1	76.3	30.7	–	–	–	30.7	–	–	–
ING loan	1	81.6	38.0	–	–	–	38.0	–	–	–
International bonds[k]	5	28.6	27.8	5.5	−0.97	0.01	40.1	9.2	0.80	0.10
Pakistan										
Eurobonds	3	21.4	30.9	1.8	−0.96	0.17	30.4	1.9	0.64	0.56
Ecuador										
International bonds	6	22.2	27.4	10.4	−0.90	0.01	60.0	7.3	0.28	0.59
Argentina										
Phase 1 (residents)[l]	50	24.1	41.7	9.4	0.02	0.90	58.1	10.5	0.58	0.00
Pesification	106	14.7	42.4	10.2	0.78	0.00	58.8	12.5	0.70	0.00
2005 International	66	8.2	72.9	7.3	0.30	0.01	67.0	9.1	−0.12	0.35
Uruguay										
External[m]	18	12.2	13.3	3.8	−0.46	0.06	27.2	6.2	0.14	0.57
Domestic[m]	46	14.1	22.0	8.4	0.01	0.97	35.1	11.1	0.44	0.00

[a] Number of old debt instruments entering the calculations. Depending on data availability, this can be lower than the number of eligible instruments (see Table 1).
[b] $H_{NPV} = 1 - NPV(new)/NPV(old)$; NPV(old) includes PDI and PDP, compounded at a US short term rate.
[c] $H_{FV} = 1 - NPV(new)/(outstanding\ principal + PDI)$. Outstanding principal includes any PDP; PDI is uncompounded.
[d] Weighted by outstanding or exchanged principal of old instruments. When several exchange options were available, generally took simple average across options.
[e] Calculations for residents ignore exchange restriction; calculations for nonresident value effect of exchange restrictions.
[f] Average, standard deviation, and correlations assume choice of shortest OFZ; average between two approaches to discounting (see Appendix).
[g] Local currency rate.
[h] Refers to Option 1 (new dollar denominated MinFin), assuming February 2000 exchange date.
[i] Based on OVDPs maturing at end-August, end-September, end-October and end-November 1998 and August 1999.
[j] Refers to hedged (dollar linked) OVDPs purchased by nonresidents through Merrill Lynch in December 1997.
[k] Gazprom bonds treated as one synthetic instrument (see Appendix).
[l] Calculations based on Option 1 (“guaranteed loan” with reduced fixed interest rate and, in general, a maturity extension of 3 years).
[m] Calculations reflect weighted average of benchmark and extension options, based on actual investor choices for each eligible instrument.

2003 exchange, with an average NPV haircut of about 13%, was the mildest, while Argentina’s 2005 exchange, with a mean haircut of around 73%, was the harshest. Most other restructurings stayed well below and above these upper and lower bounds, respectively, and are clustered in the range between 25% and 60%. Pakistan’s, Ecuador’s and Ukraine’s Eurobond exchanges

involved investor losses of about 30%; while Russia's domestic and external restructurings let to losses of 45–60%, depending on the restructuring and on whether haircuts are defined to capture losses arising from the imposition of capital controls or not.

These differences in outcomes reflect differences both in the *terms* of each exchange – the extent of face value reductions and maturity extensions, whether past due interest was recognized, whether cash was paid, etc. – and in the sovereign risk premia prevailing after the exchange, which determine the rates which were used to discount the streams of old and new bond payments. The first column of the table shows large variations in this average discount rate across exchanges, ranging from as low as 8% (Argentina) to 28% (Ukraine) for the major exchanges involving international bonds; with even higher rates for the Russian and Ukrainian domestic exchanges which involved local currency instruments. Since almost all exchanges involved maturity extensions, a higher discount rate implies a higher net present value haircut (it lowers the present value of the new instruments more than that of the old instruments). For example, Ukraine's 2000 Eurobond exchange involved relatively mild terms – with no face value reductions except on one bond series, and maturity extensions of l0 years or less – but the ''exit yield'' prevailing after the exchange was high (28%), leading to substantial NPV reductions. Uruguay's exchange was the mildest in the group studied here not just because of its terms, but because it occurred in a fairly benign financial environment, in which sovereign yields had fallen to 11–15%. In contrast, Argentina's 2005 restructuring was harsh *in spite* of the fact that emerging market bond yields were historically low at the time of the exchange (7–9%).

Second, haircuts computed according to definition (2) (i.e. with respect to outstanding principal of the original claim) tend to be higher than haircuts according to definition (1) (with respect to the net present value of the original claim). This reflects the fact that the face value of original instruments was generally higher than their net present value when discounted at the post-restructuring (still generally high) interest rates that we use to value promised payment streams. There is a single exception: Argentina in 2005, which restructured in an exceptionally favorable external environment, and as a result experienced exit yields that were typically lower than the coupon rates of the old instruments (many of which had been issued in an already distressed situation). In this case, NPV haircuts in our preferred definition are hence somewhat higher than haircuts computed according to definition (2). In addition, there are several cases when both definitions lead to almost the same result. This occurs when the old instrument had very short remaining maturity or had just matured (as was the case, for example, for all or most instruments exchanged in Pakistan's 1999, Ukraine's 2000, Russia's MinFin3, or Ukraine's Chase and ING loan restructurings).

Third, comparing restructurings targeted to residents and to nonresidents does not yield a very clear pattern. Table 2 suggests that residents obtained significantly better deals than nonresidents in Ukraine's OVDP exchanges and Russia's GKO exchange. However, in the case of Ukraine, residents avoided high overt losses only at the price of obtaining domestic currency instruments that exposed them to capital controls; nonresidents received Eurobonds. For Russia, the difference between the resident and nonresident haircuts shown in the table is due to a repatriation restriction that we have reflected only in the result for nonresidents.

No clear difference in treatment is apparent in the two most recent crises. While the Argentina 2005 exchange, targeted mostly at nonresidents, was the harshest of the restructurings covered in this paper, resident holders of the same international bonds that restructured earlier appear to have been treated almost as harshly. Their claims were first restructured in the November 2001 ''Phase 1'' exchange, and subsequently ''pesified'' in February 2002, at

a combined loss of close to 70%. Finally, during Uruguay's 2003 exchange, long dated fixed rate domestic instruments held by residents were subjected to about the same, relatively mild, haircuts as international bonds. Shorter dated treasury bills and floating rate bonds suffered higher haircuts, but this could be on account of their shorter durations (see below).

Fourth, Table 2 shows that there was also considerable variation in the haircuts received by investors *within* the same exchange or restructuring. This applies particularly to restructurings – like Argentina, Uruguay, Ecuador, and, if one includes the "Gazprom bonds", Ukraine 2000 – in which there was a large degree of heterogeneity in the characteristics of the old instruments that were being tendered. Hence, intercreditor equity was often violated in the sense that the losses suffered differed widely across creditors within the same exchange. As Table 2 shows, this is not an artifact of any particular definition of haircut: similar results hold regardless whether haircuts are evaluated relative to the face value or the net present value of the original claim. For most exchanges, the within-exchange standard deviation of haircuts according to definition 2 was slightly higher than in definition 1.

Table 2 also shows some correlations which help give us an idea of what might and might not be driving some of the within-exchange variation in haircuts. Almost all exchanges made an attempt to differentiate the package of instruments offered to investors in line with the characteristics of the old instruments traded (see Appendix). In practice, this was done either by offering holders of longer old instruments longer new instruments (Argentina; Phase 1, and pesification), or by imposing a larger face value haircut on them (Russia GKO and Prins/IANs exchange; Ukraine OVDP and 2000 exchanges) or a mixture of both (Ecuador and Uruguay exchanges). Hence, the correlation between haircuts according to definition (2) – that is, disregarding any differences in maturity and payments' terms of the old instruments – and their remaining life is typically positive. Per unit of face value, holders of longer dated old instruments tended to receive smaller values of new instruments.

However, this seemingly "tougher" treatment of longer instruments generally did not translate into less favorable treatment *per unit of NPV* of the old instruments. As Table 2 shows, the correlation between the length of the original bond and the NPV haircut was often *negative*, sometimes significantly so. This means that the "tougher" treatment of longer instruments in terms of face value reductions or maturity extensions did not fully compensate the fact that longer instruments, when evaluated at the high post-exchange yields, had lower value to begin with. As a result, holders of longer instruments often ended up with lower NPV haircuts than those of shorter original instruments.

Finally, it is interesting to compare the recovery values implicit in Table 2 (that is, $100 - H_{FV}$) with the result of the literature that estimates expected recovery values based on bond prices (Table 3). Our results imply that on average, realized recovery rates in sovereign bonds restructurings have been in the 40–70% range, about in line with recovery rates observed for *senior* corporate debt, and much higher than the benchmark 20% recovery rate that is reportedly often assumed in CDS pricing (Singh and Andritzky, 2005). However, there have been large variations across default episodes. The lowest ex post recovery rates for foreign currency debt, in Russia (2000) and Argentina (2005), were just over 30% – moderately exceeding the recovery rates that were *expected* for Argentina around the time of default, according to Sosa Navarro (2002) and Andritzky (2005). The highest recovery rates, among the exchanges involving nonresident investors, were obtained in Uruguay, at close to 75%, followed by Pakistan with almost 70%. Hence, 30% appears a very conservative assumption to make about recovery of sovereign bonds, and median recovery rates have in fact been significantly higher.

Table 3
Comparison of recovery values estimates

Study	Issuer	Instrument and/or time period	Estimate (mean)
Jarrow et al. (1997)	US corporates 74–91	Senior secured	67.1
		Senior unsecured	46.5
		Senior subordinated	32.1
		Subordinated	26.4
		Junior subordinated	18.0
Merrick (2001)	Russian Eurobond	Pre-GKO default 07/23/1998 to 04/12/1998	27.3
		Post-GKO default 08/17/1998 to 12/14/1998	10.3
	Argentina	Pre-GKO default 07/23/1998 to 08/14/1998	51.2
		Post-GKO default 08/17/1998 to 12/14/1998	49.3
Sosa Navarro (2002)	Argentina	12/10/01 to 12/20/01	21.7
		Post-default: 12/21/01	20.8
Andritzky (2005)	Argentina	Mid 2000–mid 2001	40–50
		July 2001–October 2001	30–40
		December 2001–April 2002	20–30
This paper	Russia	GKO/OFZs-residents (3/99)	56.9
		GKO/OFZs-nonresidents (3/99)	40.9
		MinFin3 (2/00)	39.0
		PRINs/IANs (8/00)	30.8
	Ukraine	OVDPs-residents (8/98)	81.8
		OVDPs-nonresidents (9/98)	40.8
		Chase loan (10/98)	69.3
		ING loan (8/99)	62.0
		International bonds (4/00)	59.9
	Pakistan	Eurobonds (12/99)	69.6
	Ecuador	International bonds (8/00)	40.0
	Argentina	Phase 1 (residents) (11/01)	41.9
		Pesification (2/02)	41.2
		2005 International (3/05)	33.0
	Uruguay	External (5/03)	72.8
		Domestic (5/03)	64.9

4. Conclusions

This paper has two main results. First, NPV haircuts – defined by comparing the present value of new instruments received with that of old instruments tendered, both evaluated at yields prevailing immediately after the debt exchange – varied substantially across the debt restructurings studied. The "toughest" restructuring was Argentina's 2005 exchange, with an average net present value haircut of almost 75%, followed by the Russian 1999–2000 debt restructurings (50–60%). The mildest was Uruguay's international bond exchange, with a haircut of only 13%. Recovery values in percent of outstanding principal varied correspondingly, from about 30% to almost 75%. These values are in about the same range as recovery values

on senior corporate debt, and appear to be higher than the benchmark recovery values which are usually assumed by market participants.

Second, considerable variation in haircuts existed within some of the exchanges, depending on the instrument tendered. In some debt restructurings, holders of longer dated instruments suffered smaller losses in NPV terms in spite of the fact that they often received smaller values of new instruments. In others, within-exchange variation in NPV losses do not seem to follow an obvious pattern.

The first of these two main results of the paper is not surprising, since variations in haircuts across debt exchanges are to be expected as a result of differences between countries' ability to pay, willingness to pay, and bargaining power. In contrast, variations in haircuts within exchanges are more surprising, as they appear to conflict with intercreditor equity and legal equality among bondholders. At a minimum, our results suggest that intercreditor equity is not a straightforward concept, and one that is harder to implement than might appear at first. One sense in which there could be intercreditor equity is that all bondholders are offered the same units of a new instrument, or the same access to a menu of instruments, per outstanding face value of their old instrument. Most debt exchanges do not seem to have sought intercreditor equity in this sense, as holders of longer dated instruments typically received a higher face value reduction, comparatively longer dated new instruments, or a combination of both. In the end, however, these attempts to differentiate treatment in accordance with the characteristics of the old instruments did not fully offset differences in the present value of old instruments, resulting in differences in NPV haircuts.

The findings of this paper raise a range of questions on the subject of debt crises and defaults. Why have some debt restructurings led to much higher investor losses than others? Is this mainly a reflection of the depth of a debt problem – a government's ability to pay – or of willingness to pay, perhaps driven by differences in the domestic political economy of defaults? Do the terms of a restructuring depend on other features of the bargaining game between investors and governments, such as the time elapsed since default, as a war of attrition model would suggest? What accounts for differences in investor treatment within the same restructuring? Do the costs of default from a country perspective – in particular, any sanctions and reputational costs – vary with the harshness of the debt restructuring pursued? We hope that the facts elaborated in this paper will lay the basis for future empirical work investigating these questions.

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Appendix. Terms of exchanges and methodological assumptions

Russia: GKO/OFZ exchange, March 1999

Terms

GKO or OFZ holders accepted to have their scheduled payments discounted to August 19, 1998, at a rate of 50% per annum. Based on the resulting adjusted nominal claims, they then received a package that include a combination of cash and short term instruments in addition to longer term OFZs. In addition to a cash payment equivalent to 3.33% of the adjusted nominal value, the short term component included 3.33% in 3-month GKOs with an issue date of December 15 (so that they would amortize shortly after the exchange on March 24); 3.33% in 6-month GKOs, also with an issue date on December 15; and 20% in "cash value" OFZs that could be used to pay tax obligations that were in arrears as of July 1st, 1998 at par, or to purchase newly issued shares of Russian banks. The remaining 70% was exchanged for new OFZs with maturities ranging from 3 to 5 years with coupons of 30, 25, 20, 15 and 10 each year, respectively. Importantly, all cash proceeds obtained under this scheme – including any receipts from selling the new GKOs or OFZs – had to be deposited in restricted ruble accounts ("S-accounts") that could be used to purchase selected Russian corporate bonds and equities, but allowed the withdrawal and repatriation of funds at market exchange rates only after they had been placed in a non-interest bearing "transit account" for 1 year.[5] Thus, the exchange in effect combined debt restructuring with the imposition of a capital control.

Russian institutional holders who were required to hold GKO/OFZs by law received a slightly better deal, involving a larger share of cash payments (10% cash, 10% in 3-month GKOs, 10% in 6-month GKOs, 20% in cash value OFZs and 50% in OFZs with maturities ranging from 4 to 5 years).

Assumptions

From the perspective of applying our methodology for computing haircuts, the main difficulty of the GKO exchange is that the Russian domestic debt market was wiped out after the default, and was not reestablished even long after the exchange. Hence, there are no secondary market prices at which the new instruments could be valued, and no "exit yields" at which to discount the old instrument. We consequently *construct* a discount rate to value old and new cash flows at the time of the exchange, using the information that would have been reflected in domestic bond rates had they existed at the time – in particular, inflation expectations and default risk. One approach is to take the 90-day interbank rate – initially an administered interest rate, but one that reflected inflation expectations, as the authorities were attempting to maintain positive real interest rates – and add to that a sovereign default risk premium, obtained as the difference between the yield of a (performing) 2004 Eurobond that was trading at the time and the yield of US treasuries of equivalent maturity. Since inflation was coming down from high levels at the end of 1998, and a portion of Russia's external was still in default, both numbers are very large: in March 1999, the interbank rate stood at 45%, and the risk premium at about 35%, which implies a ruble discount rate of 80%. While appropriate for

[5] Alternatively, investors could skip the transit account, but only if they agreed to exchange their rubles through a special auction involving a more depreciated rate.

discounting GKOs coming due in the near term, this is probably too high for discounting the medium term OFZs, as inflation was expected to decline in the medium term. An alternative approach is to apply a declining path of discount rates in line with the *actual* declines in 90-day interest rates; this yields an average discount rate of only about 60%. However, actual disinflation was faster than expected, and it is inflation *expectations* that we are interested in, so this could be on the low side. Hence, we take the approach of using a flat 80% rate discount rate as an upper bound, and a declining path (beginning at 80%, declining to about 50% by January of 2004, the maturity date of the long OFZ) as a lower bound, and compute haircuts for both sets of discount factors. The mean haircut presented in Table 2 averages over both concepts, as well as all GKOs exchanged (see Sturzenegger and Zettelmeyer, 2005, for more disaggregated results).

The requirement that all payments had to be transferred to a non-interest bearing ''transit account'' for at least 1 year before they could be repatriated is equivalent to postponing each payment by 1 year. To see how the withdrawal restriction lowered the actual new values received for nonresidents (see Table 2), we hence multiply the present values obtained from the procedure described above by an additional discount factor reflecting ruble interbank rates at the time when the payment was received (this assumes that once cash was deposited in ''S-accounts'', investors were no longer subject to default risk).

Russia: MinFin3 exchange, January 2000

Terms

In May 1999, the Russian government also defaulted on a Soviet era, domestically issued but dollar denominated bond, the ''MinFin3''. An open-ended bond exchange offer was announced in November 1999 and modified in January 2000. Bondholders were offered either a new 8-year bond similar to the original instrument, i.e. denominated in US dollars and with a coupon of 3%, or a 4 year OFZ (ruble denominated bond) paying an interest rate of 15% in the first year and 10% thereafter, with interest paid semiannually and a bullet principal payment. For investors that elected the OFZ, dollar face values were converted to ruble face value at the exchange rate of 26.2 rubles/US$ (equal to the market rate prevailing in November of 1999).

Assumptions

As in the case of the GKO exchange, the difficulty in evaluating this exchange is that there are no secondary market debt prices for the newly issued debt. However, the new 8-year MinFin bond can be valued using the yield of Russian performing external bonds – specifically, the March 2004 Eurobond – prevailing in early February of 2000 (20.8%).

Russia: Prins/IANs exchange, August 2000

Terms

Russia's ''Prins'' and ''IANs'' restructuring, comprising securitized Soviet external debt, was announced in February 11, 2000, and closed in August 2000. All Prins and IANs – with original face value of US$ 29 billion, plus US$ 2.8 billion in past due interest – were exchanged with two new Eurobonds with total face value of 21 billion. Outstanding principal was exchanged with a 2030 Eurobond with step up (2.25–7.5%) coupon, after a face value reduction of 37.5% for the longer maturity Prins and 33% for the shorter maturity IANs.

Past due interest was compensated via a 2010 Eurobond with fixed 8.25% coupon (without face value reduction) and a small cash "sweetener".

Assumptions

Unlike the new instruments issued in the GKO and MinFin exchanges, secondary market prices are available for the new Eurobonds issued immediately after the exchange. Hence, in this case, the methodology outlined in Section 2 can be applied without having to resort to constructed discount rates, with the caveat that the new instruments had two features that were designed to upgrade their seniority relative to the old instruments. First, there was an *upgrade in the obligor*, who became the Russian Federation rather than Vneshekonombank (the former external trade bank of the Soviet Union). Second, they included *expanded cross-acceleration clauses* linking default on the 2010 and 2030 bonds to default on any other issue of Russian Federation Eurobonds (including future new issues), and vice versa. (MinFins as domestic debt remained subordinated, in the sense that – though dollar denominated – they were not legally linked to existing Russian Federation Eurobonds.) Since we are ignoring these upgrades in our haircut calculations, the extent of the haircut could be somewhat overestimated in Table 2.

Ukraine: OVDP exchanges, August–September 1998

Terms

In late August of 1998, the Ukrainian government began to negotiate debt exchanges with three groups of creditors: domestic commercial banks who were holders of treasury bills (OVDPs), nonresident holders of treasury bills, and holders of a loan placed through Chase Manhattan in October of 1997. A conversion scheme for treasury bills owned by domestic banks was announced on August 26. It offered to exchange T-bills into longer term hryvnia denominated bonds of 3–6 years maturity. A range of exchange coefficients was determined in line with the present value of the T-bills at the time of the exchange, discounted at the prevailing T-bill rate of about 60%. Hence, T-bills that had just matured at the time of the exchange received new principal one-for-one, while T-bills that had been issued before the exchange and were coming due in July or August of 1999 received a face value haircut of 65.57%. The interest rate on the new bonds was set at 40% for the first year, and a floating coupon equal to the future 6-month T-bill yield plus 1 percentage point for the remainder of the period.

Foreign bondholders faced different terms. Nonresident holders were given the chance to exchange their holdings for a hryvnia denominated bond with a 22% hedged annual yield, but creditors largely ignored this option. The other option was to receive a 2 year zero coupon dollar denominated Eurobond with a yield of 20%. Some holders that had purchased currency hedges – specifically, holders of 9 and 12-month T-bills issued to nonresidents in December 1997 through Merrill Lynch – additionally received 20% of the present value of their principal in cash Hryvnia, exchanged into dollars at the market exchange rate of 2.94 on September 22, 1998.

Assumptions

For the exchange targeted to residents, values of the old and new instrument were computed and compared at a rate of 60% (the end-August 1 year T-Bill rate). However, because of the special structure of the new instrument – a floating rate bond after the first year – the discount and coupon rates approximately cancel after the first year, and the haircut is not sensitive to the discount rate assumed (in particular, for restructured T-Bills with maturity close to 1 year; see Sturzenegger and Zettelmeyer, 2005). For the exchange targeted to nonresidents, we used the

market yield – around 75% – of Ukraine's only foreign currency bond trading in secondary markets at the time (a DM-denominated bond maturing in early 2001).

Ukraine: restructuring of ''Chase Manhattan Loan'', October 1998

Terms

In addition to the OVDP restructurings, Ukraine also restructured two dollar denominated loans. Holders of a $109 million fiduciary loan issued through Chase Manhattan coming due on October 20, 1998 received a 25% ($27.25 million) cash payment, while the remainder of their claim was restructured into a new amortizing loan with a dollar interest rate of 16.75%, payable in quarterly installments starting in 1999. Principal payment would be limited to $2 million per quarter during the first year; the balance would be paid in four equal installments in 2000.

Assumptions

As the new loan did not trade, we again use the yield on Ukraine's DM Eurobond (adjusted to a dollar rate using the DM-US forward interest rate differential) to discount the new payment stream received (no discounting of the old payments stream is necessary since the loan had already matured).

Ukraine: restructuring of ''ING Loan'', August 1999

Terms

In the face of a bunching of debt service in the second quarter of 1999 – in particular, repayment of a 10-month bond placed through ING Barings in August of 1998 ($163 million including interest) maturing on June 9 – the government was again forced to seek a restructuring. On July 15, the Ministry of Finance and ING Barings reached an agreement by which 20% of the bond would be repaid in cash, with the remainder exchanged for DM bonds, at a rate of 94.3 cents of new debt for each dollar of old debt. The DM bonds would be added to an existing DM 1 billion international bond issued in 1998 and due on February 2001, with a coupon of 16%. In addition, holders of the restructured $500 million zero coupon Eurobond issued through Merrill Lynch in September 1998 were invited to enter the exchange; their holdings would be valued at either at 55 cents, or 75 cents to the dollar if investors put in new money equal to at least 15% of their holdings.

Assumptions

On August 2, 1999, Ukraine made the 20% cash payment to ING Barings, and on August 20, it tagged the original 2001 DM Eurobond for the remainder. We use the price of the DM Eurobond on August 25, 1999 to value the exchange. No discounting of the old payments stream is necessary since the loan had already matured.

Ukraine: March 2000 bond exchange

Terms

On February 4, 2000, with ING Barings as lead manager, Ukraine launched a comprehensive exchange offer involving all outstanding commercial bonds. These included two Eurobonds issued prior to the August crisis – a Euro 500 million, 14.75% Eurobond issued in March

1998 and coming due in March 2000 and the DM 1.5 billion, 16% Eurobond due in February 2001 – as well as the two bonds that had resulted from the 1998–99 restructurings – the $74 million 16.75% Chase Manhattan bond maturing in October 2000, and what remained of the Merrill Lynch Eurobond (US$ 258.4 million) falling due in October of 2000. In addition, about $1 billion of 8.5% bonds owed to the Russian energy exporter Gazprom were falling due between March of 2000 and March of 2007. Creditors could choose between two 7-year coupon amortization bonds denominated either in Euros or US dollars, to be issued under English law. For the euro denominated bond, the coupon was set at 10%, while for the U.S. dollar denominated bond it was set at 11%. There was no face value reduction except for the zero coupon Merrill Lynch Eurobond, where it was about 5% and for the ''Gazprom bonds'', where it ranged between 0% and 33% depending on the maturity date of the bonds. Coupon payments for the new bonds were set on a quarterly basis, with no grace period for interest payments. Amortization was to occur twice a year, with 3% at each amortization date in 2001, 5% in 2002, and 9.33% at each date between 2003 and 2007. Past due interest and accrued interest (i.e. interest accrued since the last scheduled coupon payment which was not yet payable) were paid in full and in cash.

Assumptions

Only the two newly issued Eurobonds were trading in the market after the exchange; thus, it is not possible to interpolate yields based on a full Eurobond yield curve for the purpose of discounting (as was done for the Russian Prins/IANs exchange). Instead, we use the yields of the actual new instruments issued for discounting purposes, with a small maturity adjustment based on the U.S. yield curve. Importantly, these yields fell from the immediate ''exit yield'' of about 28–23% a few days after the exchange. If haircuts are recomputed using these prices and yields, they would be 5–8 percentage points lower, in the 18–27% range. This is the only case in this paper where the results are sensitive to changes in prices and yields immediately after the exchange, which could arguably be attributed to a delayed reaction to the success of the exchange (rather than new information about fundamentals, which we would *not* want reflected in the haircut).

Pakistan: December 1999 Eurobond exchange

Terms

On November 15, 1999, Pakistan launched a bond exchange, ahead of a Paris club deadline that required it to show ''progress'' in negotiations with bondholders by the end of 1999. No interest or principal payments were missed prior to the exchange. The exchange involved swapping three bonds: a US$ 150 million, 11.5% Eurobond due in December 1999; a US$ 160 million, 6% exchangeable note due in February 2002 with a put option in February 2000; and a US$ 300 million Libor plus 3.95% floating rate note due in May of 2000. All three were to be exchanged for a new amortizing bond with an overall maturity of 6 years and a 3-year grace period, paying a 10% coupon. There was no nominal haircut; in fact, holders of the two bonds with the shorter average life received slightly more in nominal terms than under the original instruments.

Assumptions

An exit yield – the yield to maturity the new 2005 Eurobond – is available, and so this was used to discount the old cash flows, with a minor maturity correction based on the US yield curve.

Ecuador: August 2000 exchange

Terms

In late August of 1999, against the background of a deteriorating currency and banking crisis, Ecuador announced that it would suspend coupon payments on Discount and PDI Brady bonds, and by the end of October, it also defaulted on its remaining Brady bonds and its Eurobonds. On July 27, 2000, Ecuador launched an offer to exchange its defaulted Bradys and Eurobonds for new uncollateralized bonds maturing in 2030 with a step-up coupon starting at 4% and rising to 10%, in 1% steps, by 2006. For each type of defaulted bond, an exchange ratio was set in line with ''stripped'' secondary market prices; thus, the idea was to treat each bond equally based on their pre-default prices. The shortest instruments – Eurobonds and Brady Interest Equalization bonds – were exchanged at par, while the longer dated Brady bonds were exchanged at 1:0.78 (PDI bonds), 1:0.58 (Discount bonds) and 1:0.40 (Pars). Holders of Par and Discount bonds also received a cash payment equal to the present value of their U.S. collateral. Past due interest and principal were repaid in cash, while accrued interest (interest owed since the last scheduled coupon payment) was exchanged, at par, for a new Republic bond with a fixed coupon of 12%, maturing in 2012. Bondholders could also elect to exchange their principal for this shorter bond rather than the 2030 bonds at the cost of a further 35% discount relative to the face value of the 2030 bonds. The aggregate amount of 2012 bonds was limited to US$ 1.25 billion, and holders of Eurobonds and shorter dated Brady bonds were given priority in the allocation of the 2012 bonds.

Assumptions

As in the case of Pakistan, Ukraine (2000) and the Russian Prins/IANs exchange, the newly issued Eurobonds traded immediately after the exchange, and discount rates for the old instruments were computed by interpolating those yields, in line with the remaining life of the old instruments. For Pars and Discounts, principal and last 12 months of interest were discounted using a US long rate (5.81%).

Argentina: ''Phase 1'' exchange, November 2001

Terms

In November 2001, after several attempts at balancing the budget and avoiding a restructuring of debt obligations, the government decided to seek a debt restructuring. It was planned in two stages. ''Phase 1'' would be targeted at domestic residents, ''Phase 2'' at nonresidents; this phase never materialized as planned. Incentives to maximize resident participation included favorable accounting rules for banks and pension funds, which were allowed to value the new instrument at par rather than mark it to market. ''Phase 1'' offered local bondholders ''guaranteed'' loans governed by Argentine law, which carried lower interest payments and longer maturities than the outstanding bonds. The ''guarantee'' of the loans would be revenues collected through the financial transaction tax; moreover, bondholders were given the option of recovering the original bonds if any of the terms and conditions of the guaranteed loans were changed in the future. Creditors were given 1–3 options, depending on the instrument tendered. One option was a fixed rate loan in which interest rates would be reduced by 30% relative to the original rate, with a cap at 7% per annum. In addition, maturities would be extended, by 3 years, on shorter term instruments. Interest payments were to be monthly, to match interest payments with the collection of the financial transaction tax. For floating rate bonds similar

conditions were imposed, with the cap set at Libor plus 300 basis points. The third option was a capitalizing loan with maturity in 2011; only few bonds were offered this alternative.

Assumptions

From the perspective of computing haircuts, Argentina's Phase 1 exchange poses unique challenges. The number of old and new instruments involved was much larger than in any previous exchange, and there was no secondary market for the new domestic instruments immediately after the exchange. As a result, the methodology used in most previous computations – to discount both new and old payment streams with the maturity-adjusted "exit yield" – cannot be applied. Instead, our approach is to compare the old and new payments streams using two alternative discount rates that arguably constitute upper and lower bounds, respectively, for the true, unobservable, exit yield, as follows.

First, the old instruments continued to be held by nonresident and some resident bondholders, and were traded after the exchange. Because the government had announced that the new instruments would in effect be treated as senior – the intention was to restructure the old instruments in a second phase while attempting to service the new ones – these yields can be regarded as an upper bound for the unobservable yield of the new instruments. Maturity differences between new and old instruments are handled by discounting the new guaranteed loans using the yield on the old bond with the closest average life, adjusted by the US T-bill yield curve when the two did not match perfectly.

Second, the government eventually issued post-default debt in U.S. dollars, "Bodens", which began trading in September 2002. By comparing the yields on the Boden 07 (a post-default, fairly liquid paper denominated in indexed pesos) and a guaranteed loan of similar average life, one can compute a "liquidity premium" associated with the guaranteed loans, which we estimate at 2.7%. This is then added to the yield of the Boden 2012 which started trading in September 2002, making small yield curve adjustments using the US T-bill yield curve when appropriate. Since by September 2002 much legal and political uncertainty had been resolved and the economy was rapidly recovering, this constructed yield will almost certainly understate what the yield would have been in November of 2001. The results in Table 2 are averages between the results based on these two set of discount rates.

A further complication is that the payment stream for some floating rate bonds is difficult to project. While forward rates are readily available for the LIBOR, some Argentine bonds were indexed to local rates that do not have a forward curve. In those cases, we took the actual payments these bonds would have made as long as we have the information and keep this value frozen thereafter. A sole exception is the "FRAN", which was indexed to the yield of Argentine debt; thus, we valued this bond at par at the time of the exchange.

Argentina: "Pesification", February 2002

Terms

In February 2002, the government decided to "pesify" the guaranteed loans that had been issued in November 2001, as well as all other dollar denominated domestic law debt instruments. Dollar instruments would be redenominated in local currency at 1.40 pesos/US$, with a promise to index capital and interest payments by inflation. As the peso/US$ exchange rate was close to 1.90 at the time, this entailed a substantial loss. In addition, interest rates were further reduced for most of the instruments, with all, except for those with the longest maturity, set at 2%. Maturities were left unchanged. While there was no exchange – the terms

of domestic law instruments were simply changed by fiat – investors were given the option to return to the defaulted foreign currency bond they had exchanged during "Phase 1".

Assumptions

We discount the original dollar denominated instruments using the yield of dollar denominated instruments at the time, while the cash flow of the new local currency instruments are discounted by the yield on the indexed peso bonds. As mentioned above, guaranteed loans commanded a slightly higher yield relative to bonds with the same characteristics, reflecting their lack of the liquidity; hence, they are discounted at a slightly higher rate. The final step is to convert the peso net present values into dollars using the current exchange rate of 1.9 pesos/US$, so they can be compared to the present value of the old instruments.

Argentina: external debt exchange, January–February 2005

Terms

Following "Phase 1" and pesification, there remained a large stock – about US$ 80 billion – of unrestructured international debt issued prior to the default, held mostly by nonresidents and some residents which had not tendered in the Phase 1 exchange. An exchange offer emerged by September of 2004, entailing a "menu" of three securities – a par bond with no face value reduction, a discount bond with a high reduction, and a "quasi par" bond in between, each with a detachable "GDP warrant" with payments tied to GDP growth. The exchange opened in January of 2005. The *par bond* could be denominated in CPI-indexed pesos, dollars, euros or yens; with a maturity of 35 years. Coupons would increase from 1.33% in the first 5 years to 2.5 in the next 10, 3.75 in the following 10 and 5.25 thereafter for the dollar bond (0.63%, 1.18%, 1.77% and 2.48%, respectively, for the indexed peso bond). Amortization would take place in 19 half-year installments starting in September 2029. The *discount bond* was exchanged at 33.7% of the original face value, had a maturity of 30 years, and paid a constant interest rate of 8.28% in dollars (5.83% in indexed pesos), part of which capitalized during the first 10 years. It was offered in the same currencies as the par bond, and was to amortize in 20 equal payments beginning in June 2024. Finally, the "quasi par" bond had a maturity of 42 years, was exchanged at 69.6% of face value, had an interest rate of 3.31 that capitalized during the first 10 years, and amortized in 20 semiannual payments starting in 2036. This bond was issued in indexed pesos only, and targeted specifically to Argentine pension funds, which were coaxed into an agreement in which they received the quasi par bond along with regulatory benefits. A minimum of 350,000 dollars was required to bid for this bond, imposing a constraint on retail investors. In contrast, a *maximum* of 50,000 dollars per holder of each issue was set for the par bond, as a way of forcing larger holders to the discount bond, which with a haircut of 66.3% provided the largest debt relief in terms of face value.

In order to de-dollarize the debt, owners of any instrument could opt for indexed pesos bonds. The currency conversion was done at the exchange rate prevailing on December 31, 2003, the formal issue date of the bond. The new bonds would pay interest beginning at this date, which would be paid out in cash at settlement. Unpaid and accrued interest through December 31, 2001 (the default date) would also be included. There was no recognition, however, for unpaid interest due between December 2001 and December 2003 – the only instance, among the debt restructurings covered in this paper, when past due interest was not recognized in some form.

Assumptions

The offer closed on February 25. Although settlement did not begin until early June – reflecting litigation by holdouts that delayed the originally envisaged April 1, 2005 settlement date – a gray "when and if" market in promises to deliver the new bonds after settlement sprung into existence immediately after preliminary exchange results were announced on March 3, 2005. Using the prices and yields in this market, as well as the yields of other performing post-default debt, it is possible to calculate the haircuts following the methodology of Section 2.

Uruguay: external bond exchange, May 2003

Terms

In early 2003, the government decided to launch a debt exchange, geared mainly to extending the maturity of the debt and improve the liquidity of existing instruments. The exchange targeted all traded debt (about half of total sovereign debt). Eligible securities comprised (i) 46 domestically issued bonds and treasury bills, accounting for US$ 1.6 billion in principal; (ii) 18 international bonds, accounting for US$ 3.5 billion; and (iii) one "Samurai" bond issued in Japan, accounting for about US$ 250 million.

The external bond exchange offered most bondholders a choice between two options. First, a *maturity extension option*, under which each bond could be exchanged by another with similar coupon and extended maturity (in general, 5 years longer than the original), mixed in some cases with a 30 year bond, which capitalized part of the interest earned over the first 4 years. Second, a *benchmark bond option*, under which investors received one of a smaller number of new bonds that were longer dated but more liquid. Three external and four domestic benchmark bonds were issued, with maturities ranging from 7 to 30 years. Some of the bonds had step-up coupons, geared to creditors trading out of floating rate bonds. These benchmark bonds were designed to be attractive not only to institutional investors but also to index-tracking funds, on the premise that the new issues would be large enough to be included in international indices. In addition, some bondholders were offered small upfront cash payments to compensate for accrued interest on the old bonds (there was no past due interest or principal). Holders of two collateralized Brady bonds (the 2021 par "Series A" and "Series B bonds") received the present value of the principal repayment in cash.

Assumptions

Secondary market prices are not available for some of the new bonds that were part of the menu (either because they were illiquid or because they were in fact not issued due to lack of interest). However, prices and hence exit yields are available for all fixed coupon US dollar denominated and for the two euro denominated bonds. Using these, we compute the haircuts, for each old instrument and each of the two exchange options, using the yield of the new instrument received to discount the old cash flows.

Uruguay: domestic bond exchange, May 2003

Terms

Uruguayan domestic bonds prior to the May 2003 exchange were denominated in US dollars and consisted of treasury bills coming due within the next 12 months, medium and long term variable rate bonds indexed to LIBOR, and five fixed rate government bonds coming due

between 2005 and 2012. Treasury bill holders received 15% in cash, with the remainder traded either into a 5.25% fixed rate bond maturing in 2006, or a step-up coupon bond maturing in 2010 (benchmark option). Floating rate bonds could choose between a floating rate "extension bond" indexed to LIBOR with a maturity extension of generally 5 years, or a slightly longer dated benchmark bond with step-up coupon. Bonds maturing in 2003 received some cash payments, but those maturing in 2004 or later did not. Finally, fixed rate bondholders generally had a choice between a fixed 7.5 coupon bond and a step-up coupon bond, with maturity extensions of 5–8 years.

Assumptions

Uruguay's floating rate bonds tendered at the 2003 exchange were equipped with a put option which allowed bondholders to ask for early repayment of up to 10% of principal on each annual anniversary of the issue date. When computing the net present value of these instruments at the time of the exchange, we assume that these put options would have been exercised in full, in light of the relatively high sovereign yield of about 14% prevailing at the time.

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