IMF Working Paper

Long-Term Returns in Distressed Sovereign Bond Markets: How Did Investors Fare?

Prepared by Jochen Andritzky and Julian Schumacher[1]

Authorized for distribution by Vitaliy Kramarenko

July 2019

Abstract

Sovereign debt restructurings are perceived as inflicting large losses to bondholders. However, many bonds feature high coupons and often exhibit strong post-crisis recoveries. To account for these aspects, we analyze the long-term returns of sovereign bonds during 32 crises since 1998, taking into account losses from bond exchanges as well as profits before and after such events. We show that the average excess return over risk-free rates in crises with debt restructuring is not significantly lower than the return on bonds in crises without restructuring. Returns differ considerably depending on the investment strategy: Investors who sell during crises fare much worse than buy-and-hold investors or investors entering the market upon signs of distress

Contents   Page

List of Tables

List of Figures

I. INTRODUCTION

Government bond restructurings can inflict sizable losses on creditors. Cruces and Trebesch (2013) suggest that investors participating in bond exchanges since the 1970s suffered present value haircuts of 40 percent on average, with the losses in Argentina (2005) and Greece (2012) topping the league. However, from an investor perspective, a bond restructuring captures only the negative return at a single moment in time. A longer-term perspective would also take into account the returns earned before a debt exchange, and the potential recovery in sovereign bonds' market value after a crisis is resolved. In this paper, we compute such long-term returns of sovereign bonds issued by countries affected by financial crises and undergoing bond restructurings. Analyzing a newly assembled bond-by-bond dataset on 32 emerging market debt crises, we find that in the longer term, investors fare reasonably well in distressed sovereign debt markets – even if the losses resulting from bond restructurings are taken into account.

This finding underpins the idea that debt restructuring is not just a zero-sum wealth transfer from creditors to debtors. By improving debt sustainability, debt restructuring can bolster confidence and reduce debt overhang, in turn supporting the economic recovery and possibly bolstering growth (Reinhart and Rogoff, 2010). Thus, a restructuring that facilitates a transition from a crisis equilibrium with high spreads and encumbered market access to a non-crisis equilibrium of low spreads and restored market access may offer upside not only to debtors, but also to creditors, at least in the longer run (Claessens, 1990; Claessens and Van Wijnbergen, 1993; Cohen, 1990; Krugman, 1988; Sachs and Huizinga, 1987).

Why do we observe debt restructuring only in very few debt crises? Restructurings are commonly associated with costs such as domestic financial instability (Gennaioli, Martin, and Rossi, 2014), capital market exclusion (Cruces and Trebesch, 2013), trade distortions (Rose, 2005), legal action by creditors (Schumacher, Trebesch, and Enderlein, 2018), or fear of political instability (Borensztein and Panizza, 2009; Funke, Schularick, and Trebesch, 2016). One further explanation could be that sustaining debt service has a disciplining effect, facilitating economic reforms. These factors seem to often outweigh the expected benefits from debt restructuring from the policymaker's point of view.

Based on a newly assembled dataset on sovereign bond returns, we shed new light on the effects of debt restructuring on creditors by analyzing whether investment returns differ between crises that were resolved with or without debt restructuring. We combine daily price observations for 274 bonds from a number of sources and match these with the security-

specific terms from eleven sovereign debt restructurings, mostly derived from original debt offer documents. Using this new dataset, we calculate the total excess returns earned by investors in emerging market government bonds over risk-free rates for different investment horizons in sovereign debt crises of the last two decades. We compute the bonds' market value as well as all cash flows on a daily basis. We then compare crises that were resolved by means of a bond exchange with crises that did not include a debt restructuring. Furthermore, we calculate total excess returns for investment horizons resembling typical investor types, such as long-term buy-and-hold investors, investors bound by investment mandates who sell during crises and buy during recoveries, or distressed debt investors doing roughly the opposite. We also calculate and compare long term returns using the full sample of available bond returns over up to 20 years.

Our dataset explicitly includes the (at times substantial) coupon payments, amortization payments, and additional payoffs such as cash transfers or GDP-linked warrants following a bond exchange. We calculate the total return both on a bond-by-bond level as well as in the form of market-weighted country indices. When evaluating investment returns of crises involving bond exchanges, we distinguish between restructurings mainly consisting of a maturity extension to address a liquidity crisis ("reprofiling") and restructurings aiming at debt reductions to address solvency concerns ("face value cut"; see also IMF 2014, and Andritzky 2006). Using a consistent methodology to date 32 crisis episodes in 24 emerging market countries, we compare returns from seven countries undertaking a debt reprofiling and four countries pursuing a face value cut with 21 crisis episodes where no debt restructuring took place.

We address the following questions. First, how do long term returns differ between sovereign debt crises which involved maturity extending sovereign bond restructurings with or without principal haircut, compared to sovereign debt crises without a restructuring? Over a long time window of about 15 years, a bond portfolio of crisis countries undergoing restructurings yielded about the same total gross return like a portfolio of crisis countries without restructuring. Both portfolios roughly doubled in value. Looking at shorter time windows around single crisis episodes, average annualized excess returns are 3.5 percentage points higher when no restructuring takes place compared to crisis periods with any type of restructuring. While annualized excess returns in crisis episodes without restructuring reach 2.4 percent, returns drop to -0.1 percent where a reprofiling takes place, and -2.6 percent where a face value cut was implemented. However, given the large variation of returns between crisis episodes, most of these differences are insignificant.

Second, how do different investors fare if bound to specific investment horizons, such as due to rating or spread thresholds? Some investment mandates include explicit rating requirements, which set thresholds under which bonds need to be divested. Other investors do not wish to hold bonds in distress and sell into falling markets once a crisis breaks, while possibly losing out on the upside during the recovery. We therefore compare hypothetical returns of a portfolio of countries undergoing crises and restructurings, differentiating investors who sell at crisis start ("constrained investor") and investors who buy at crisis start ("distress investor"). Our results suggest that constrained investors fare worse by selling into crises than when holding on to the bonds, except when a face value cut is later imposed. Distressed debt investors reap very significant upsides which are highest if no restructuring follows, and lowest when a reprofiling is implemented.[1] To take into account the differences in volatility, we also calculate Sharpe ratios. Compared to a long term buy-and-hold strategy, distress investors achieve a better risk-return relationship while constrained investors fare worse.

Third, we exploit the security-level dimension of our dataset to see if bond characteristics such as coupons or maturities matter for the returns of different investor types over the crisis horizon. Regression results from about 100 bonds in our sample suggest that coupon, bond size and remaining maturity do not make a significant difference for any investor type, both when looking at crisis periods only or looking at the entire sample. The result also holds when using crisis fixed effects.

The remainder of this paper is structured as follows. The following section reviews the related literature. Section III introduces our data and describes the methodology of dating crises and calculating returns. Section IV discusses the results. Section V draws conclusions.

II. LITERATURE

A small but in recent years growing literature has looked into the question whether sovereign debt returns in non-crisis times can offset losses during crises, and thereby incentivize creditors to lend to risky issuers. The most comprehensive analysis is provided by the recent contribution of Meyer, Reinhart, and Trebesch (2018) who analyze more than 1,500 sovereign foreign-currency bonds over the past 200 years. Over this period and including all years of default, major wars, and global crises, Meyer, Reinhart, and Trebesch (2018) find a 4 percent annual excess return above US or UK government bonds.

---

[1]This ex post calculation of returns uses mid prices and does not consider the bonds' actual tradabilty or trading costs.

A number of papers has focussed on historical episodes of investor returns in bonds issued by foreign governments, using instrument-level data. Madden, Nadler, and Sauvain (1937) and Eichengreen and Portes (1986) compute internal rates of return for the interwar era, finding little evidence for excess returns over US and UK risk-free rates. Lindert and Morton (1989) and Eichengreen and Portes (1989) put these findings in perspective by comparing returns in pre-World War II eras against investment returns in the 1970s and 80s. They provide evidence that while the yield to maturity at issuance ("ex ante" return) promised a significant spread over US and UK government rates, the realized ("ex post") excess rates of return, after taking into account losses from default and renegotiation, proved only marginally positive.

A few papers have specifically estimated long-term investment returns in more recent times. Klingen, Weder, and Zettelmeyer (2004) using aggregate debt flows rather than bond-by-bond data, analyze the ex post realized returns of private investors between 1970 and 2000, thereby taking into account both creditor profits as well as losses from restructurings. Their main result is similar to the historical studies: excess ex post returns are negligible, suggesting that high returns in good times compensate investors for losses in crisis situations. Cohen (1992) comes to a similar conclusion for the Latin American debt crises of the 1980s.

Other papers covering the era of bond financing have mostly focused on analyzing yields and spreads, rather than returns. Starting with contributions by Edwards (1984, 1986) this strand of the literature has researched fundamental determinants of sovereign borrowing rates and risk premia (Boehmer and Megginson, 1990; Hilscher and Nosbusch, 2010; Longstaff and others, 2011; Mauro, Sussman, and Yafeh, 2002; Zhang, 2008), mostly for credit and liquidity risk (Beber, Brandt, and Kavajecz, 2009; Duffie, Pedersen, and Singleton, 2003). Most of these analyses use data for benchmark yields or CDS premia and do not investigate the variation between securities.

Our approach extends the analysis in Andritzky (2006), at that time the first instrument-level analysis of ex post returns of restructured bonds. Including crises without restructurings (and extending the dataset), our paper elaborates on the initial findings by comparing different types of sovereign debt crisis resolution from the perspective of different types of bond investors. To the best of our knowledge, the only paper that encompasses ours is Meyer, Reinhart, and Trebesch (2018), written in parallel to our analysis. Relative to their study, we analyze daily rather than monthly returns, allowing a more precise mapping of debt restructuring events to bond prices. We furthermore offer a unique focus on crisis periods and different types of crisis resolution, Finally, our focus on holding period returns that resemble different investor types provides new insights into the profitability of investment strategies in crisis

countries. Our finding that excess returns are marginal in our sample of crisis cases is in line with existing evidence from previous episodes. However, we show creditor returns in sovereign bond markets with credit risk depend crucially on the investor type and the respective investment horizon. While our contribution to the literature is empirical, this can be informative for theoretical models of sovereign debt featuring investors with heterogeneous preferences or facing individual constraints.

III. DATA AND METHODOLOGY

In this section, we first describe how crisis episodes are defined. In a second step, we outline the calculation of total bond returns that also account for losses from potential debt restructurings.

A. Crisis episodes

The analysis focuses on the modern era of sovereign bond restructurings, which started with the Russian debt crisis in 1998 (Sturzenegger and Zettelmeyer, 2006).[2] After the 1930s, when bonded debt by European and Latin American countries defaulted in large volumes, sovereign bonds had enjoyed a de facto seniority status for decades. The debt crises of the 1980s involved mostly non-marketable debt held by commercial banks, for which reliable market prices barely exist, and total returns cannot be easily estimated. Only the resolution of these crises by the Brady plan in the early 1990s and the increasing number of countries issuing bonds on international capital markets in the following years created the environment in which bond investors became involved in sovereign debt crises again.

Our sample covers 32 crises since 1998. About half of all crises were stand-alone debt crises, with the rest also related to currency or banking crises (see figure 1). The sample distinguishes crises that were addressed by means of a debt restructuring and those that did not. In line with the methodologies of credit rating agencies, we consider as a restructuring a distressed debt exchange in which creditors receive instruments with less-favorable terms than the original issues. We further distinguish between restructurings that included a notable reduction in principal ("face value cut") and those in which the main element was an extension of repayment

---

[2]Given our focus is on long term returns, recent sovereign debt crises (like Argentina 2013-2015 and Ukraine in 2015) or ongoing distress cases (such as Venezuela since 2008) are not included.

dates ("reprofiling").[3] For non-restructuring crises, we rely on sovereign spreads over risk-free rates and credit ratings as market indicators. As the post-crisis recovery is a key element of our analysis, recent or ongoing crises or restructuring cases could not be included in the sample. The analysis therefore does not include advanced economies during the recent euro area debt crisis. The conclusions we draw thus apply only to emerging markets.

Figure 1. Types of crises

Debt crises

Argentina 1998
Argentina 2008
Belize 2007 (R)
Belize 2008
Belize 2013 (R)
Brazil 2001
Bulgaria 1998
Colombia 2002
[Cote d'Ivoire 1997-2001 (R)]
[Ecuador 2009 (buyback)]
Gabon 2008

[Georgia 2008]
Grenada 2005 (R)
Iraq 2008
Jamaica 2008
[Morocco 1998]
Pakistan 1999 (R)
Pakistan 2008
Serbia 2008
Seychelles 2010 (R)
Sri Lanka 2008
Venezuela 1998/2001
Vietnam 2008

Colombia 1998
[Kazakhstan 2008]
Lebanon 1998-2001

Brazil 1998
Ghana 2008
Nigeria 1998
Venezuela 2001
[Venezuela 2008-2010]

Argentina 2005 (R)
Dominican Rep. 2005 (R)
Ecuador 2000 (R)
[Malaysia 1998]
Russia 2000 (R)
Turkey 2001
Ukraine 2000 (R)
Ukraine 2008
Uruguay 2003 (R)

[China 1998]
[Croatia 1998]
[Hungary 2008]
[Nigeria 2009]
[Russia 2008]

[Korea 1997-1998]
[Philippines 1997-1998]
[Thailand 1997-1998]

[Belarus 2009]

Banking crises

Currency crises

Notes: Overview of crises in market access countries since 1998 as indicated by membership in JPM EMBI index. Banking and currency crises from Laeven and Valencia (2012). To label crises, we use the year of the crisis start or of the debt operation (following Cruces and Trebesch (2013) updated dataset). Debt crises from own composite crisis trigger. (R) marks restructurings considered in this paper. [] marks cases not included in our sample.

Based on these indicators, we determine the start and end dates of the crisis periods as follows:

---

[3]This classification follows Andritzky 2006. "Face value cut" and "reprofiling" in this paper are used as umbrella terms and do not rule out that the restructuring did not contain other elements.

- *Sovereign spreads above 1,000 basis points.* Crisis periods are counted as those weeks during which sovereign spreads as measured by JP Morgan's Emerging Markets Bond Index (EMBI)[4] exceed 1,000 basis points on at least five consecutive trading days. Temporarily lower spreads during periods of up to 150 trading days are disregarded to avoid splitting crises into several events.

- *Sovereign ratings below B2/B.* Crisis start dates are defined as downward rating revisions to or below B2 (Moody's) or B (Standard and Poor's, Fitch), respectively. Crisis end dates are defined as upward rating revisions to above B2/B. If ratings by more than one rating agency are available, we use the lowest rating to make the event window as wide as possible.

These two criteria are combined in a composite crisis indicator by choosing the earlier date of the two criteria as crisis start and the later date as crisis end, respectively.[5] The resulting composite criteria reflects the most comprehensive and consistent choice.

Table 1 shows the resulting sample of 32 crisis periods, distinguishing sovereign bond restructurings with and without face value cuts as well as periods of bond market distress where no restructuring occurred.[6] The episodes identified by our methodology tend to capture a larger universe of crises in market access countries than previous studies relying only on the rating cycle (IMF, 2014) or spreads (Cottarelli and others, 2010; Pescatori and Sy, 2007). While in 20 crises, countries drew on IMF resources, in 12 crises countries did not.

Our use of criteria to define crises tries to limit qualitative or judgemental analysis which is typically needed to identify debt crises (Claessens and Kose, 2013). However, endogeneity concerns may arise from the use of risk spreads or ratings, both for determining the existence of a debt crises as well as dating it. Nevertheless, spreads are an important determinant

---

[4]The EMBI country indices are market-value weighted averages of a country's outstanding tradeable foreign-currency securities.

[5]For completeness, we also considered notable absence of major primary market issuance as indicator of crises. Using Dealogic data, we distinguish major issuances from rolling of short-term debt by focusing on larger volumes, typically in excess of US$500 million, with a medium- to long-term maturity. The problem with this indicator is, however, that a longer period without issuance may not mark a lack of market access due to a lack of creditor interest, but could also reflect low financing needs on behalf of the borrower, bearing in mind many small issuers in our sample. Furthermore, in some cases countries may not have the need to tap market after a crisis for some while. Therefore, we rely on the market access criteria only as a robustness check.

[6]The crises in Georgia, Malaysia, Morocco, Kazakhstan are excluded due to lack of data, as are the crises with restructurings in Cote d'Ivoire and Jamaica. The Ecuador buyback in 2009 has also been excluded due to its different nature. Lebanon and Pakistan (1998) are included in the results reported on country-level but are excluded from the results on bond-level because no bond covers the entire crisis period.

Table 1. Countries and crisis dates

	Rating			Spread				IMF program
	Start	End	IMF 2014	Start	End	PS 2007	CFGM 2010	
No restructuring								
Argentina (1998)			N	24.08.1998	28.09.1998	N	Y	Y
Argentina (2008)	11.08.2008	13.09.2010	N	29.09.2008	27.07.2009	n/a	N	N
Belize (2008)			N	12.11.2008	08.03.2010	n/a	N	N
Brazil (1998)	03.09.1998	16.10.2000	Y	17.08.1998	12.10.1999	Y	N	Y
Brazil (2001)	12.08.2002	09.09.2004	N	09.07.2001	07.04.2003	Y	Y	Y
Bulgaria (1998)			N	17.08.1998	26.10.1998	N	N	Y
Colombia (1998)			Y	08.09.1998	13.10.1998	N	Y	N
Colombia (2002)			N	16.09.2002	15.10.2002	N	Y	Y
Gabon (2008)			N	20.10.2008	06.04.2009	n/a	N	Y
Ghana (2008)			N	20.10.2008	11.05.2009	n/a	N	N
Iraq (2008)			N	28.11.2008	20.04.2009	n/a	N	Y
Jamaica (2008)	18.11.2008[3,4]		Y	01.12.2008	11.05.2009	n/a	N	N
Lebanon (2001)	30.07.2001[2]	13.04.2010[2]	Y	22.04.2002	25.11.2002	N	Y	N
Nigeria (1998)			N	10.08.1998	21.07.2003	Y	Y	N
Pakistan (2008)	15.05.2008[1]	24.08.2009[1,9]	Y	25.08.2008	03.08.2009	n/a	N	Y
Serbia (2008)			N	17.11.2008	26.01.2009	n/a	N	Y
Sri Lanka (2008)	15.12.2008[1]	14.09.2010[1]	Y	29.09.2008	25.05.2009	n/a	N	Y
Turkey (2001)	23.02.2001[1]	09.02.2004[3]	Y	26.03.2001	04.09.2001	N	Y	Y
Ukraine (2008)	24.10.2008[1]	29.07.2010[1]	Y	29.09.2008	28.12.2009	n/a	N	Y
Venezuela (1998/2001)	03.09.1998[2]	12.08.2005[1]	Y	03.08.1998	09.06.2003[11]	Y	N/Y	N
Vietnam (2008)			N	20.10.2008	24.11.2008	n/a	N	N
Reprofiling								
Belize (2007)	05.08.2004[2]	20.02.2007[1,10]	Y			N	N	N
Belize (2013)	04.08.2011[1,5]	20.03.2013[1,9]	Y	04.07.2011	25.03.2013	n/a	n/a	N
Dominican Republic (2005)	01.10.2003[1]	22.04.2010[2]	Y	20.10.2003	01.11.2004	n/a	Y	Y
Grenada (2005)	08.10.2004[1]	18.11.2005[1,9]	Y			n/a	N	N
Pakistan (1999)	01.06.1998[1]	22.11.2006[2]	Y			Y	Y	Y
Ukraine (2000)	09.09.1998[2]	10.11.2003[2]	Y			Y	Y	Y
Uruguay (2003)	26.07.2002[1]	21.12.2006[2]	Y	08.07.2002	12.05.2003	N	Y	Y
Face Value Cut								
Argentina (2005)	28.03.2001[2]	02.10.2006[1]	Y	16.04.2001	13.06.2005	Y	Y	Y
Ecuador (2000)	[6]	[6]	Y	10.08.1998	17.05.2004	Y	Y	Y
Russia (2000)	13.08.1998[2]	19.12.2001[1]	Y	22.06.1998	14.05.2001	Y	Y	Y
Seychelles (2010)	01.08.2008[1,7]	08.08.2014[3]	Y			n/a	n/a	Y

[1] S&P.   [2] Moody's.   [3] Fitch.   [4] Rating downgrade to B.   [5] Rating downgrade from B to B-.
[6] Rating trigger disregarded given crisis end exceeds maturity of restructured bonds.   [7] First rating downgrade, from B to CCC.
[8] Rating upgrade to B/B2.   [9] Rating upgrade to B-.   [10] S&P upgrade to B to avoid overlap with Belize (2008).
[11] Splits into two crisis periods (03 Aug 1998 to 20 Sep. 1999 and 24 Sep. 2001 to 09 Jun. 2003) based on spreads.
 Sources: Bloomberg, IMF, JP Morgan, Moody's, S&P; Cottarelli and others (2010), IMF (2014), Pescatori and Sy (2007).

for risk and return potential, rendering it an important indicator for investors (Pescatori and Sy, 2007). Ratings tend to lag spread movements but have frequently been used to date debt crises, particularly their end (Claessens and Kose, 2013). The sample of debt crises shows large overlaps with previous papers using differing methodologies (Cottarelli and others, 2010; IMF, 2014). By using a long horizon by including data for roughly half a year each before crisis start and after crisis end, we can assume that ex ante it was not absolutely obvious for investors that a crisis will start or end at that particular time. Also, robustness checks

indicate the general results are not different whether using spreads or ratings as crisis indicator.

B. Bond returns

The crises described in the previous section affected 274 bonds issued by 24 emerging market countries. For each of these bonds, prices and static bond data are sourced from JP Morgan's Morgan Market database, with missing observations filled with data from Bloomberg, which we also use for US Treasury benchmark rates. We consider only instruments denominated in US dollars. Information about the debt operations are gathered from offer documents and other secondary sources including IMF reports, Andritzky (2006), Sturzenegger and Zettelmeyer (2006), Cruces and Trebesch (2013).

We calculate a time series of daily total returns taking into account quoted bond prices, accrued interest (as long as applicable as per the industry body Emerging Markets Trader Association, EMTA[7]), paid coupons, and cash and quoted prices of instruments received in debt exchanges. We follow market practice and use bid-quotes to approximate the market price.[8] Cash received is assumed to be reinvested. The total return index captures the returns of an initial investment normalized to 100. At current prices and accrued interests, this means the investor holds a nominal amount FV of bond i at time t of:

$$
FV_{it} = \begin{cases} 100 \times \frac{100}{P_{i0} + AI_{i0}} & \text{if } t = 0 \\ FV_{i,t-1} \times \left(1 + \frac{C_{it} + AM_{it}}{P_{it} + AI_{it}} - \frac{AM_{it}}{100} \right) & \text{if } t > 0 \end{cases} \tag{1}
$$

where P_{it} denotes the market price, AI_{it} is the accrued interest in the current interest period, C_{it} the paid coupons in period t and AM_{it} any principal repayments (amortization payments). The total return index measures the daily market value of the nominal holdings of this bond:

$$
TR_{it} = \frac{FV_{it}}{100}(P_{it} + AI_{it}) \tag{2}
$$

---

[7]Market convention in non-crisis times is that while dealers quote "clean" prices as the percentage of face value, the actual transactions take place at "dirty" prices, consisting of the sum of the clean price and the accrued interest in the current coupon period. An investor holding a positive coupon bond therefore earns a positive return every day even if the quoted price does not change. However, for distressed bonds, market convention is to trade bonds at clean prices, without considering the accrued interest, since the payment of the pending coupon is uncertain. The change in market practice is usually announced by EMTA. For each crisis, we follow this convention and do not consider accrued interests in the return calculation once market convention changes to trading at clean prices.

[8]This is in line with, for example, JP Morgan's EMBI methodology.

Daily total returns are given by the percentage change in this index, $r_{it} = TR_{it}/TR_{it-1} - 1$. To calculate excess returns, we deduct the return of a corresponding investment in US Treasury bonds $r_{US,t}$ from daily gross total returns:

$$ER_{it} = r_{it} - r_{US,t} \qquad (3)$$

We approximate $r_{US,t}$ by linearly interpolating US Treasury total return indices to bond i's remaining maturity on a daily basis.[9] Bond gross and excess returns are then aggregated by country using weights according to original outstanding principal of the instruments in our sample. If a restructuring offered a menu of options, we build the average of returns.

IV. RESULTS

The following section discusses first results for the entire sample period and the entire crisis episodes similar to those of a buy-and-hold investor. Secondly, results are shown for partial crisis periods to reflect the investment behavior of risk-averse or constrained investors and risk-loving or distress investors. Thirdly, we discuss insights from analyzing individual bonds' returns.

A. Long-term returns

Figure 2 gives a broad overview of our results, showing the development of four return indices over the longest comparable sample period: the widely used EMBIG, the broadest index of emerging market sovereign bonds which includes debt issued by countries that are classified by the World Bank as having low or middle per capita income; an index of bonds issued by crisis countries in our sample that did not resolve their crisis with a restructuring; an index of bonds issued by crisis countries that implemented a reprofiling during the sample period; and an index of bonds issued by crisis countries that completed a restructuring with a nominal face value reduction.

Three stylized insights can be derived from the data. First, investors in countries experiencing sovereign debt crises have realized lower returns compared to the broad market index. Second, investing in bonds issued by emerging market economies was profitably even if countries experienced a sovereign debt crisis: while performing much weaker than the EMBIG,

---

[9]We use US Treasury total return indices from Bloomberg for the 1, 3, 5, 7, 10, 20, and 30 years to maturity tenors.

Figure 2. Cumulative returns by crisis resolution type
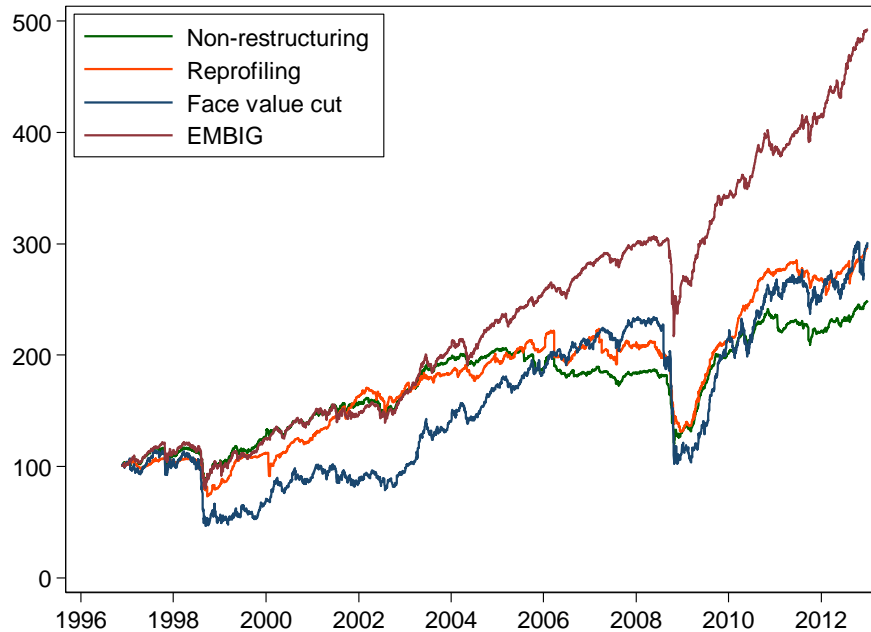
Notes: The graph plots the EMBIG broad country index as well as three aggregate crisis-country indices aver-
aged over the three groups of countries in our sample undergoing no restructuring, a reprofiling only, or a face
value cut. All four indices are normalized to the first observation of the reprofiling index, which is the youngest
index, starting in November 1996 (see also Table 1 for the timing of crisis episodes in the three subgroups).
Note that the EMBIG is a market-value weighted index, while the other indices uses outstanding principal
weighting.

the indices of crisis countries still roughly doubled between the mid-1990s and 2013.[10] Third,

long-term returns do not display much difference whether countries resolved the crisis with-

out a restructuring, by implementing a reprofiling or a face value reduction – the three crisis-

country indices developed roughly similarly throughout the sample period, even though with

variations during different episodes.

Next, we analyze more systematically if the observed small differences between the three

sub-groups are statistically significant. To that end, we analyze long-term returns covering

the most comprehensive time period. This reflects a buy-and-hold investment strategy that

---

[10]The large valuation gains realized by the EMBIG suggests that our sample period captures a period of gen-
erally high returns during a period when emerging market bonds evolved into a mainstream asset class. This
development may have supported the sizable recovery rallies after crises and may have limited the long-term
penalty on defaulting debtors.

includes periods of distress without regard to market conditions or credit rating. Specifically, we consider two holding periods:

- "Full sample" encompasses the returns of our entire sample, covering a time period of 15.3 years on average. As outlined above, price data starts from as early as 1990 (for Brazil) or first available data point. Data ends November 2013 for most series, except for Belize and Seychelles which we extended to 2016 to capture the end of crises. The portfolio is being rebalanced to include newly issued bonds proportional to outstanding amounts per issuer. Cashflows in the form of coupons or amortizations are reinvested into the (remaining) portfolio of outstanding securities by the same government.

- "Crisis episodes" encompass the crisis periods, as defined above, and a time window of 100 trading days – roughly half a year – before and after to capture potential post-crisis recoveries. The portfolio consists of bonds outstanding at time of the episode start, weighted by outstanding amounts per issuer. Payouts received are reinvested into the (remaining) portfolio.

Table 2 provides an aggregated overview of the resulting country-level returns for the entire sample and by type of crisis. All results are based on country-level indices weighted by outstanding amount of the underlying bonds. Average simple returns suggest large gains in all subsamples for the crisis countries. However, the crisis episodes differ in length and global macroeconomic conditions, and thus annualized excess returns offer a more comparable metric. On average, sovereign bonds of countries that suffered debt crises in our sample returned 4.8 percent per year in nominal terms, which is less than similar calculations by Meyer, Reinhart, and Trebesch (2018) for a global portfolio of 732 sovereign bonds from 62 countries, most of which did not endure debt crises, in the period 1994-2016. The average excess return of 1.4 percent per year over comparable US Treasuries over our entire sample period slightly exceeds the estimates by Klingen, Weder, and Zettelmeyer (2004) for the period 1970-2000 which includes the era of bank financing and Latin American debt crisis during the 1980s and early 1990s.

By type of crisis resolution, the highest annualized excess returns (both in the full sample and during crisis episodes) are realized during crises without restructuring, while the lowest annualized excess return occurred during crises with face value cuts. For countries undergoing reprofiling operations, the annualized excess return amounts to 0.8 percent over the entire sample period or -0.1 percent over the crisis episodes. However, even investors holding bonds

Table 2. Long-term returns in sovereign bond markets experiencing crises

| | Full sample period | | | | Crisis episodes[1] | | | |
| | Simple | | Annualized | | Simple | | Annualized | |
	Gross	Excess	Gross	Excess	Gross	Excess	Gross	Excess
All								
Mean (%)	103.0	38.7	4.8	1.4	26.8	10.8	5.3	1.3
SD (%)	75.3	66.6	3.6	3.1	40.7	31.5	7.5	6.7
Obs	28	28	28	28	32	32	32	32
No restructuring (A)								
Mean (%)	88.2	40.7	4.7	2.0	20.9	10.2	6.5	2.4
SD (%)	58.9	52.7	3.3	2.2	23.3	15.1	6.6	5.9
Obs	18	18	18	18	21	21	21	21
Reprofiling (B)								
Mean (%)	126.9	55.1	4.8	0.8	39.6	22.6	3.0	-0.1
SD (%)	102.1	93.3	5.1	5.3	60.9	46.5	10.2	8.5
Obs	6	6	6	6	7	7	7	7
Face value cut (C)								
Mean (%)	133.4	5.2	5.6	-0.1	35.4	-6.6	3.2	-2.6
SD (%)	101.8	87.2	3.2	2.3	73.2	60.7	7.6	6.8
Obs	4	4	4	4	4	4	4	4
Difference of means tests								
(A) vs. (B) and (C)	-41.3	5.5	-0.4	1.5	-17.2	-1.8	3.4	3.5
(A) vs. (C)	-45.2	35.5	-0.9	2.0	-14.5	16.8	3.3	5.1
(A) vs. (B)	-38.7	-14.4	-0.1	1.2	-18.7	-12.4	3.5	2.5
(B) vs. (C)	-6.5	49.9	-0.8	0.9	4.2	29.2	-0.2	2.6

Notes: This table reports returns computed according to section 3.2. Daily bond-level returns are averaged by country, weighted by the bonds' issue amount. All values in percent.
[1]**+/- 100 trading days around start/end**

with principal reductions did not lose on average in comparison to an investment in risk-free assets over the full sample period. Annualized excess returns of -0.1 percent over the entire sample period or -2.6 percent over the crisis episodes appear much more moderate than the loss given default at the point in time of a restructuring, such as measured by haircuts in net present value terms. While in individual cases even long-term investors incurred significant losses, it is remarkable that a portfolio of government bonds from issuers suffering debt crises fared very well, even when there are sovereign bond restructurings.

The lower panel of Table 2 provides statistical tests of the differences in returns between crisis types. The difference in annualized excess returns during crisis episodes between the no-restructuring cases and crises with restructuring amounts to 3.5 percent. Bearing in mind the

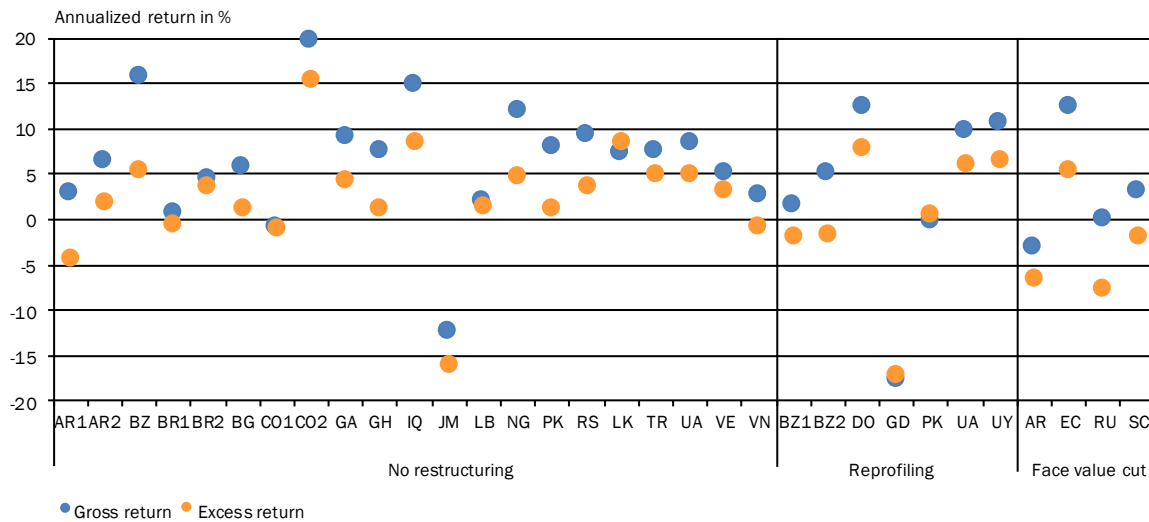**Figure 3. Returns during full sample period**
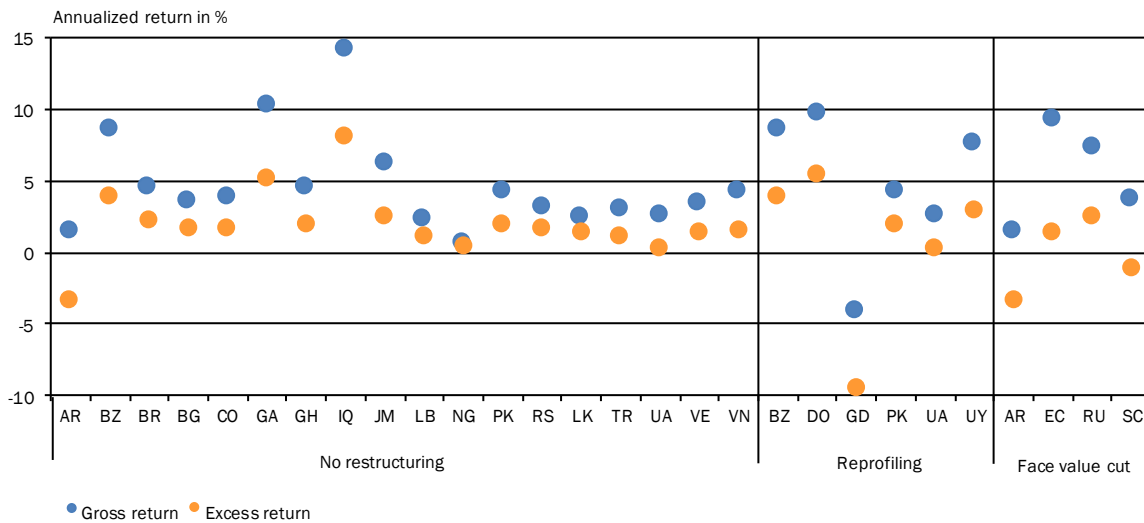
Notes: Chart shows mean returns from two menu options offered at the bond exchanges in Argentina (2005), Ecuador (2000), and Uruguay (2003). Crises in Venezuela 1998 and 2001 collapsed into a single observation. No restructuring: AR=Argentina (1998, 2005[R], 2008), BZ=Belize (2007[R], 2008, 2013[R]), BR=Brazil (1998,2001), BG=Bulgaria (1998), CO=Colombia (1998,2002), GA=Gabon (2008), GH=Ghana (2008), IQ=Iraq (2008), JM=Jamaica (2008), LB=Lebanon (2001), NG=Nigeria (1998), PK=Pakistan (2008), RS=Serbia (2008), LK=Sri Lanka (2008), TR=Turkey (2001), UA=Ukraine (2008), VE=Venezuela (1998/2001), VN=Vietnam (2008). Reprofiling: BZ=Belize (2007[R],2008,2013[R]), DO=Dominican Republic (2005), GD=Grenada (2005), PK=Pakistan (1999), UA=Ukraine (2000), UY=Uruguay (2003). Face value cut: AR=Argentina (1998, 2005[R], 2008), EC=Ecuador (2000), RU=Russia (2000), SC=Seychelles (2010).

limited sample size, the large variance of country-level bond returns renders this and all other differences shown in the table insignificant at a 10 percent level. This suggests that country circumstances or factors other than the observation whether a restructuring took place may explain different investment outcomes.

Figure 3 illustrates country-level results for gross and excess annualized returns for the full sample. Overall, country level excess returns remained in a narrow range between zero and 2.5 percent for 17 out of the 28 crisis cases.[11] The variation is lower for crisis countries without restructuring, where 14 out of 18 crisis cases fall into this range. With one exception, annualized excess returns are bound between zero and 5 percent for the six reprofiling cases,

---

[11]Some large and varying differences between gross and excess returns are explained by price swings of US Treasury benchmarks and the different length of the observation periods. Note that countries with multiple crises are repeated in each category, such as Argentina with its history of debt crises and its default in 2001/02 followed by a large face value cut in 2005.
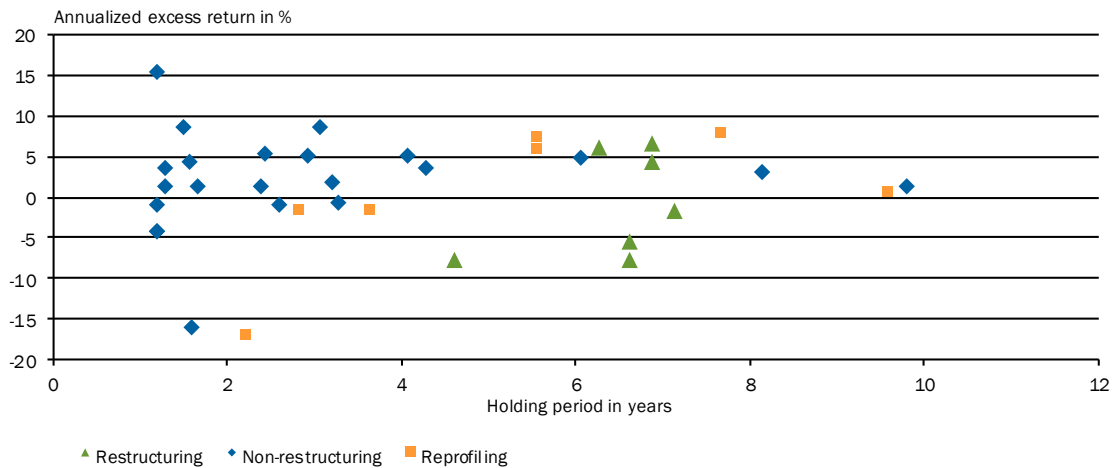
Figure 4. Returns during crisis episodes

Notes: Graph shows mean returns from two menu options offered at the bond exchanges in Argentina (2005), Ecuador (2000), and Uruguay (2003). Crises in Venezula 1998 and 2001 collapsed into a single observation. No restructuring: AR1=Argentina (1998), AR2=Argentina (2008), BZ=Belize (2008), BR1=Brazil (1998), BR2=Brazil (2001), BG=Bulgaria (1998), CO1=Colombia (1998), CO2=Colombia (2002), GA=Gabon (2008), GH=Ghana (2008), IQ=Iraq (2008), JM=Jamaica (2008), LB=Lebanon (2001), NG=Nigeria (1998), PK=Pakistan (2008), RS=Serbia (2008), LK=Sri Lanka (2008), TR=Turkey (2001), UA=Ukraine (2008), VE=Venezuela (1998/2001), VN=Vietnam (2008). Reprofiling: BZ1=Belize (2007), BZ2=Belize (2013), DO=Dominican Republic (2005), GD=Grenada (2005), PK=Pakistan (1999), UA=Ukraine (2000), UY=Uruguay (2003). Face value cut: AR=Argentina (2005), EC=Ecuador (2000), RU=Russia (2000), SC=Seychelles (2010).

and between -4 to 3 percent for the four cases of face value cuts.[12] Note that large negative excess returns are only observed for Argentina and, to a smaller extent, Seychelles.

Figure 4 shows annualized returns for the narrower time window of crisis episodes. Returns are more dispersed, although a large fraction (41 percent) of excess returns remains range bound between zero and 5 percent. Besides Grenada (2005), Jamaica's (2008) protracted crisis resulted in high losses to investors. Large gains in Colombia (2002) and Iraq (2008) coincided with relatively short crisis episodes of 14 and 18 months, respectively.

In the case of the repeated crises in Belize, the reprofilings in 2007 and 2013 yielded negative annualized excess returns of -1.8 percent and -1.7 percent, respectively, while a positive annualized excess return of 5.3 percent was realized during its 2008 crisis that followed on the

---

[12]In Grenada (2005), investors incurred a large market value loss during the crisis, yet after an initial recovery prices have collapsed again and trade at very low levels in 2013, the end of the observation period.

Figure 5. Returns during crisis episodes by length of investment period

Notes: Based on aggregate country returns by crisis episode. Showing separate observations for returns from two menu options offered at the bond exchanges in Argentina (2005), Ecuador (2000), and Uruguay (2003). Crises in Venezula 1998 and 2001 collapsed into a single observation.

back of the first restructuring. The crisis episodes in the Dominican Republic (2005), Ukraine (2000), and Uruguay (2003) yielded fairly high returns, which may at least in the case of the Dominican Republic and Uruguay be related to their reprofilings which imposed very moderate net present value losses (Cruces and Trebesch, 2013).

Returns are very mixed for cases involving face value cuts. Argentina (2005) and Russia (2000) imposed severe haircuts that left investors with negative annualized excess returns, even after factoring in post-restructuring rallies. The large positive return related to the Ecuador (2000) exchange is driven by the performance of the very long dated exchange bond maturing in 2030. However, president Correa later labeled the debt exchange as "illegal" and "intransparent" to justify the 2008 default, upon which investors were offered a buyback at 35 percent of face value in 2009.[13]

Portfolio theory suggests that the variance of returns declines with longer investment horizons. Figure 5 plots annualized returns along the duration of the holding period. Given the elevated volatility at the height of crises, we would expect that returns during short (albeit possibly intense) crises may show a greater variance than returns during drawn-out crises. The standard deviation of returns during holding periods of two years or shorter is 8.4, for

---

[13]Our sample includes the decline in market prices to around 30 cents on the dollar prior to the default, but ends after November 2008. Since, market prices have fluctuated greatly.

Figure 6. Total crisis-episode return against change in NPV from restructuring
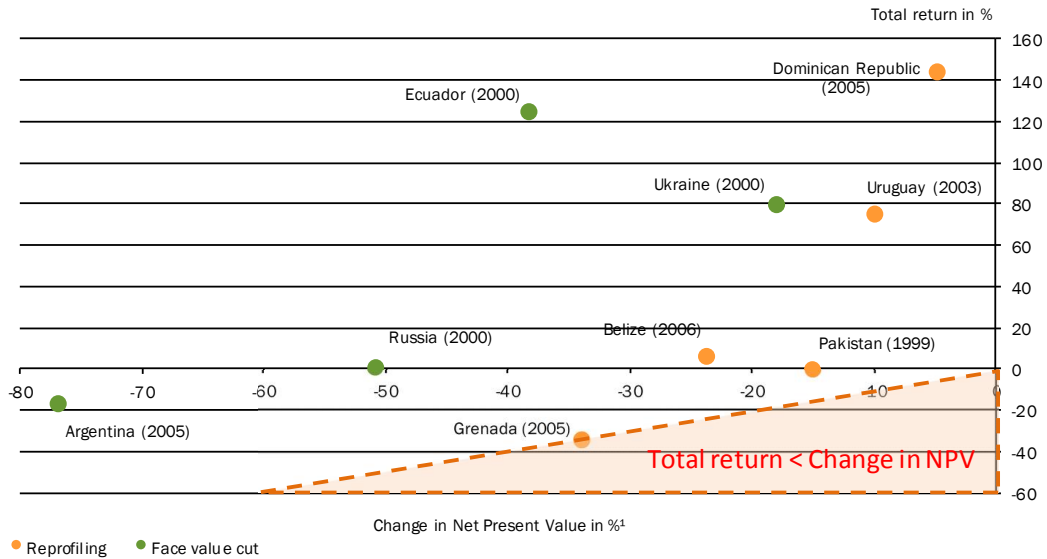
Notes: Figure shows total gross return during crisis episodes plotted against net present value loss [1] Haircut estimates by Cruces and Trebesch (2013).

more than two and up to four years is 6.9, for more than four and up to six years is 6.0, and for more than six years the standard deviation is 5.0. This decline is smaller than a decline by the square root of time as theory suggests when volatility is assumed to be constant over time. Thus, drawn out crises seem to be associated with disproportionately higher volatility. Certainly, this observation cannot answer the question whether the crisis duration is related to the severity of the crisis, a delay in crisis resolution, or other factors.

Figure 6 plots the total gross return against the implied net present value change in debt operations based on calculations by Cruces and Trebesch (2013). In all cases with the exception of Grenada (2005), ex post realized returns were more favorable than the calculated net present value loss of the restructuring. In other words, country-level returns lie in all but one case clearly above an ascending 45 degree line through the origin. The distance from this line is largest for cases including face value cuts, for which the net present value loss is largest. This is consistent with the idea that face value cuts improve debt sustainability most drastically, and post-crisis rallies may at least partly offset the higher net present value loss of the restructuring.

**Table 3. Sharpe ratios of long-term returns in distressed bond markets**

	Full sample period		Crisis episodes	
	Excess return	Sharpe ratio	Excess return	Sharpe ratio
All	4.23	0.49	3.26	0.20
	[2.66; 5.82]	[0.08; 0.90]	[1.53; 5.00]	[0.11; 0.29]
No restructuring	4.75	0.55	4.26	0.24
	[2.94; 6.54]	[0.07; 1.01]	[2.21; 6.31]	[0.13; 0.35]
Reprofiling	3.17	0.21	3.38	0.21
	[1.89 4.46]	[0.12; 0.29]	[-0.23; 6.98]	[0.02; 0.39]
Face value cut	-2.79	-0.08	-3.39	-0.08
	[-4.82; 0.77]	[-0.14; -0.02]	[-8.03; 1.24]	[-0.21; 0.05]

Notes: The table reports the average Sharpe ratio over all bonds in our sample. The ratio is defined as ER/σ_{ER}, where ER represents the excess return as in eq. (3) and σ_{ER} the sample standard deviation of that excess return. All values in percent. Values in brackets indicate the 95% confidence interval around the estimated mean.

Table 3 reports the excess returns at bond-by-bond level and puts them in context to the observed volatility in our sample period. The table reports the average excess return as well as the average Sharpe ratio, computed as the excess return over the volatility of excess returns over all bonds in our sample. The average excess return of all bonds in our sample and throughout the entire sample period is slightly above 4 percent, with a Sharpe ratio of 0.49; these values are very similar to the results in Meyer, Reinhart, and Trebesch (2018). Bonds that were not restructured returned about 1.6 percentage points more per annum than bonds undergoing a reprofiling; while this means that annualized excess returns were about one third lower in reprofiled bonds, the difference was considerably larger in risk-adjusted terms. Bonds that were restructured with a face value cut had negative excess returns on average and were also the least profitable in risk-adjusted terms. During crisis episodes, the difference between unrestructured and reprofiled bonds becomes notably smaller; in risk-adjusted terms, the difference is negligible.

B. Returns of constrained and distressed investors

Crises nevertheless involve significant swings in the bond prices. Not all investors have the opportunity to sit out crises episodes. To shed more light on returns during sub-periods of our crisis episodes, we next look at returns during different investment periods. To make this more illustrative, we calculate hypothetical returns for different holding periods – determined ex post – that resemble two fundamentally different investment styles as shown in Figure 7.

Figure 7. Stylized investment periods by investor type
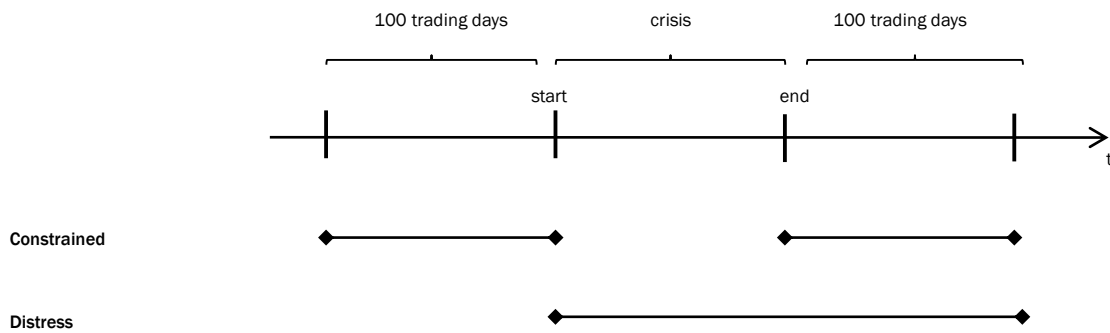
- The *constrained* investor characterizes a risk adverse portfolio which is subject to investment constraints from market conditions or ratings. Investors are therefore assumed to having invested 100 trading days prior to the crisis start date. The portfolio is liquidated at crisis start, and re-invested at crisis end. This portfolio is then held for 100 trading days.[14] During the crisis period, funds are invested in the risk free benchmark.

- The *distress* investor is acquiring a portfolio upon a signal of distress as defined by our crisis start date, thus avoiding some of the downside but entering the market at times of high risk. Therefore it is assumed that the investor buys the portfolio at the crisis start and liquidates it 100 trading days after crisis end. For comparison with the hypothetical portfolio of the constrained investor, it is assumed that funds are invested in the risk free benchmark prior to the distress signal.

Figure 8 illustrates the resulting annualized excess returns of two investor types during crisis episodes. While constrained investors avoid some volatility during the crisis period, they are likely to capture some downside and miss at least part of the recovery. On average, the constrained investors yield annualized excess returns close to zero. Distress investors fare better, often by a very large margin. Notably, distress portfolios perform better than constrained portfolios in all three types of crisis resolutions.

Comparing simple averages, the difference is largest for crises without restructurings, and smallest for reprofilings:[15] While in crises without restructurings, constrained investors' an-

---

[14]Results are broadly robust to varying the 100 trading day window before crisis start and after crisis end.
[15]We also run these calculations using the full sample period. Given multiple crises in a few countries, results are harder to interpret but do not contradict findings based on crisis episodes.

nualized excess return is -1.4 percent, distress investors reap a whopping 33 percent on average. This large average is driven by large gains during a few distress periods, particularly those taking place during the Global Financial Crisis such as Iraq (2008), Gabon (2008), or Vietnam (2008). During reprofilings, constrained investors realize an average annualized excess return of -3.5 percent compared to 7.9 percent for distress investors, a relatively small difference compared to the other types of crisis resolution. During restructurings with face value cuts, constrained investors yielded an annualized excess return of 0.9 percent in contrast to 28.0 percent for distress investors. Sizable differences are observed in all four cases. Surprisingly, annualized excess returns of constrained investors did not exceeding the narrow range of 0.1 to 1.4 percent.

Figure 8. Excess returns for constrained and distress investors during crisis episodes
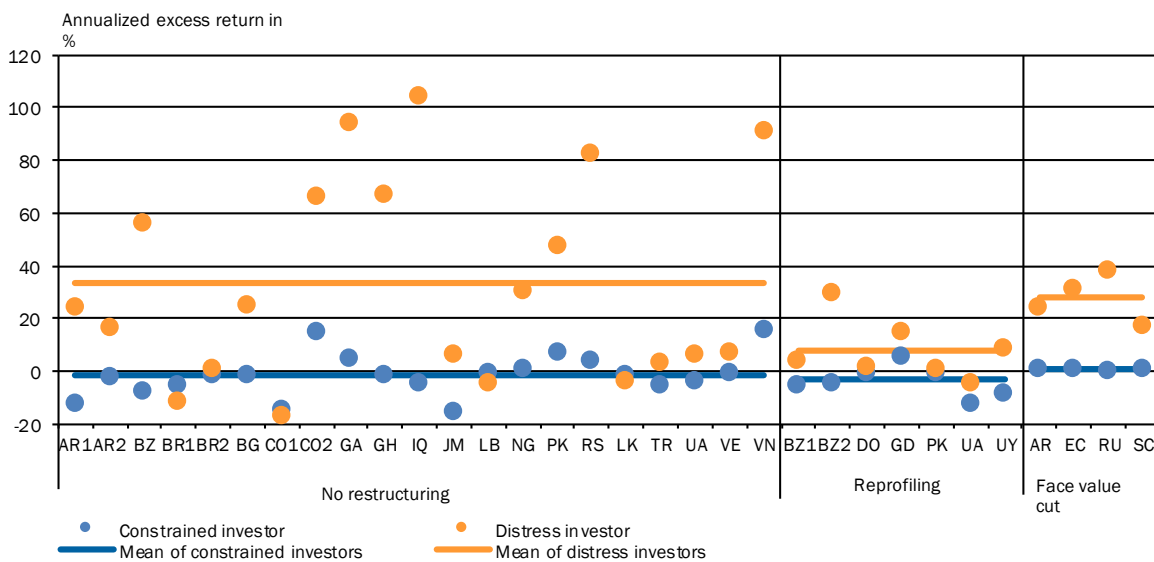
Notes: No restructuring: AR1=Argentina (1998), AR2=Argentina (2008), BZ=Belize (2008), BR1=Brazil (1998), BR2=Brazil (2001), BG=Bulgaria (1998), CO1=Colombia (1998), CO2=Colombia (2002), GA=Gabon (2008), GH=Ghana (2008), IQ=Iraq (2008), JM=Jamaica (2008), LB=Lebanon (2001), NG=Nigeria (1998), PK=Pakistan (2008), RS=Serbia (2008), LK=Sri Lanka (2008), TR=Turkey (2001), UA=Ukraine (2008), VE=Venezuela (1998/2001), VN=Vietnam (2008). Reprofiling: BZ1=Belize (2007), BZ2=Belize (2013), DO=Dominican Republic (2005), GD=Grenada (2005), PK=Pakistan (1999), UA=Ukraine (2000), UY=Uruguay (2003). Face value cut: AR=Argentina (2005), EC=Ecuador (2000), RU=Russia (2000), SC=Seychelles (2010).

Do the higher returns compensate for the higher risk taken? To answer this question, we set the empirically observed excess returns over risk-free US Treasury rates in relation to realized

excess volatility (Sharpe ratio).[16] Table 4 reports the results. During the crisis episodes, the buy-and-hold investor realized an average annualized return of 3.3 percent at a Sharpe ratio of 0.2, somewhat lower than a portfolio of (risk free) UK and US government bonds in the period 1994-2017 based on Meyer, Reinhart, and Trebesch (2018). In contrast, a constrained investor realizes an average annualized return of -1.8 percent at a Sharpe ratio of -0.1. The distress investor, realizing an average annualized return of 17.2 percent at a Sharpe ratio of 0.9 fares best by far.

Table 4. Sharpe ratio of returns by investor type

	Excess return (annualized)	Sharpe ratio
Unconstrained	3.26	0.20
	[1.53; 5.00]	[0.11; 0.29]
Constrained	-1.75	-0.06
	[-3.30; -0.19]	[-0.15; 0.03]
Distressed	17.22	0.89
	[13.43; 21.01]	[0.65; 1.12]

Notes: The table reports the average Sharpe ratio over all bonds in our sample during crisis episodes, distinguishing between the unconstrained, constrained, and distress investment periods. The Sharpe ratio is defined as ER/σ_{ER}, where ER represents the excess return as defined in eq. (3) and σ_{ER} the sample standard deviation of that excess return. All values in percent.

The differences in the risk-return relationship between the investor types points to a large and possibly convex risk premium, reflecting the risk aversion of investors. In addition, liquidity premia may play a role: markets liquidity can drain during crisis times. Hence, constrained investors sell at prices further depressed by illiquid market conditions which potentially benefits potential distress investor buying at that time.

C. Bond-by-bond returns

The micro-dimension of our dataset allows analyzing if investment returns in sovereign bonds during crisis episodes depend on bond characteristics. For this part of the analysis, we organize the data in a crisis-bond-date dataset, such that for each of the 32 crises in our sample we take into account all bonds with sufficient pricing data during the crisis episode. Some bonds enter the analysis multiple times if they experience more than one crisis until maturity or if they were exchanged for a new instrument which becomes subject to a subsequent crisis

---

[16]For this calculation, we use the simple average of individual bonds, therefore obtaining a different weighting than in the country indices.

episode. Overall, we observe around 100 bonds during the narrow definition of crisis episodes in our sample.

Table 5 shows regressions results of the relation between returns, crises, and bond characteristics for different investor types with and without country fixed effects. As the previous analysis already suggested, idiosyncratic features of each crisis may drive the large difference in returns between crises, which is captured by the fixed effects in columns (2), (4), (6), and (8) of Table 5 and which explains the much larger explanatory power of these regressions. In contrast, the introduction of dummies for reprofilings and face value reductions in the other regressions results in a rather poor fit, consistent with the earlier analysis.

Table 5. Cross-sectional determinants of bond-by-bond returns

	Unconstrained				Constrained		Distressed	
Coupon	0.12	0.23	-0.11	0.23	-0.07	-0.04	0.11	0.06
	(0.36)	(0.39)	(0.33)	(0.39)	(0.31)	(0.25)	(0.88)	(0.55)
Log(size)	1.69	-0.10	1.63	-0.10	0.18	-0.86	-0.76	0.28
	(1.15)	(0.78)	(1.03)	(0.78)	(0.99)	(0.56)	(2.12)	(1.36)
Floating	-0.88	-0.92	1.54	-0.92	-0.75	-0.97	-5.32	-1.10
	(1.79)	(1.61)	(2.10)	(1.61)	(1.43)	(0.83)	(5.42)	(2.29)
Time to maturity	-0.08	0.10	-0.02	0.10	-0.12	0.01	0.09	0.33**
	(0.13)	(0.09)	(0.11)	(0.09)	(0.11)	(0.06)	(0.22)	(0.14)
Reprofiling	1.31		-0.92		-4.50*		-8.87*	
	(2.70)		(2.43)		(2.40)		(4.67)	
Face value cut	-8.59***		-9.67***		3.00***		-21.92***	
	(2.84)		(2.63)		(0.94)		(3.51)	
EMBIG excess return			1.12***	0.78***				
			(0.19)	(0.24)				
Constant	-30.61	-5.69	-39.06*	-3.76	-2.87	7.78	35.64	32.54
	(23.64)	(18.54)	(21.42)	(18.12)	(20.66)	(13.50)	(42.72)	(32.13)
Crisis fixed effects	N	Y	N	Y	N	Y	N	Y
R2	11%	82%	37%	82%	6%	91%	13%	88%
No. Bonds	103	103	103	103	103	103	113	113

Notes: The table shows the results from a regression of the annualized excess return during crisis episodes (+/- 100 business days before/after the start/end of the crisis). Robust standard errors are presented in parentheses below the coefficient estimates. The sample definitions in the three panels (unconstrained, constrained, distressd) follow the definition of investment horizons presented above.

Given the bond-level regression differs from the comparisons of country-level returns in Table 2, the dummies can only be interpreted in context of individual bonds. Therefore, the circumstances of countries with a large number of outstanding bonds, such as Argentina and Brazil, dominate in the analysis. This may drive the significance of the coefficients for re-

structuring dummies. For the buy-and-hold investment style, the coefficient for bonds undergoing reprofilings remains insignificant while the coefficient for face value cuts is significantly negative. For constrained and distress investment styles, the bond-level regression yields a slightly negative coefficient for reprofilings. As constrained investors avoid the haircut but may capture part of the recovery and distress investors fully absorb the face value cut, the dummy turns out significantly positive for constrained investors but significantly negative for distress investors. However, the coefficients cannot be interpreted in isolation to conclude anything about the realized return without also taking into account the other coefficients.

The empirical model in Table 5 includes furthermore the average coupon rate, an indicator variable for floating-rate bonds, the log of the bond issuance size (in US\$ billion), and the residual time to maturity at the start of a crisis episode (in years). In many cases, sovereign debt restructurings apply a similar maturity extension to bonds with short and long residual maturities. Hence, short-dated bonds may be expected to be relatively more negatively affected by a restructuring. In contrast, bonds with high coupons and lower duration may ensure that investors' capital investment is recouped faster than lower-coupon bonds by the same issuer that are sold at stronger discounts. However, none of the coefficients show strong significance for any investment style. This result suggests that following our approach of including total valuation changes, intercreditor equity between holders of different bond series is not violated on average. While the pooled regression may be too crude to tease out more precise differences, the overall result suggests that there is no systematic pattern of bond characteristics that is related to different investment returns during crisis episodes. One reason may be that valuation changes even out the differences, for instance as the short end of the yield curve adjusts more than the long end during the recovery.

V. Conclusion

It is a common notion that sovereign debt restructurings force significant losses on bond investors. These losses are reflected in the market value of sovereign bonds during crisis episodes. While bonds of crisis countries perform worse, our analysis suggests that on average, such mark-to-market losses from debt restructurings are temporary. Conditional on a crisis occurring, whether or not bondholders are "bailed into" the crisis resolution through a bond restructuring or not does not significantly alter longer-term returns. Crisis recoveries are on average associated with strong rebounds of bond prices. Our analysis illustrates what sovereign debt crises and their subsequent resolution imply for bondholders: overall, investors do not seem to fare too badly, and not significantly worse in case of restructurings.

Looking at a longer time window around crises helps putting the implications of debt crises for long-term investors in perspective. While all cases in our sample of emerging markets involve significant losses around the early crisis stage, in most cases recoveries partly make up for them. Even though the earned excess returns above the risk-free rate is not very large, in most cases it still remains positive, suggesting that the risk premium compensates investors over the long run even in a sample of debtor countries suffering from crises, even on a risk-adjusted basis derived from Sharpe ratios. While on average we observe a higher annualized excess return for crises without restructurings than for crises including reprofilings or face value cuts, the large variation of outcomes and the small sample size render these differences insignificant at a country level.

One explanation may be the economic recovery following crises, in particular when restructurings have helped to overcome a debt overhang situation. If this is the case, the debt operation helps to move a country from an equilibrium of high spreads and low valuations to one of low spreads and high valuations. While the latter state is preferable from a debtor's perspective, implying lower debt service and possibly better growth prospects, the transition from the "bad" to the "good" equilibrium also entails upside for the investor. This upside is captured in our calculations for long-term investor returns during crisis episodes. Calculations of the net present value loss inherent in debt operations exclude this aspect, although the prospect of post-crisis recovery may be instrumental in getting creditors to participate in debt exchanges.

A distinction between investment periods covering the unfolding crises and the recovery reveals that investors who sell at crisis start and re-enter the market after crisis-end fare much worse than investors who keep their portfolios. These hypothetical investment results hold when comparing the risk-return relationship based on Sharpe ratios. This is partly to be expected given that we use ratings and spreads as indicators of crises, both of which have little predictive power for future financial crises (Reinhart, 2002; Sy, 2004). As a result, even risk-averse investors following these indicators will sell too late and incur part of the downside, and likely miss most of the post-crisis rally. Furthermore, market liquidity is low during distress, further depressing prices as the crisis unfolds. However, in our sample of crisis episodes, the risk-averse "constrained" investor type still avoids larger losses and notably fares no worse than the risk-free benchmark in the instances of restructurings involving face value reductions.

These differences in returns illustrate the drawback of investment mandates which are bound by rating thresholds and can lead to forced sales in situations of financial distress. Similarly, prudential investment rules may include loss-inflicting procyclical revaluation triggers. Ac-

counting rules may require portfolios to be revalued upon impairment but not in response to subsequent valuation gains. Such rules have the potential to intensify fire sales and fuel excessive price drops, which in turn benefits distress investors who can pick up bonds at particularly deep discounts. Avoiding asymmetric or even procyclical regulatory requirements could help to preserve market efficiency during crisis times and reduce the risk and severity of investor runs.

In context of different investment styles, we do not find systematic evidence that certain bond characteristics, such as remaining maturity, yield a significantly different return. This result may alleviate concerns about reaching creditor consensus about a restructuring when outstanding bond series have widely varying characteristics.

Overall, our analysis broadens the view from net present value losses through a debt operation to a longer-term perspective that factors in earned risk premia and recovery prospects. In the past, long-term investors were able to realize high (risk-adjusted) returns during sovereign debt restructurings. This return could be interpreted as a premium compensating for the risks associated with a debt operation, such as holdouts causing legal uncertainty. Improvements to the debt restructuring process, for instance through clear procedures, and legal certainty, for instance through collective action clauses, may reduce this premium and make debt restructuring more effective as a crisis resolution tool.

REFERENCES

Andritzky, Jochen, 2006, *Sovereign Default Risk Valuation* (Springer: Berlin).

Beber, Alessandro, Michael W. Brandt, and Kenneth A. Kavajecz, 2009, "Flight-to-Quality or Flight-to-Liquidity? Evidence from the Euro-Area Bond Market," *Review of Financial Studies*, Vol. 22, No. 3, pp. 925–957.

Boehmer, E., and W. Megginson, 1990, "Determinants of Secondary Market Prices for Developing Country Syndicated Loans," *Journal of Finance*, Vol. 45, No. 5, pp. 1517–1540.

Borensztein, Eduardo, and Ugo Panizza, 2009, "The Costs of Sovereign Default," *IMF Staff Papers*, Vol. 56, No. 9, pp. 683–741.

Claessens, Stijn, 1990, "The debt Laffer curve: Some estimates," *World Development*, Vol. 18, No. 12, pp. 1671–1677.

Claessens, Stijn, and M. Ayhan Kose, 2013, "Financial Crises: Explanations, Types, and Implications," Vol. IMF Working Paper No. 13/28.

Claessens, Stijn, and Sweder Van Wijnbergen, 1993, "Secondary market prices and Mexico's Brady Deal," *The Quarterly Journal of Economics*, Vol. 108, No. 4, pp. 965–982.

Cohen, Daniel, 1990, "Debt relief: Implications of secondary market discounts and debt overhangs," *The World Bank Economic Review*, Vol. 4, No. 1, pp. 43–53.

———, 1992, "The Debt Crisis: A Postmortem," in Olivier J. Blanchard and Stanley Fischer (eds.), *NBER Macroeconomics Annual Vol. 7*, pp. 65–114 (MIT Press).

Cottarelli, Mr Carlo, Mr Paolo Mauro, Lorenzo Forni, and Jan Gottschalk, 2010, *Default in today's advanced economies: Unnecessary, undesirable, and unlikely*, 2010-2012 (IMF).

Cruces, Juan J, and Christoph Trebesch, 2013, "Sovereign Defaults: The Price of Haircuts," *American economic Journal: Macroeconomics*, Vol. 5, No. 3, pp. 85–117.

Duffie, D., L. H. Pedersen, and K. Singleton, 2003, "Modeling Sovereign Yield Spreads: A Case Study of Russian Debt," *Journal of Finance*, Vol. 58, No. 1, pp. 119–159.

Edwards, Sabastian, 1984, "LDC's Foreign Borrowing and Default Risk: An Empirical Investigation," *American Economic Review*, Vol. 74, No. 4, pp. 726–734.

Edwards, Sebastian, 1986, "The Pricing of Bonds and Bank Loans in international Markets: An empirical Analysis of Developing Countries' foreign Borrowing," *European Economic Review*, Vol. 30, No. 3, pp. 565–589.

Eichengreen, B., and R. Portes, 1989, "Dealing with Debt: the 1930s and the 1980s," Husain, I. and I. Diwan (eds.), Dealing with the Debt Crisis.

Eichengreen, Barry, and Richard Portes, 1986, "Debt and Default in the 1930s: Causes and Consequences," *European Economic Review*, Vol. 30, No. 3, pp. 599–640.

Funke, Manuel, Moritz Schularick, and Christoph Trebesch, 2016, "Going to extremes: Politics after financial crises, 1870–2014," *European Economic Review*, Vol. 88, pp. 227–260.

Gennaioli, Nicola, Alberto Martin, and Stefano Rossi, 2014, "Sovereign Default, Domestic Banks, and Financial Institutions," *Journal of Finance*, Vol. 69, No. 2, pp. 819–866.

Hilscher, Jens, and Yves Nosbusch, 2010, "Determinants of Sovereign Risk: Macroeconomic Fundamentals and the Pricing of Sovereign Debt," *Review of Finance*, Vol. 14, pp. 235–262.

IMF, 2014, "Annex to Board Paper: The Fund's Lending Framework and Sovereign Debt–Annexes, Annex II: A Review of Sovereign Debt Restructurings Since the 1980s, Table A2," www.imf.org/external/np/pp/eng/2014/052214a.pdf, [retrieved 15 February 2017].

Klingen, Christoph A., Beatrice Weder, and Jeromin Zettelmeyer, 2004, "How Private Creditors Fared in Emerging Debt Markets, 1970-2000," Vol. IMF Working Paper No. 04/13.

Krugman, Paul, 1988, "Financing vs. forgiving a Debt Overhang," *Journal of development Economics*, Vol. 29, No. 3, pp. 253–268.

Laeven, Luc, and Fabian Valencia, 2012, "Systemic Banking Crises Database: An Update," Vol. IMF Working Paper No. 12/163.

Lindert, Peter, and Peter Morton, 1989, "How Sovereign Debt Has Worked," in Jeffrey D. Sachs (ed.), *Developing Country Debt and the World Economy*, pp. 225–236 (University of Chicago Press).

Longstaff, Francis, Jun Pan, Lasse H. Pedersen, and Kenneth Singleton, 2011, "How Sovereign Is Sovereign Credit Risk?" *American Economic Journal: Macroeconomics*, Vol. 3, pp. 75–103.

Madden, John Thomas, Marcus Nadler, and Harry Charles Sauvain, 1937, *America's Experience as a Creditor Nation* (Prentice Hall).

Mauro, Paolo, Nathan Sussman, and Yishay Yafeh, 2002, "Emerging Market Spreads: Then versus Now," *Quarterly Journal of Economics*, Vol. 117, No. 2, pp. 695–733.

Meyer, Josefin, Carmen Reinhart, and Christoph Trebesch, 2018, "Sovereign Bonds since Waterlo," Vol. Paper presented at the 2018 NBER Summer Institute.

Pescatori, A., and A. Sy, 2007, "Are debt crises adequately defined?" *IMF Staff Papers*, Vol. 54, No. 2, pp. 306–337.

Reinhart, Carmen M, 2002, "Default, Currency Crises, and Sovereign Credit Ratings," *World Bank Economic Review*, Vol. 16, No. 2, pp. 151–169.

Reinhart, Carmen M, and Kenneth S Rogoff, 2010, "Growth in a Time of Debt," *American Economic Review*, Vol. 100, No. 2, pp. 573–578.

Rose, A. K., 2005, "One reason countries pay their debts: renegotiation and international trade," *Journal of Development Economics*, Vol. 77, No. 1, pp. 189–206.

Sachs, Jeffrey D, and Harry Huizinga, 1987, *US commercial Banks and the developing Country Debt Crisis* (Brookings Papers on Economic Activity).

Schumacher, Julian, Christoph Trebesch, and Henrik Enderlein, 2018, *Sovereign Defaults in Court* (ECB Working Paper, forthcoming).

Sturzenegger, Federico, and Jeromin Zettelmeyer, 2006, *Debt defaults and lessons from a decade of crises* (Cambridge: MIT Press).

Sy, Amadou NR, 2004, "Rating the rating agencies: Anticipating Currency Crises or Debt Crises?" *Journal of Banking & Finance*, Vol. 28, No. 11, pp. 2845–2867.

Zhang, Frank X., 2008, "Market Expectations and Default Risk Premium in Credit Default Swap Prices," *Journal of Fixed Income*, Vol. 18, No. 1, pp. 37–55.