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Analyzing Debt Sustainability

Concepts and Tools Applied for Guinea, Rwanda, and Senegal

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It is now widely recognized that a sustainable debt is a precondition for sustainable development. Indeed, levels of debt that are not sustainable may have significant negative implications not only for the ability of governments to provide basic services to their populations, but also for investment and growth, in what is commonly referred to as a *debt overhang*.[1] The existence of a debt overhang in many of the poorest countries was the main rationale for debt relief under the Heavily Indebted Poor Countries (HIPC) Initiative. Furthermore, the importance of achieving sustainable debt is also reflected in the addition of debt sustainability to the set of Millennium Development Goals.

As described in the first chapter of this book, the analysis of a country's debt sustainability is a complex task that many times encounters problems related to (1) establishing the actual debt outstanding and future debt-service obligations;[2] (2) defining appropriate sustainability indicators; and (3) projecting future macroeconomic variables like gross domestic product (GDP), exports, interest rates, inflation rates, and exchange rates. These projections are crucial because any serious debt sustainability analysis is necessarily forward-looking and highly sensitive to changes in macroeconomic variables.

This case study illustrates the key concepts and complexities of any practical debt sustainability analysis (DSA) for three West African countries: Guinea, Rwanda, and Senegal. Following this introduction, we begin with an overview of the main debt sustainability indicators as they typically are used in practice. We then provide a brief historical review of previous and current debt relief initiatives and illustrate how they have been applied in each of our three countries. The main debt sustainability analyses will be provided in the fifth and sixth sections where we will use a recently developed, Excel-based simulation tool, SimSIP Debt.[3] In the fifth section we project a variety of debt indicators for each of the countries using SimSIP's Debt Projection Module, and the subsequent section explains the rationale behind SimSIP's Deficit-Debt Consistency Module and applies it to our countries. The various assumptions used and the results presented are for illustrative purposes and should not be interpreted as the authors' projections. Finally, the chapter ends with some concluding remarks.

Review of Previous and Current Debt Relief Initiatives

This section provides a brief review of the main approaches used to implement debt relief in developing countries. We start by reviewing traditional debt relief initiatives through Paris Club arrangements, and continue with the debt sustainability criteria used in the HIPC framework.

Traditional Debt Relief

Traditional debt relief refers to that provided to low-income countries through three Paris Club arrangements, named after the city in which the Group of Seven met.[4] At or shortly after that meeting, the Paris Club agreed to new terms of debt relief: (1) debt relief under *Toronto terms*, providing a 20–33 percent net present value (NPV) debt reduction on eligible debt-service flows (October 1988 to June 1991); (2) debt relief under *London terms*, providing a 50 percent NPV debt reduction on eligible debt-service flows (December 1991 to December 1994); and (3) debt relief under *Naples terms*, providing a 50 percent NPV debt reduction on eligible debt-service flows and/or debt stocks for developing countries with a GDP per capita above $500, and a 67 percent NPV debt reduction on eligible debt-service flows and/or debt stocks for developing countries with a GDP per capita below $500, (in effect since January 1995).

The periods shown in parentheses above indicate the planned time in which the terms were supposed to be implemented. However, implementations of Paris Club debt relief is not automatic; rather, it is based on case-by-case decisions of the Paris Club, usually conditional on a variety of economic performance criteria. Although each Paris Club agreement (Toronto, London, and Naples terms) provided a different set of options for the delivery of debt relief, there are some broad similarities among the three:

- The debt reduction (DR) option implies an NPV debt reduction through cancellation of either some part of eligible debt stock or some eligible flows of debt service, and a rescheduling of the remaining to market rates.
- The debt-service reduction option implies an NPV debt reduction through the rescheduling of either eligible debt stock or eligible flows of debt service to a reduced interest rate.
- The long-maturities option implies no NPV reduction, but rather a rescheduling of eligible maturing flows of debt service to market rates with a relatively long grace period.

Debt relief under London and Naples terms provided one additional option, capitalization of moratorium interest. This option implies that some interest payments could be rescheduled over some years, including a grace period. Whereas debt relief under Toronto terms was provided only on eligible debt-service flows (usually for the three years following a Paris Club agreement), debt relief under London terms introduced the cancellation or rescheduling of eligible debt stock, although no such stock-of-debt operation took place under London terms. Stock-of-debt operations, however, are in effect under Naples terms. The details of the debt reductions on the stock of debt and on debt service (flows) for countries with a GDP per capita below $500 are provided in table 10.1. For developing countries with a GDP per capita above $500, appropriately adjusted terms provide an NPV debt reduction of 50 percent.

Debt relief provided by the Paris Club covers external bilateral debt that (1) is public and publicly guaranteed (PPG), (2) is not official development assistance (non-ODA), and (3) has been contracted before the cut-off date (COD; usually the date a debtor country has been granted Paris Club debt relief for the first time). All three conditions (PPG, non-ODA, and pre-COD) are summarized and referred to as "eligible" debt. In other words, debt contracted post-COD is not eligible; neither are

Table 10.1. Naples Terms "Two-by-Two" Matrix

	Stock	Flow
DR option	NPV reduction of 67 percent of eligible debt through an appropriate debt stock cancellation. The remaining eligible debt stock will be rescheduled at market rates over a period of 23 years, including 6 years of grace.	NPV reduction of 67 percent of eligible debt through an appropriate debt-service cancellation. The remaining eligible debt service will be rescheduled at market rates over a period of 23 years, including 6 years of grace.
DSR option	NPV reduction of 67 percent of eligible debt through an appropriate debt stock rescheduling at reduced rates over a period of 33 years, including 3 years of grace.	NPV reduction of 67 percent of eligible debt through an appropriate debt-service rescheduling at reduced rates over a period of 33 years, including 0 years of grace.

Source: Authors' construction.
Note: DR = debt reduction; DSR = debt-service reduction; NPV = net present value.

ODA debts, although they are usually rescheduled at the original interest rate over a long period of time, including a grace period. All private debt that is not publicly guaranteed and all multilateral debt is excluded from traditional debt relief. Formally, Paris Club debt relief is conditional on non–Paris Club bilateral creditors providing the same (or better) terms of debt relief, though this condition has never been enforced strictly.

Debt Sustainability Criteria of the Original HIPC Framework

The International Monetary Fund (IMF) and World Bank launched the HIPC Initiative in autumn 1996 (see chapter 1). It was the first comprehensive approach to reducing the external debt of the world's poorest, most heavily indebted countries, and it represented an important step forward in placing debt relief within an overall framework of poverty reduction. HIPC debt relief is available for the group of heavily indebted poor countries—defined as countries that satisfy both of these conditions: (1) they rely on highly concessional financing from the World Bank's concessional lending-arm (the International Development Association),[5] and (2) they face an unsustainable external debt situation after the full application of traditional debt relief mechanisms (the 67 percent NPV reduction on eligible debt stock, regardless of what the country's GDP per capita is). Whereas views on what debt levels constitute debt sustainability have evolved over time (see below),

there are a couple of key elements of the HIPC framework that were adopted with the goal of providing a fair amount of assistance across countries.

First, as a result of the relatively small amount of external private and domestic public debt for the group of HIPCs and the difficulties related to establishing the correct amount and repayment terms of these categories of debt, the HIPC framework has excluded external private and domestic public debt from its DSA. In the cases of Guinea and Rwanda, there is no private external debt that is not publicly guaranteed, although both countries have some small amount of public domestic debt. Senegal has a small amount of private external debt (that is not publicly guaranteed) and a considerable amount of public domestic debt.

Second, the DSA reference point is usually determined to be the end of the fiscal year before the decision point of each HIPC. Because Guinea and Rwanda reached their decision points in December 2000 and use the calendar year as the fiscal year, Guinea's and Rwanda's reference point for the decision point DSA was the end of December 1999. Because Senegal reached its decision point in June 2000 and uses the calendar year as its fiscal year, the proper DSA reference point should have been the end of December 1999. However, because reliable debt data for end-December 1999 were not available and the debt data for end-December 1998 had just been reconciled, it had been decided to use end-December 1998 as Senegal's DSA reference point.

Third, exports exclude workers' remittances[6] and are calculated based on a three-year backward-looking average. In the cases of Guinea and Rwanda, workers' remittances are highly volatile (possibly because of data constraints), but average less than 1 percent of the exports of goods and services. In the case of Senegal, workers' remittances average about 7 percent of goods and services exports. Thus, the inclusion or exclusion of workers' remittances can make a difference in calculating HIPC debt relief.

Fourth, discount rates are the currency-specific commercial interest reference rates (CIRRs), averaged over a six-month period before the DSA reference point as they are published on the Organisation for Economic Co-operation and Development Web site. For currencies without a published CIRR, the HIPC framework uses either the CIRR of the pegged currency or the CIRR for the IMF's special drawing right. The discount rates used for Guinea's, Rwanda's, and Senegal's Enhanced HIPC Decision Point DSAs are provided in each country's HIPC document (available on the HIPC Web site). The rates range from 1.98 percent (for the Japanese yen) to 7.04 percent (for the U.S. dollar).

Under the original framework of the HIPC Initiative (1996–99), sustainable debt-to-export levels were defined at a ratio ranging from 200 to 250 percent (on an NPV basis) at the completion point. The main idea behind this threshold was that it would be detrimental for economies to service foreign debts at higher levels, with resulting pressures on their currency, among other things. For very open economies, however, where the exclusive reliance on external indicators may not adequately reflect the fiscal burden of external debt, an NPV debt-to-export target below the 200–250 percent range could be recommended if the country concerned met two criteria: (1) an export-to-GDP ratio of at least 40 percent and (2) a 20 percent minimum threshold of fiscal revenue in relation to GDP. For countries meeting those criteria, the NPV debt-to-export target was set at a level that achieves 280 percent of the NPV debt-to-revenue ratio at the completion point. Consistent with the HIPC Initiative, the Paris Club extended its previous agreements for HIPCs through the adoption of *Lyon terms* (1996).

Whereas the original framework of the HIPC Initiative yielded some progress, multilateral organizations, bilateral creditors, HIPC governments, and civil society have engaged in an intensive dialogue about its strengths and weaknesses since the inception of the initiative. A major review in 1999 resulted in a significant enhancement of the original framework to provide more and faster debt relief.

Under the enhanced framework (adopted in September 1999), sustainable debt-to-export levels are defined at a fixed ratio of 150 percent (on an NPV basis) at the decision point. For very open economies, an NPV debt-to-export target below 150 percent can be recommended if the country concerned meets two criteria at the decision point: (1) an export-to-GDP ratio of at least 30 percent and (2) a 15 percent minimum threshold of fiscal revenue in relation to GDP. For countries meeting these thresholds, the NPV debt-to-export target will be set at a level that achieves a debt-to-revenue ratio of 250 percent of the NPV at the decision point.

Furthermore, the enhanced framework provides the option to consider additional assistance at the completion point, beyond that committed at the decision point, if there has been a fundamental change in a country's economic circumstances at the completion point, and if the change clearly was occasioned by exogenous developments.[7] Consistent with the Enhanced HIPC Initiative, the Paris Club once again extended its previous agreements for HIPCs through the 1999 adoption of the *Cologne terms*.

Outlook beyond the HIPC Initiative

A number of bilateral creditors have indicated that they would provide additional debt forgiveness for HIPCs when those countries reach their Enhanced HIPC completion points. Nevertheless, given that the HIPC Initiative cannot guarantee long-term debt sustainability, the IMF and World Bank have started to shift the task of achieving debt sustainability away from the HIPC Initiative and toward the Poverty Reduction Strategy Paper (PRSP) approach (adopted in 1999) "within which the authorities should seek to maintain a sustainable debt burden" (IDA and IMF 2002, p. 39). Furthermore, related to recent debt problems in middle-income countries, we see an increasing interest in the adoption of a much broader international debt workout mechanism. The IMF has called for a sovereign debt restructuring mechanism, but most international advocacy groups have called for a fair and transparent arbitration procedure.[8]

At the time this chapter was written, it was not clear how the HIPC Initiative would be related to these broader suggestions, although it is likely that HIPCs will be covered under such debt workout mechanisms if they continue to face debt-service problems after completing the HIPC process. Since that time, the Multilateral Debt Relief Initiative (MDRI) has been adopted, and it has reduced substantially the debt burden of the countries participating in the initiative (including Rwanda and Senegal).[9] We do not analyze the effect of the MDRI here, however; rather, we focus on an analysis of data before the initiative was adopted.

Debt Accumulation, Stagnation, and Debt Relief

This section provides an analysis of the debt profile of Guinea, Rwanda, and Senegal, using data from 2001—well before the MDRI was adopted. We present first the long-term trends in total external debt for the three countries, before analyzing both traditional debt relief under the Paris Club arrangements and the debt relief granted under the HIPC Initiative.

Long-term Trends in Total External Debt

The long-term developments of Guinea's, Rwanda's, and Senegal's total external debts up to the year 2001 are illustrated in figures 10.1 and 10.2. Figure 10.1 shows the debt levels for 1970, 1980, 1990, and 2000; figure 10.2 traces the more detailed and recent developments for each

Figure 10.1. Total External Debt, by Decades, 1970–2000
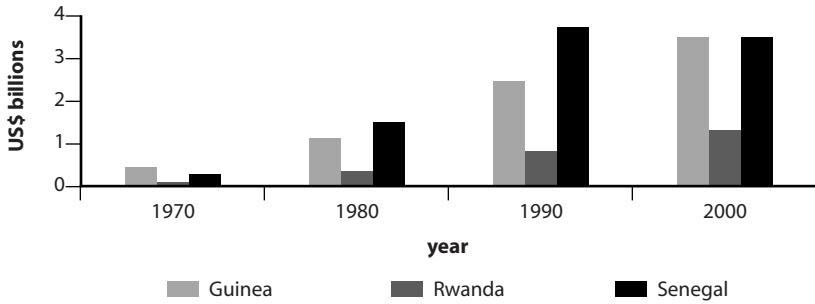
Source: World Bank 2003.

Figure 10.2. Total External Debt, Annually, 1990–2001

Source: World Bank 2003.

year since 1990. Among the three countries, Rwanda's debt grew most rapidly, followed by that of Senegal—although Senegal's debt grew less than that of Guinea during the 1990s.

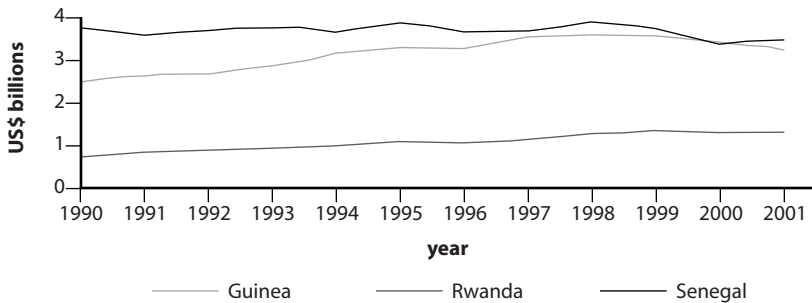In 1970, Guinea's stock of total external debt was $0.3 billion. Ten years later, it was more than three times that value ($1.1 billion). It then doubled during the 1980s (to $2.5 billion in 1990), and reached a maximum of $3.5 billion in the late 1990s. The developments of Rwanda's external debt are even more dramatic. Starting with only $2 million in 1970, it grew exponentially during the 1970s and 1980s to reach $190 million in 1980 and $712 million in 1990. Although it continued to grow sharply during most of the 1990s, it seems to have stabilized during the last few years at around $1.3 billion. Senegal's debt also grew sharply during the 1970s and 1980s—although not as dramatic as that of Rwanda—

increasing from $145 million in 1970 to $3.7 billion in 1990. It remained around $3.8 billion during most of the 1990s and has shown some small ups and downs since then.

Figures 10.3 and 10.4 show the more useful developments of Guinea's, Rwanda's and Senegal's external debt expressed as a percentage of government revenues (figure 10.3) and as a percentage of exports of goods and services (figure 10.4). Rwanda's 1994 ratios (each amounting to

Figure 10.3. Total External Debt as a Share of Government Revenues, 1990–2001
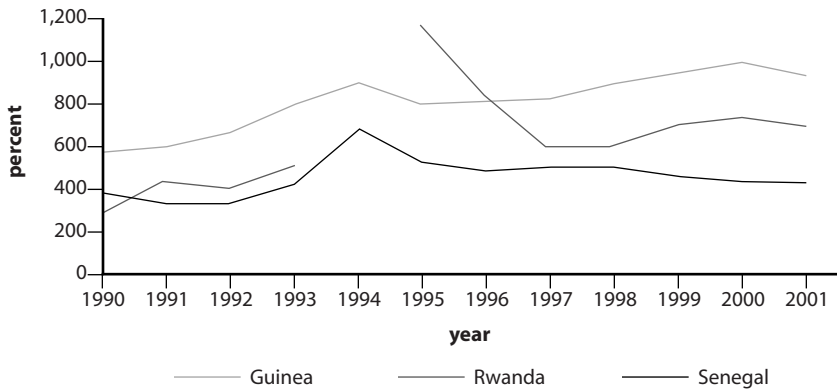
Figure 10.4. Total External Debt as Share of Exports, 1990–2001
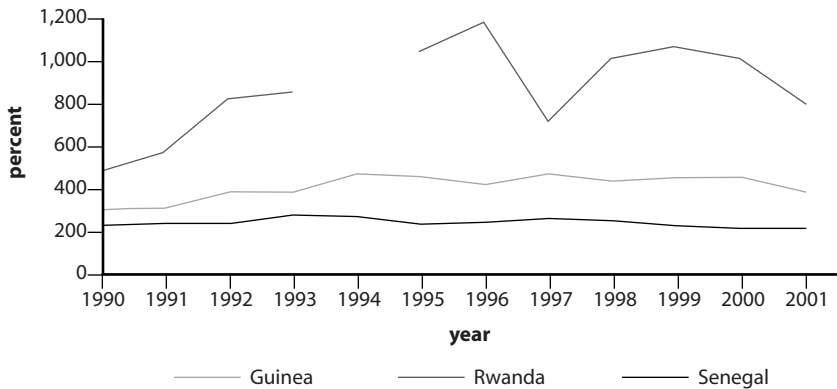
about 3,000 percent) are not included in the graphs because both government revenues and exports were extremely low in 1994 as a result of the civil war and genocide. It would have been preferable to use NPV debt ratios, but no such time-series data are available.

Debt-Service Problems and Traditional Debt Relief

Given the sharp increases in external debts during the 1970s and 1980s, which far more than outpaced the growth rates of income and exports, it is not surprising that all three countries have been experiencing severe debt-service problems since the 1980s, and have thus been granted traditional debt relief (although with considerable delay and far below levels needed to eliminate the debt overhang and end the stagnation in growth and development). The debt relief granted to these countries includes the following:

- In 1986, the Paris Club agreed to reschedule Guinea's eligible debt-service payments due between January 1, 1986, and February 28, 1987, that were related to non-ODA loans with a maturity of more than one year, contracted pre-COD (January 1, 1986). Rescheduled debt service was to be paid over a 10-year period, including a 5-year grace period. Subsequent agreements rescheduled eligible debt-service payments on Toronto terms in 1989, on London terms in 1992 and 1995, and on Naples 50-percent-terms in 1997.
- Rwanda has benefited from one Paris Club flow rescheduling agreement signed in May 1998 on Naples terms, covering outstanding arrears as of the end of June 1998 and a consolidation period from July 1998 to end-May 2001, with an NPV reduction of 67 percent on eligible debt. Although Rwanda obviously faced debt-servicing problems a long time before 1998, the previously precarious conflict and postconflict civil situation prevented Rwanda from receiving traditional debt relief.
- Between 1987 and 1998, Senegal benefited from 12 Paris Club rescheduling operations on debt contracted with the Paris Club group of creditors before the January 1, 1983, COD. In June 1998, Senegal benefited from a stock-of-debt operation on Naples terms, which brought the overall reduction of eligible debts to 67 percent in NPV terms.

Debt Relief under the Enhanced HIPC Initiative

Given that Senegal continued to face an unsustainable debt after the full use of traditional debt relief (agreed to in June 1998), and given that Guinea and Rwanda were projected to face unsustainable debts after a hypothetical Naples terms debt reduction,[10] all three countries became eligible for debt relief under the Enhanced HIPC Initiative. Senegal qualified under the fiscal criterion (because its export-to-GDP and revenue-to-GDP ratios were above the minimum HIPC thresholds for the fiscal window), whereas Guinea and Rwanda qualified under the usual export criterion. Senegal reached its Enhanced HIPC decision point in June 2000; Guinea and Rwanda reached theirs in December 2000. As shown in table 10.2, at the enhanced decision points, debt relief under the Enhanced HIPC Initiative was projected to reduce debt levels in the three countries in the following ways:

- Guinea's external PPG debt service to all its creditors was reduced by about $800 million, corresponding to about $545 million in NPV terms, which is equivalent to approximately 32 percent of total debt outstanding after the full use of traditional debt relief mechanisms.
- Rwanda's external PPG debt service to all its creditors was lowered by about $814 million, corresponding to approximately $452 million in NPV terms, which is roughly equivalent to 71 percent of total debt outstanding after the full use of traditional debt relief mechanisms. Hence, consistent with the HIPC framework, the HIPC DSA calculated HIPC debt relief after the full application of traditional debt relief,

Table 10.2. Committed Debt Relief under the Enhanced HIPC Initiative

Rwanda			*Guinea Senegal*
Target: NPV debt-to-export ratio (%)	150	150	(133)
Target: NPV debt-to-revenue ratio (%)	n.a.	n.a.	250
Reduction in NPV terms (US$ millions)	545	452	488
Nominal debt-service relief (US$ millions)	800	814	850
Common NPV reduction factor (%)	31.6	71.3	18.1

Source: International Monetary Fund and World Bank, Enhanced HIPC Initiative decision point documents.

which implied that it had to establish Guinea's debt after a hypothetical 67 percent NPV stock reduction on eligible debt.
- Senegal's external PPG debt service to all its creditors decreased by roughly $850 million, corresponding to approximately $488 million in NPV terms, which is equivalent to about 18 percent of total debt outstanding after the full use of traditional debt relief mechanisms.

Including the additional bilateral debt forgiveness promised by some bilateral creditors at the Enhanced HIPC completion point, the decision point DSAs (of June and December 2000) projected that the NPV debt-to-export ratios at Guinea's, Rwanda's, and Senegal's completion points will be 123 percent, 185 percent,[11] and 112 percent, respectively. However, given that the projections used at the Enhanced HIPC decision points were overly optimistic, the latest projections (autumn 2002) indicate that the NPV debt-to-export ratios are likely to be around 137 percent, 189 percent, and 158 percent, respectively, for Guinea, Rwanda, and Senegal. It is thus expected that HIPC debt relief for Rwanda and Senegal will have to be topped up at their completion points.

Using Debt Projections to Analyze Debt Sustainability

The Debt Projection Module of the SimSIP Debt simulation tool calculates the values for various debt indicators based on three elements: (1) the modeling of government expenditures; (2) the modeling of government revenues; and (3) the specification of the government deficit, which is financed by new borrowing after deducting grants and debt relief. Because the model has been explained in chapter 8 (devoted to a case study of debt sustainability in Paraguay) and to some extent in chapter 3 (devoted to methodology issues in analyzing debt sustainability), we will not repeat it here. In terms of data, the World Bank's *Global Development Finance 2003* provides most of the data on external debt and exports, and most of the other macroeconomic data come from the World Bank's African Development Indicators database. Domestic debt levels have been estimated on the basis of scarce and incomplete public information provided in IMF and government publications.[12]

Given that no information was available on domestic debt interest rates and maturities, we have assumed an interest rate of 6.5 percent and a maturity of two years for all three countries. Because of the relatively small

share of domestic public debt in total PPG debts, the results are not extremely sensitive to changes in these domestic debt variables. However, it should be pointed out that the fiscal burden of domestic debts is far more than proportional to its share in total debt because domestic debt is unlikely to be concessional.[13] For example, although Guinea's public domestic debt constitutes less than 4 percent of its public external debt, 2001 interest payments on domestic debt were approximately 20 percent of the 2001 interest payments on public external debt.

The high volatility of some key macroeconomic variables implies a considerable challenge. For example, figures 10.5, 10.6, and 10.7 illustrate

Figure 10.5. Exports of Goods and Services, 1990–2001
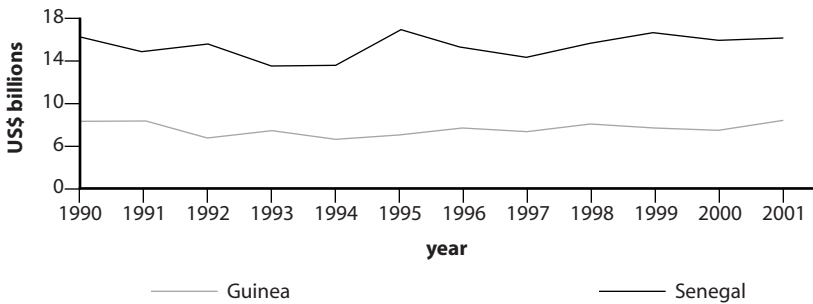
Source: World Bank Development Indicators.

Figure 10.6. Annual Growth Rates in Exports of Goods and Services, 1990–2001
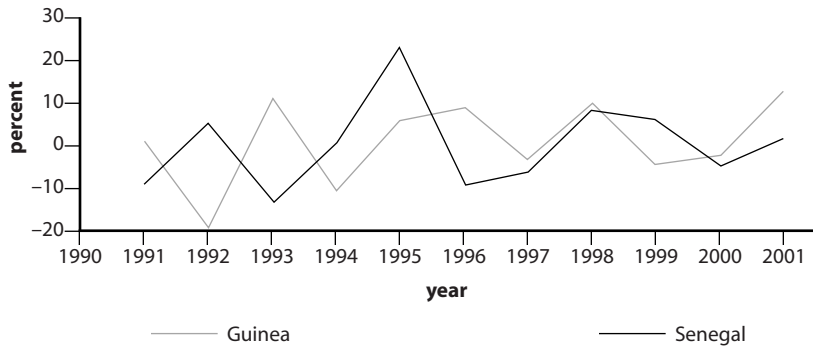
Source: World Bank Development Indicators.

the high volatility in exports of goods and services, especially in Rwanda. Figure 10.8 shows the high volatility in donor grants to each of the three countries' federal budgets. We have excluded the 1994 outlier ($7.5 million) for Rwanda and the 1996 outlier ($307 million) for Senegal. Excluding those outliers, annual donor grants to the federal budgets vary between $50 million and $170 million. This large nominal volatility in grant financing of government budgets has serious budget implications, as we can see when we express grants as percentages of nongrant government

Figure 10.7. Exports and Annual Growth Rates in Exports, Rwanda, 1990–2001

Source: World Bank Development Indicators.

Figure 10.8. Grants Provided to the Government Budget, 1990–2001
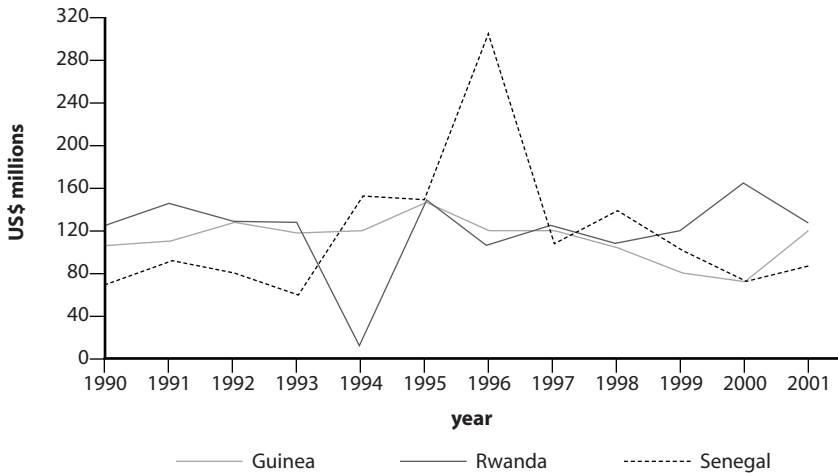
Sources: World Bank and International Monetary Fund data.

revenues (figures 10.9 and 10.10). It is obvious in those figures that fiscal sustainability of all three countries—but especially of Rwanda—is dominated by the provision of donor grants.

Finally, the amount of debt relief to be provided under traditional and HIPC debt relief efforts is also significant for each country's budget, although we need to remember that some of the debt service due in the past has not been paid. In other words, the actual savings are much less than the calculated amounts of traditional and HIPC debt relief. Based on the data provided in the Enhanced HIPC decision point documents (especially the detailed delivery schedule of Enhanced HIPC debt relief from the IMF and the World Bank), we have projected the annual total

Figure 10.9. Grants as a Share of Nongrant Government Revenues, Guinea and Senegal, 1990–2001
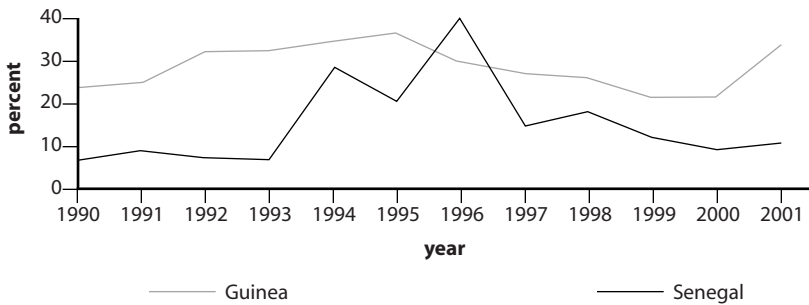
Sources: World Bank and International Monetary Fund data.

Figure 10.10. Grants as a Share of Nongrant Government Revenues, Rwanda, 1990–2001

Sources: World Bank and International Monetary Fund data.

Table 10.3. Assumed Delivery of Traditional and HIPC Debt Relief, 2001–21
US$ millions

Year	Guinea	Rwanda	Senegal	Year	Guinea	Rwanda	Senegal
2001	59	49	60	2012	63	51	41
2002	58	48	62	2013	63	51	41
2003	63	45	67	2014	63	51	41
2004	68	47	71	2015	64	51	41
2005	68	53	71	2016	45	51	41
2006	64	55	65	2017	45	51	41
2007	63	55	62	2018	45	51	41
2008	62	54	63	2019	45	51	41
2009	63	52	41	2020	45	28	41
2010	64	51	41	2021	45	28	41
2011	63	51	41				

Sources: World Bank and International Monetary Fund data.
Note: HIPC = heavily indebted poor countries.

amounts of traditional and HIPC debt relief for the period 2001–21 (table 10.3).

We first analyze the fiscal sustainability of Guinea, Rwanda, and Senegal by looking at the impact of three alternative scenarios (that is, baseline, optimistic, and pessimistic) on the NPV public debt-to-GDP ratio, the NPV public debt-to-revenue ratio, and the public debt service-to-revenue ratio. Consistent with the concept of fiscal sustainability, we include both domestic and external PPG debt. The initial conditions for year 2001 and baseline macroeconomic assumptions are provided in figure 10.11, which presents a screen shot from SimSIP. Following our remarks above, the assumptions on each country's domestic PPG debt are shown in figure 10.12. Finally, although Guinea and Rwanda do not have any private external debt not publicly guaranteed, Senegal does have a small amount ($51 million) and we will include it in our external DSA. We will assume that Senegal's private external debt always will grow at the same rate as does its GDP.

Under the baseline, pessimistic, and optimistic scenarios, we assume that for year 2016 all three countries will reach GDP growth rates of 4 percent, 3 percent, and 5 percent, respectively; export growth rates of 5 percent, 3 percent, and 7 percent, respectively; inflation rates of 3 percent, 4 percent, and 2 percent, respectively; and devaluation rates of 4 percent, 5 percent, and 3 percent, respectively. Furthermore, we assume that, because of the implementation of ambitious poverty reduction

Figure 10.11. Initial Conditions and Baseline Macroeconomic Assumptions

Guinea

	Public For. Debt		Nominal			Grants	Exports	Excha. rate
	Stock	Int. Pay.	GDP		Initial Value	100	854	1951.0
Initial Value	3,254	65	2,900		Growth (t0)	2.0	5.0	7.0
					Growth (t15)	2.0	5.0	4.0

	Discount rate (%)	Interest rate (%)	Inflation rate (%)	Real GDP growth (%)	Rev. to GDP(%)	P.Spe.to GDP(%)	Average Maturity
Value (2001)	6.0	2.0	5.0	3.0	12.2	15.3	30
Value (2016)	6.0	2.0	3.0	3.0	16.0	18.0	35

Rwanda

	Public For. Debt		Nominal			Grants	Exports	Excha. rate
	Stock	Int. Pay.	GDP		Initial Value	110	163	443.0
Initial Value	1,283	13	1,700		Growth (t0)	2.0	6.0	6.0
					Growth (t15)	2.0	5.0	4.0

	Discount rate (%)	Interest rate (%)	Inflation rate (%)	Real GDP growth (%)	Rev. to GDP(%)	P.Spe.to GDP(%)	Average Maturity
Value (2001)	6.0	1.0	4.0	5.0	10.8	19.4	38
Value (2016)	6.0	1.0	3.0	3.0	15.0	20.0	38

Senegal

	Public For. Debt		Nominal			Grants	Exports	Excha. rate
	Stock	Int. Pay.	GDP		Initial Value	90	1,609	733.0
Initial Value	3,410	51	4,600		Growth (t0)	2.0	2.0	5.0
					Growth (t15)	2.0	4.0	5.0

	Discount rate (%)	Interest rate (%)	Inflation rate (%)	Real GDP growth (%)	Rev. to GDP(%)	P.Spe.to GDP(%)	Average Maturity
Value (2001)	6.0	1.5	3.0	4.0	18.0	19.2	30
Value (2016)	6.0	1.5	3.0	4.0	20.0	21.0	35

Source: SimSIP; assumptions provided by the authors.
Note: Excha. = exchange; For. = foreign; GDP = gross domestic product; Int. Pay. = interest payment; P. Spe. = public spending; Rev. = revenue.

strategies, the ratios of priority spending to GDP increase by 3 percent (cumulative over the next 15 years) in Guinea and Senegal, and by 2 percent (cumulative over the next 15 years) in Rwanda, reflecting the already huge gap between revenues and expenditures in Rwanda.

We will keep this assumption on the evolution of government expenditures fixed for all three scenarios to see the impact of this increased spending on debt. However, we make adjustments in the ratio of government revenues to GDP, whereby we also take into account the different initial conditions of the three countries. We assume that the lower the initial revenue-to-GDP ratio, the higher the cumulative percentage increase over the next 15 years. For Guinea, we assume an increase in the revenue-

to-GDP ratio from the current 12.2 percent to 16.0 percent in the baseline scenario, to 15.0 percent in the pessimistic scenario, and to 17.0 percent in the optimistic scenario. For Rwanda, we assume an increase in the

Figure 10.12. Assumptions on Public Domestic Debt

Guinea

	Public Domestic Debt	Interest on Public Domestic Debt		
Initial Value	120	7.8		

	Share of Domestic Financing	Interest rate	Discount rate	Average Maturity
Value (t0)	10	6.5	6.5	2.0
Value (t15)	10	6.5	6.5	2.0

Rwanda

	Public Domestic Debt	Interest on Public Domestic Debt		
Initial Value	125	8.1		

	Share of Domestic Financing	Interest rate	Discount rate	Average Maturity
Value (t0)	15	6.5	6.5	2.0
Value (t15)	15	6.5	6.5	2.0

Senegal

	Public Domestic Debt	Interest on Public Domestic Debt		
Initial Value	500	32.5		

	Share of Domestic Financing	Interest rate	Discount rate	Average Maturity
Value (t0)	20	6.5	6.5	2.0
Value (t15)	20	6.5	6.5	2.0

Source: SimSIP; assumptions provided by the authors.

revenue-to-GDP ratio from the current 10.8 percent to 15.0 percent in the baseline scenario, to 14.0 percent in the pessimistic scenario, and to 16.0 percent in the optimistic scenario. For Senegal, we assume an increase in that same ratio from the current 18 percent to 20 percent (baseline), to 19 percent (pessimistic), and to 21 percent (optimistic scenario).

Following our previous discussion of the crucial impact of grants, we assume that grants will always grow at 2 percent under the baseline scenario, remain constant at the 2001 level under the pessimistic scenario, and grow at 4 percent each year in the optimistic scenario. Furthermore, given that growth rates alone will not appropriately represent the huge difference in the grant levels under the baseline, pessimistic, and optimistic scenarios, we also make adjustments in the 2001 level of grants for each country. Doing so could been seen as taking into account that none of our three countries has yet reached its HIPC completion point, so debt relief to be provided under the Enhanced HIPC Initiative is not yet guaranteed. Therefore, reflecting the baseline, pessimistic, and optimistic scenarios, respectively, we assume that Guinea's initial levels of grants would be $100 million, $60 million, and $130 million; Rwanda's initial levels would be $110 million, $70 million, and $130 million; and Senegal's initial levels would be $90 million, $50 million, and $130 million.

The results for these three scenarios are depicted in figure 10.13. Part (a) presents the results of the fiscal debt sustainability and part (b) illustrates the results of the external debt sustainability. We include all the graphs in one figure because it offers us a better overview and comparison. Overall, the results are pretty much what we would have expected them to be, given the initial parameters and different scenarios. However, some broad comments and explanations seem appropriate.

First, the different results for each of the three fiscal debt sustainability indicators are mainly prompted by changes in GDP growth rates, revenue-to-GDP ratios, and donor grants. The same applies for the different results reached in the external DSA, although those results are also heavily influenced by a fourth factor: the simulated changes in export growth rates. The debt service-to-revenue ratios results largely are prompted by debt relief, amounting to about 17, 27, and 8 percent of annual revenues for Guinea, Rwanda, and Senegal, respectively. When debt relief stops, the debt service-to-revenue ratios will jump upward again.

Second, when looking at the latter six graphs in part (a) of figure 10.13, we notice that there are no differences in the point of origin for each of the three scenarios because the definition of revenues excludes grants. If

Figure 10.13. Results of the Baseline, Pessimistic, and Optimistic Scenarios, 2001–16

a. Fiscal debt sustainability analysis

Senegal

Rwanda

Guinea

impact on debt service-to-revenue ratio (%)

b. External debt sustainability analysis

Senegal

Rwanda

Guinea

impact on NPV debt-to-export ratio (%)

baseline scenario ——— pessimistic scenario ------- optimistic scenario ———

year
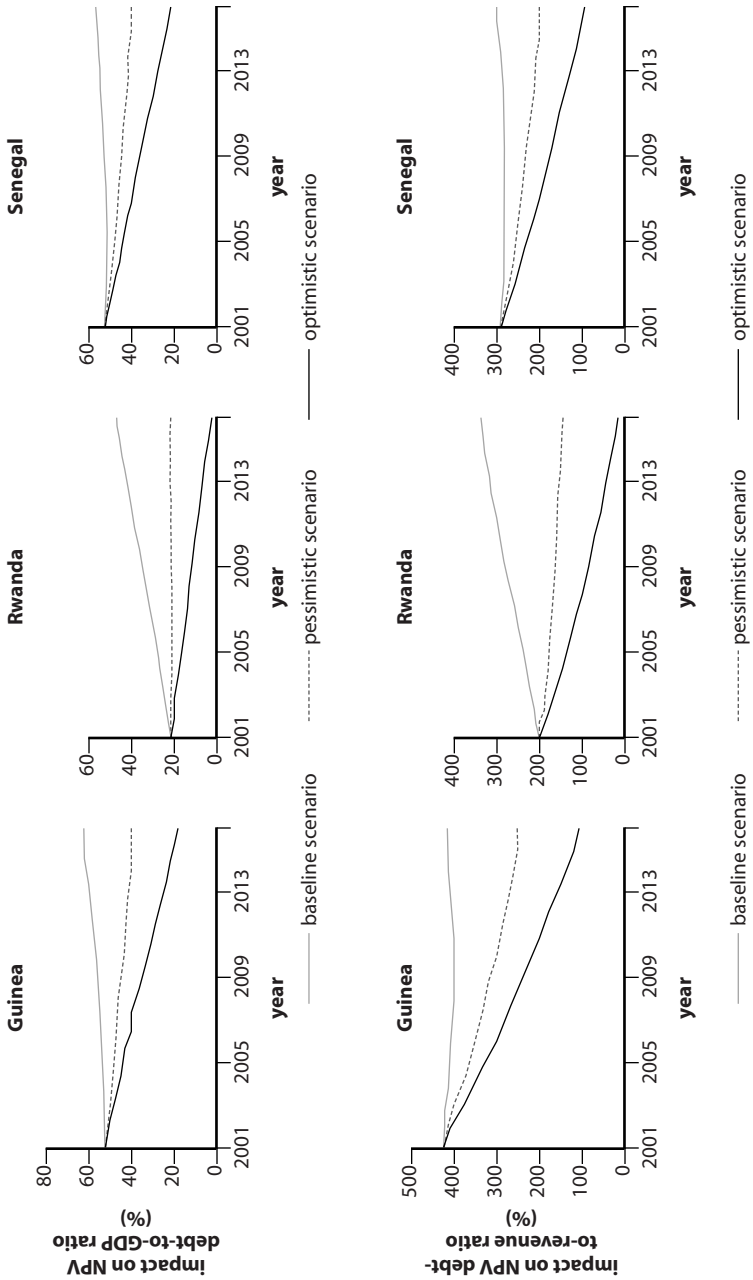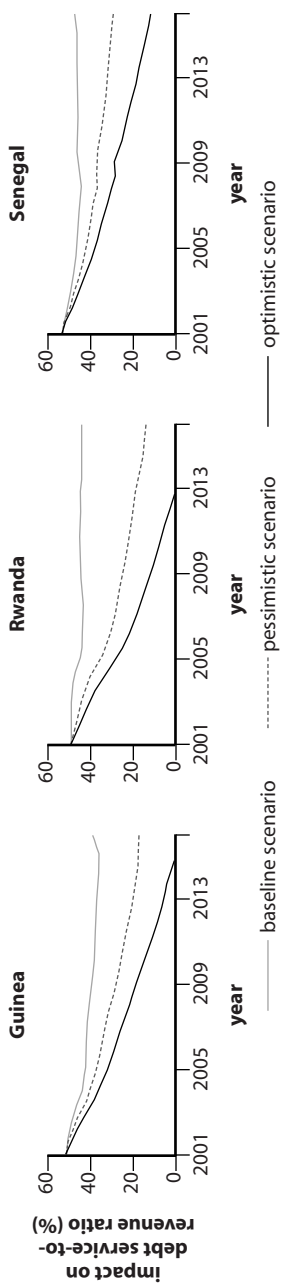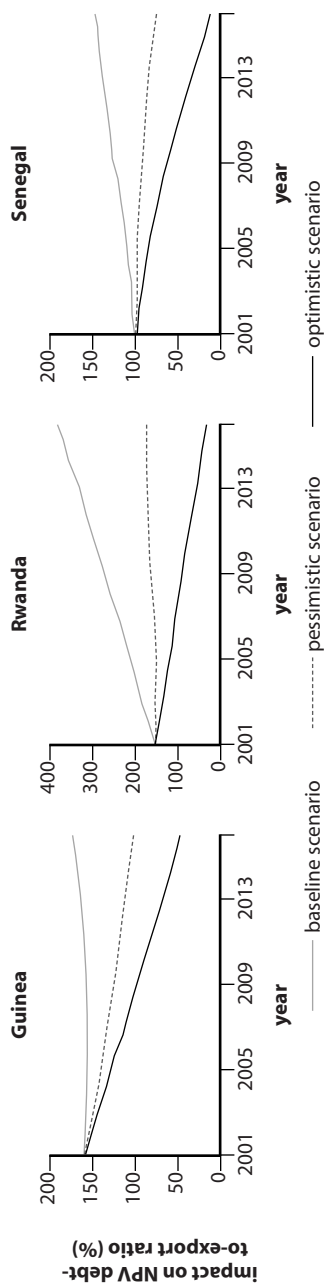
Source: Estimations by the authors, using SimSIP.
Note: GDP = gross domestic product; NPV = net present value.

grants were included, we would see different points of origin. Note also that the range of the graphs for each debt indicator is not always the same across countries, so we have to be a bit careful when comparing levels.

Third, in the cases of Guinea and Rwanda, the graphs for the debt service-to-revenue ratio seem to become negative toward the end of the projection period in the optimistic scenario. This happens because debt service is always calculated after debt relief. In the optimistic scenario, the projected delivery of traditional and HIPC debt relief exceeds the amounts of projected debt service (excluding debt relief), so debt service after debt relief becomes negative. Looking at the trends for the optimistic scenario, we obviously would prefer a more frontloaded delivery of debt relief under the optimistic scenario. At this point, we also should note that the relatively uneven shapes in the debt service-to-revenue ratios are caused by uneven delivery of debt relief.

Fourth, we note that the initial NPV debt-to-export ratios for Guinea and Rwanda are around the 150 percent level—which is appropriate because we simulate the situation after the full delivery of debt relief. The reason why that ratio is considerably below the 150 percent level for Senegal is that Senegal had qualified under the fiscal window of the Enhanced HIPC Initiative, and that results in a 2001 NPV debt-to-export ratio of approximately 130 percent.

Fifth, we note that the optimistic scenario always results in clearly sustainable debt trends, whereas the pessimistic scenario usually implies clearly unsustainable debt trends. The baseline scenario also provides sustainable debt trends for Guinea and Senegal, but not for Rwanda where the NPV debt-to-GDP ratio remains stable and the NPV debt-to-export ratio increases. Although Rwanda's debt sustainability is clearly more fragile, reflecting the low initial values in revenues and exports (each around 10 percent of GDP), is does not mean that Rwanda is likely to be the least sustainable case. A different set of baseline assumptions obviously would lead to different debt paths. We tried to present similar assumptions for each scenario to see the different effects. There is no implicit assumption that the baseline scenario is the most realistic one for each country. Some people would argue that our baseline assumptions are too optimistic; others would argue that they are too pessimistic.

Finally, looking at the initial levels of the various debt ratios after the full application of traditional and HIPC debt relief, there are some concerns related to high debt service-to-revenue ratios (amounting to about

50 percent for all three countries) and to Guinea's high NPV debt-to-revenue ratio (starting above 400 percent). Although the trends of these two ratios clearly are decreasing in the baseline and optimistic scenarios, the high initial levels cast doubt on the HIPC Initiative's effective removal of the debt overhang, especially if domestic public debt is included. Conversely, Guinea's external debt sustainability (which excludes domestic public debt) is only threatened in our pessimistic scenario.

Using SimSIP Debt's Deficit-Debt Consistency Module

The Deficit-Debt Consistency Module of the SimSIP Debt software builds on the theoretical framework of the Debt Projection Module, although it abstracts from the details of the composition of revenues and expenditures and just looks at the difference between the current year's stock-of-debt and the previous year's stock of debt (by definition, the current year's budget deficit after grants and after debt relief). Because the conceptual framework also has been presented in chapter 8, we focus here on results. We have applied the three deficit-debt consistency matrices for all three countries, using more or less the same initial values and baseline macroeconomic assumptions as we described earlier. However, because not all variables are used in the Deficit-Debt Consistency Module and some different assumptions have been made to better illustrate the significance of some variables, we provide the exact inputs for Guinea's, Rwanda's, and Senegal's short- and long-term analysis in figures 10.14 to 10.16, respectively. The resulting short- and long-term matrices are presented in tables 10.4 to 10.6, respectively (pp. 336–38).

Note that we have increased Rwanda's public foreign debt from the actual $1.3 billion to $1.4 billion to avoid the display of a 0 percent NPV debt-to-GDP ratio in the first row of that matrix because the module is not defined for a 0 percent ratio. Using the correct amount of $1.3 billion public external debt implies (1) an NPV total public debt-to-GDP ratio of about 20 percent, (2) an NPV total external debt-to-export ratio of about 150 percent, and (3) an NPV total public debt-to-revenue ratio of approximately 200 percent (all after taking into account full debt relief). Hence, in the case of Rwanda, we should simply concentrate our analysis on the first few rows of the three matrices.

The first major observation we make is that the values for the deficit-to-GDP ratios in each matrix are increasing as GDP growth rates increase

(as can be seen moving from the left to the right within each matrix). This is the trivial result of higher GDP growth rates allowing higher deficit-to-GDP ratios. Similarly, we can see in each matrix that the values

Figure 10.14. Inputs for Guinea

Guinea: Inputs for the short-term matrix.

GDP			Public Foreign Debt				Public Domestic Debt		
initial value	real growth		initial stock	maturity	average interest rate old debt	new debt	initial stock	average interest rate old debt	new debt
2,900	4.0		3,254	30	2.0	2.0	120	6.5	6.5

Discount rate %	Inflation rate %	Deval. rate %	Exports ini. share to GDP	real growth	Revenues ini. share to GDP	real growth
6.0	5.0	6.0	29.0	4.0	12.2	4.0

Guinea: Inputs for the long--term matrix.

GDP			Public Foreign Debt				Public Domestic Debt		
initial value	real growth		initial stock	maturity	average interest rate old debt	new debt	initial stock	average interest rate old debt	new debt
2,900	4.0		3,254	30	2.0	2.0	120	6.5	6.5

Discount rate %	Inflation rate %	Deval. rate %	Exports ini. share to GDP	real growth	Revenues ini. share to GDP	real growth
6.0	3.0	3.0	32.0	4.0	16.0	4.0

Source: SimSIP; assumptions provided by the authors.
Note: Deval. = devaluation; GDP = gross domestic product; ini. = initial.

Figure 10.15. Inputs for Rwanda

Rwanda: Inputs for the short-term matrix.

GDP			Public Foreign Debt				Public Domestic Debt		
initial value	real growth		initial stock	maturity	average interest rate old debt	new debt	initial stock	average interest rate old debt	new debt
1,700	4.0		1,400	30	2.0	1.0	125	6.5	6.5

Discount rate %	Inflation rate %	Deval. rate %	Exports ini. share to GDP	real growth	Revenues ini. share to GDP	real growth
6.0	4.0	5.0	11.0	6.0	10.8	5.0

Rwanda: Inputs for the long--term matrix.

GDP			Public Foreign Debt				Public Domestic Debt		
initial value	real growth		initial stock	maturity	average interest rate old debt	new debt	initial stock	average interest rate old debt	new debt
1,700	4.0		1,400	30	2.0	1.0	125	6.5	6.5

Discount rate %	Inflation rate %	Deval. rate %	Exports ini. share to GDP	real growth	Revenues ini. share to GDP	real growth
6.0	3.0	3.0	13.0	5.0	15.0	5.0

Source: SimSIP; assumptions provided by the authors.
Note: Deval. = devaluation; GDP = gross domestic product; ini. = initial.

Figure 10.16. Inputs for Senegal

Senegal: Inputs for the short-term matrix.

GDP			Public Foreign Debt					Public Domestic Debt		
initial	real		initial		average interest rate			initial	average interest rate	
value	growth		stock	maturity	old debt	new debt		stock	old debt	new debt
4,600	4.0		3,410	30	3.2	2.0		500	6.5	6.5

Discount	Inflation	Deval.	Exports		Revenues	
rate	rate	rate	ini. share	real	ini. share	real
%	%	%	to GDP	growth	to GDP	growth
6.0	3.0	4.0	35.0	4.0	18.0	4.0

Senegal: Inputs for the long--term matrix.

GDP			Public Foreign Debt					Public Domestic Debt		
initial	real		initial		average interest rate			initial	average interest rate	
value	growth		stock	maturity	old debt	new debt		stock	old debt	new debt
4,600	4.0		3,410	30	3.2	2.0		500	6.5	6.5

Discount	Inflation	Deval.	Exports		Revenues	
rate	rate	rate	ini. share	real	ini. share	real
%	%	%	to GDP	growth	to GDP	growth
6.0	3.0	3.0	38.0	4.0	20.0	4.0

Source: SimSIP; assumptions provided by the authors.
Note: Deval. = devaluation; GDP = gross domestic product; ini. = initial.

for the deficit-to-GDP ratios are increasing as the various NPV debt ra-
tios increase (as can be seen moving from the top to the bottom of each
matrix). This is the trivial result of higher debt levels allowing higher
deficit-to-GDP ratios.

The second major observation we make is that the values for the
deficit-to-GDP ratios consistent with various real GDP growth rates and
various NPV debt ratios are always lower in the short-term matrices (the
ones on the left) than the corresponding values for the deficit-to-GDP ra-
tios in the long-term matrices (those on the right). This occurs because of
three differences in the short- and long-term inputs for each country:

1. There is a higher short-term differential between inflation and deval-
   uation compared with the long-term inputs (that is, in the short-term
   inputs, we always kept a 1 percent differential between inflation and
   devaluation, whereas we always kept a parity between inflation and
   devaluation rates in the long term).[14]
2. There is a lower short-term export-to-GDP ratio compared with the
   higher long-term export-to-GDP ratio, combined with no difference
   in the export growth rates between the short- and long-term in-
   puts.[15]

Table 10.4. Short- and Long-Term Deficit-Debt Consistencies for Guinea

a. Deficit-to-GDP ratios (%) consistent with various real GDP growth rates (%) and various NPV of total public debt-to-GDP ratios (%)

| | Short term | | | | | | Long term | | | | |
| | Growth of Y (%) | | | | | | Growth of Y (%) | | | | |
NPV debt/Y (%)	2	3	4	5	6	NPV debt/Y (%)	2	3	4	5	6
30	0.3	0.6	0.8	1.1	1.4	30	0.6	0.8	1.1	1.4	1.7
40	0.4	0.7	1.1	1.5	1.8	40	0.8	1.1	1.5	1.9	2.2
50	0.5	0.9	1.4	1.8	2.3	50	1.0	1.4	1.9	2.3	2.8
60	0.6	1.1	1.7	2.2	2.7	60	1.1	1.7	2.2	2.8	3.3
70	0.7	1.3	1.9	2.5	3.2	70	1.3	2.0	2.6	3.2	3.9

b. Deficit-to-GDP ratios (%) consistent with various real GDP growth rates (%) and various NPVs of foreign public debt-to-exports ratios (%)

| | Growth of Y (%) | | | | | | Growth of Y (%) | | | | |
NPV debt/X (%)	2	3	4	5	6	NPV debt/X (%)	2	3	4	5	6
120	0.3	0.6	1.0	1.3	1.6	110	0.7	1.0	1.3	1.6	1.9
140	0.4	0.8	1.1	1.5	1.8	130	0.8	1.2	1.6	1.9	2.3
160	0.4	0.9	1.3	1.7	2.1	150	0.9	1.4	1.8	2.2	2.6
180	0.5	1.0	1.4	1.9	2.4	170	1.0	1.5	2.0	2.5	3.0
200	0.5	1.1	1.6	2.1	2.6	190	1.2	1.7	2.3	2.8	3.3

c. Deficit-to-GDP ratios (%) consistent with various real GDP growth rates (%) and various NPVs of total public debt-to-revenue ratios (%)

| | Growth of Y (%) | | | | | | Growth of Y (%) | | | | |
NPV debt/R (%)	2	3	4	5	6	NPV debt/R (%)	2	3	4	5	6
380	0.4	0.9	1.3	1.7	2.1	280	0.9	1.3	1.7	2.1	2.5
400	0.5	0.9	1.3	1.8	2.2	300	0.9	1.4	1.8	2.2	2.6
420	0.5	0.9	1.4	1.9	2.3	320	1.0	1.4	1.9	2.4	2.8
440	0.5	1.0	1.5	2.0	2.4	340	1.0	1.5	2.0	2.5	3.0
460	0.5	1.0	1.5	2.0	2.5	360	1.1	1.6	2.2	2.7	3.2

Source: Authors' calculations.
Note: GDP = gross domestic product; NPV = net present value.

Table 10.5. Short- and Long-Term Deficit-Debt Consistencies for Rwanda

a. Deficit-to-GDP ratios (%) consistent with various real GDP growth rates (%) and various NPV of total public debt-to-GDP ratios (%)

| | Short term | | | | | | Long term | | | | |
| | Growth of Y (%) | | | | | | Growth of Y (%) | | | | |
NPV debt/Y (%)	2	3	4	5	6	NPV debt/Y (%)	2	3	4	5	6
10	0.2	0.4	0.5	0.7	0.9	10	0.4	0.5	0.7	0.9	1.1
20	0.4	0.7	1.1	1.4	1.7	20	0.7	1.1	1.4	1.8	2.1
30	0.5	1.1	1.6	2.1	2.6	30	1.1	1.6	2.2	2.7	3.2
40	0.7	1.4	2.1	2.8	3.5	40	1.5	2.2	2.9	3.6	4.2
50	0.9	1.8	2.7	3.5	4.4	50	1.8	2.7	3.6	4.4	5.3

b. Deficit-to-GDP ratios (%) consistent with various real GDP growth rates (%) and various NPVs of foreign public debt-to-exports ratios (%)

| | Growth of Y (%) | | | | | | Growth of Y (%) | | | | |
NPV debt/X (%)	2	3	4	5	6	NPV debt/X (%)	2	3	4	5	6
130	0.6	0.8	1.1	1.3	1.6	100	0.8	1.0	1.2	1.5	1.7
150	0.6	0.9	1.2	1.5	1.8	120	0.9	1.2	1.5	1.7	2.0
170	0.7	1.1	1.4	1.7	2.1	140	1.1	1.4	1.7	2.0	2.3
190	0.8	1.2	1.6	1.9	2.3	160	1.2	1.6	2.0	2.3	2.7
210	0.9	1.3	1.7	2.1	2.5	180	1.4	1.8	2.2	2.6	3.0

c. Deficit-to-GDP ratios (%) consistent with various real GDP growth rates (%) and various NPVs of total public debt-to-revenue ratios (%)

| | Growth of Y (%) | | | | | | Growth of Y (%) | | | | |
NPV debt/R (%)	2	3	4	5	6	NPV debt/R (%)	2	3	4	5	6
200	0.8	1.2	1.5	1.9	2.3	130	1.1	1.4	1.8	2.1	2.4
220	0.9	1.3	1.7	2.1	2.5	150	1.2	1.6	2.0	2.4	2.8
240	1.0	1.4	1.9	2.3	2.7	170	1.4	1.9	2.3	2.7	3.2
260	1.0	1.5	2.0	2.5	3.0	190	1.6	2.1	2.6	3.1	3.5
280	1.1	1.6	2.2	2.7	3.2	210	1.7	2.3	2.8	3.4	3.9

Source: Authors' calculations.

Note: GDP = gross domestic product; NPV = net present value.

Table 10.6. Short- and Long-Term Deficit-Debt Consistencies for Senegal

a. Deficit-to-GDP ratios (%) consistent with various real GDP growth rates (%) and various NPV of total public debt-to-GDP ratios (%)

| | Short term | | | | | | Long term | | | | |
| | Growth of Y (%) | | | | | | Growth of Y (%) | | | | |
NPV debt/Y (%)	2	3	4	5	6	NPV debt/Y (%)	2	3	4	5	6
30	0.4	0.9	1.3	1.7	2.1	30	0.9	1.3	1.7	2.1	2.5
40	0.6	1.1	1.7	2.3	2.8	40	1.2	1.7	2.3	2.8	3.4
50	0.7	1.4	2.1	2.8	3.5	50	1.5	2.2	2.8	3.5	4.2
60	0.9	1.7	2.6	3.4	4.2	60	1.7	2.6	3.4	4.2	5.0
70	1.0	2.0	3.0	3.9	4.9	70	2.0	3.0	4.0	4.9	5.9

b. Deficit-to-GDP ratios (%) consistent with various real GDP growth rates (%) and various NPVs of foreign public debt-to-exports ratios (%)

| | Growth of Y (%) | | | | | | Growth of Y (%) | | | | |
NPV debt/X (%)	2	3	4	5	6	NPV debt/X (%)	2	3	4	5	6
80	0.4	0.8	1.3	1.7	2.1	70	0.8	1.2	1.6	2.0	2.3
100	0.5	1.1	1.6	2.1	2.6	90	1.0	1.5	2.0	2.5	3.0
120	0.6	1.3	1.9	2.5	3.1	110	1.3	1.9	2.5	3.1	3.7
140	0.7	1.5	2.2	2.9	3.6	130	1.5	2.2	3.0	3.7	4.4
160	0.9	1.7	2.5	3.3	4.1	150	1.7	2.6	3.4	4.2	5.0

c. Deficit-to-GDP ratios (%) consistent with various real GDP growth rates (%) and various NPVs of total public debt-to-revenue ratios (%)

| | Growth of Y (%) | | | | | | Growth of Y (%) | | | | |
NPV debt/R (%)	2	3	4	5	6	NPV debt/R (%)	2	3	4	5	6
250	0.7	1.3	1.9	2.5	3.1	220	1.3	1.9	2.5	3.1	3.7
270	0.7	1.4	2.1	2.7	3.4	240	1.4	2.1	2.7	3.4	4.0
290	0.8	1.5	2.2	2.9	3.6	260	1.5	2.2	3.0	3.7	4.4
310	0.8	1.6	2.4	3.1	3.9	280	1.6	2.4	3.2	3.9	4.7
330	0.9	1.7	2.5	3.4	4.2	300	1.7	2.6	3.4	4.2	5.0

Source: Authors' calculations.
Note: GDP = gross domestic product; NPV = net present value.

3. There is a lower short-term revenue-to-GDP ratio compared with the higher long-term revenue-to-GDP ratio, and no difference in the revenue growth rates between the short- and long-term inputs.

Third, we also can draw some conclusions from comparing the matrices across countries, although we must be somewhat careful when making such cross-country comparisons because the displayed ranges for the three debt indicators are not always the same. Anyway, we can see that, for a GDP growth rate of 4 percent and an NPV debt-to-GDP ratio of 30 percent, Rwanda can have the highest deficit-to-GDP ratio (amounting to 1.6 percent in the short term and 2.2 percent in the long term), followed by Senegal (1.3 percent in the short term and 1.7 percent in the long term) and by Guinea (0.8 percent in the short term and 1.1 percent in the long term). Moreover, Senegal can have the highest deficit-to-GDP ratios to maintain external debt sustainability at around 150 percent in both the short and the long term. Comparing the matrices with NPV debt-to-revenue ratios, we can see that Guinea would need to reduce its deficit-to-GDP ratio considerably to reach sustainable NPV debt-to-revenue ratios, especially for the short term, whereas Rwanda and Senegal have some more fiscal freedom—especially under the long-term assumptions.

Comparing the three short-term matrices of Guinea with each other, we can see that, for a GDP growth rate of 4 percent, the deficit-to-GDP ratios consistent with the initial debt ratios are all around 1.4 percent. The same is true for Guinea's three long-term matrices in which the deficit-to-GDP ratios consistent with the initial debt ratios under the long-term assumptions are all around 1.9 percent. This is no coincidence; rather, it is the result of having all three growth rates (GDP growth rate, export growth rate, and revenues growth rate) growing at 4 percent. When the three growth rates are equal to each other, there is no difference in the consistent deficit-to-GDP ratios for the initial debt ratios.[16] In the case of Rwanda, the growth rates are not the same, so this does not apply. It does apply for our Senegal assumptions.[17]

Finally, we want to point out another important result. For countries that are in the process of obtaining increasingly concessional loan terms (as we have assumed for Rwanda and Senegal), the deficit-to-GDP ratios consistent with a specific NPV debt indicator and a given growth rate are higher than with a specific nominal debt indicator (and vice versa).

Conclusion

We have shown that the analysis of a country's debt sustainability is a complex issue. When analyzing a country's debt sustainability, it is important to differentiate between external and fiscal debt sustainability, whereby the first should include private external debt and the second should include public domestic debt. In any case, there is growing evidence that the more relevant debt sustainability criteria for the gravity of a debt overhang are fiscal criteria, especially in cases where there is a substantial amount of public domestic debt. Conversely, an unsustainable external debt can cause balance of payments crises, especially if a debtor country faces difficulties in securing new external loans.

We have shown that the results of any DSA are highly sensitive to differences in macroeconomic assumptions. In the cases of Guinea and Senegal, full debt relief and continuously growing grant financing seemed to be necessary conditions for achieving external debt sustainability around 2001. In Rwanda, our baseline assumptions were not sufficient to provide external debt sustainability because the NPV debt-to-export ratio continued to grow under the baseline scenario.

Looking at fiscal sustainability, our baseline scenarios are usually sufficient to result in decreasing long-term trends,[18] although high initial levels remain to constitute a short-term debt overhang, especially in Guinea. The problem of a short-term debt overhang is that it may imply the assumed medium-high growth rates and medium-low inflation rates will never be realized. In other words, our baseline and optimistic scenarios may be highly unrealistic for countries in which debt overhangs remain after full debt relief. Looking at our three countries from this perspective, Rwanda actually seems to be the country with the best prospects for sustainable growth.

Although many of our results may look trivial, given the assumptions of our three scenarios, we presented them to give an idea of the type of debt and fiscal sustainability work that can be conducted using the SimSIP Debt simulation tool. For example, alternative macroeconomic assumptions could be used to check the sensitivity of expenditure programs on debt and fiscal sustainability. Finally, as mentioned previously, the results presented here do not take into account the MDRI adopted by the IMF and the World Bank in 2005. That initiative has drastically reduced the debt burden of two of the three countries included in this case study—namely, Rwanda and Senegal.

Notes

1. See the section titled "Is Debt Relief Needed and How Much?" in Gunter (2002), and the additional empirical evidence provided in Addison, Hansen, and Tarp (2004).

2. This requires a collection of all loan terms, including adjustments made in the repayment terms (agreed and/or hypothetical debt relief), which is not a trivial task because of possible disagreements between creditors and debtors on disbursements or repayments, and because of lacks in debt recording and debt management.

3. SimSIP Debt (Gunter et al. 2002) is part of a family of Excel-based SimSIP products designed to assist policy makers in analyzing poverty-related issues. All SimSIP products are available without cost on the Internet at http://www.worldbank.org/simsip.

4. The Paris Club is an informal group of official creditors whose role is to find coordinated and sustainable solutions to the payment difficulties experienced by debtor nations. Paris Club creditors agree to reschedule debts owed to them. Rescheduling is a means of providing a country with debt relief through a postponement and, in the case of concessional rescheduling, a reduction in debt-service obligations. For more information on the Paris Club, see http://www.clubdeparis.org/en/index.php.

5. Originally, Equatorial Guinea and Nigeria were considered to be HIPCs, but they have been dropped from the list because they are no longer considered to be IDA-only countries. On the other hand, the Comoros, and the Gambia and Malawi have been added as it became clear that their debt is higher than initially estimated. For the current list of HIPCs and a more detailed description of the HIPC Initiative, see the World Bank's HIPC Web site, http://www.worldbank.org/hipc/. As Gunter (2003) showed, the Enhanced HIPC Initiative covers neither the poorest nor the most indebted countries.

6. Workers' remittances are current transfers by migrants employed or intending to remain employed for more than a year in another economy in which they are considered residents.

7. For more details, see the HIPC document "Enhanced HIPC Initiative—Completion Point Consideration," available at http://www.imf.org/external/np/hipc/2001/cpd/cpd.pdf.

8. For example, see Herman (2003).

9. Rwanda's and Senegal's participation in the MDRI has substantially lowered their debt burdens. As we are focusing in this book of concepts and case studies on traditional debt analysis, we kept the two countries in the analysis to illustrate the use of standard debt and fiscal sustainability analysis.

10. Hence, consistent with the initiative's framework, the HIPC DSA calculated HIPC debt relief after the full application of traditional debt relief, which implied that it had to establish Guinea's as well as Rwanda's debt after a hypothetical 67 percent NPV stock reduction on eligible debt.

11. Note that this ratio is above the 150 percent decision point target because Enhanced HIPC debt relief is calculated based on the debt situation of the decision point DSA. HIPC debt relief is not due until the completion point. Depending on the loan profile, new borrowing, and the evolution of exports, the NPV debt-to-export ratio at the completion point easily can exceed the 150 percent target ratio.

12. For details on Guinea, see IMF (2002); the Rwandan data, based on Rwandan authorities and IMF staff estimates and projections, are posted at http:// www.afrol.com/Countries/Rwanda/backgr_economic_performance.htm; and the Senegalese data, provided by the West African Economic and Monetary Union in December 2002, are available at http://www.izf.net/izf/Guide/ TableaudeBord/sénégal.htm.

13. To avoid any distortions in the NPV calculation, we have set the discount rate on public domestic debt equal to the estimated average interest rate on public domestic debt.

14. More generally, the higher the inflation rate and the lower the devaluation rate, the higher the value of the consistent budget deficit-to-GDP ratio (and vice versa), although it should be stressed that the two variables usually are moving in the same direction because higher inflation rates usually imply higher devaluations.

15. Note that this result would not necessarily hold if the short-term export growth rates were higher than the long-term export growth rates because then we would have a situation in which the dynamics work against each other: higher export-to-GDP ratios allow for higher deficit-to-GDP ratios without increasing the NPV debt-to-export ratio, and lower export growth rates push the levels of consistent deficit-to-GDP ratios down. The same applies for the relationship between revenue growth rates and revenue-to-GDP ratios.

16. The small differences visible in the matrices result from rounding the initial debt ratios to the next interval—for example, Guinea's initial NPV debt-to-GDP ratio for a short-term 4 percent GDP growth rate is 52 percent; thus, the matrix shows an NPV debt-to-GDP ratio of 50 percent.

17. At this point, we should also note that Rwanda's deficit-to-GDP ratios displayed in the matrices are beefed up by relatively high growth rates of exports and revenues. More generally, the higher a country's growth rates of exports relative to its growth rates of GDP, the higher the ranges of consistent deficit-to-

GDP ratios for the debt-to-export ratios compared with the consistent deficit-to-GDP ratios for the debt-to-GDP ratios (and vice versa). Similarly, the higher a country's growth rates of revenues relative to its growth rates of GDP, the higher the ranges of consistent deficit-to-GDP ratios for the debt-to-revenues ratios compared with the consistent deficit-to-GDP ratios for the debt-to-GDP ratios (and vice versa). Finally, the higher a country's growth rates of exports relative to its growth rates of revenues, the higher the ranges of consistent deficit-to-GDP ratios for the debt-to-export ratios compared with the consistent deficit-to-GDP ratios for the debt-to-revenues ratios (and vice versa).

18. The exception is Rwanda's NPV debt-to-GDP ratio, which continues to increase under the baseline scenario.

References

Addison, Tony, Henrik Hansen, and Finn Tarp, eds. 2004. *Debt Relief for Poor Countries.* Houndmills, Basingstoke, Hampshire: Palgrave Macmillan.

Edwards, Sebastian. 2002. "Debt Relief and Fiscal Sustainability." Working Paper 8939, National Bureau of Economic Research, Cambridge, MA.

Gunter, Bernhard, G. 2001. "Does the HIPC Initiative Achieve Its Goal of Debt Sustainability?" Discussion Paper 2001/100, United Nations University/World Institute for Development Economics Research, Helsinki. http://www.wider.unu.edu/publications/dps/dp2001-100.pdf.

———. 2002. "What's Wrong with the HIPC Initiative and What's Next?" *Development Policy Review* 20(1): 5–24.

———. 2003. "Achieving Debt Sustainability for All Heavily Indebted Poor Countries (HIPCs)." Paper presented at the 16th Technical Group Meeting of the Intergovernmental Group of 24, Trinidad and Tobago, February. http://www.g24.org.

Gunter, Bernhard G., Humberto Lopez, Krishnan Ramadas, and Quentin Wodon. 2002. "SimSIP Debt: A Simulation Tool for Analyzing Debt Sustainability." World Bank, Washington, DC. http://www.worldbank.org/simsip.

Herman, Barry. 2003. "Strengthening Sovereign Lending Through Mechanisms for Dialogue and Debt-Crisis Workout: Issues and Proposals." Paper presented at the 16th Technical Group Meeting of the Intergovernmental Group of 24, Port of Spain, Trinidad and Tobago, February 13–14. http://www.g24.org.

IDA (International Development Association) and IMF (International Monetary Fund). 2002. "External Debt Management in Heavily Indebted Poor Countries (HIPCs)." Washington, DC. http://www.imf.org/external/np/hipc/2002/edm/032102.htm.

IMF (International Monetary Fund). 2002. "Guinea: Request for a Three-year Arrangement under the Poverty Reduction and Growth Facility—Staff Report and Press Release on the Executive Board Discussion." Country Report 02/66, Washington, DC. http://www.imf.org/external/pubs/cat/longres.cfm?sk=15738.0.

World Bank. 2003. *Global Development Finance 2003: Striving for Stability in Development Finance.* Washington, DC: World Bank.

———. Various years. "African Development Indicators." Washington, DC: World Bank.