

REPUBLIC OF MADAGASCAR: JOINT BANK-FUND DEBT SUSTAINABILITY ANALYSIS

Madagascar's risk of debt distress is moderate, albeit in the low range of the moderate category. Madagascar's external debt burden indicators under the baseline scenario remain below the relevant policy-dependent indicative thresholds. The stress tests, however, reveal that external debt sustainability is sensitive to export shocks. The inclusion in the analysis of the small domestic debt does not change the assessment of country's risk of debt distress.

A. Introduction

1. **This debt sustainability analysis (DSA) has been prepared jointly by IMF and World Bank staff.** It is based on the framework for low-income countries approved by the respective Executive Boards. The framework takes into account indicative thresholds for debt burden indicators determined by the quality of the country's policies and institutions.¹ It comprises of a baseline scenario (which assumes, among others, implementation of the Multilateral Debt Relief Initiative –MDRI– by the African Development Fund (ADF), IDA and the Fund) and a set of alternative scenarios.

B. Recent Developments and Current Debt Situation

2. **Madagascar reached its completion point under the Enhanced HIPC Initiative in October 2004.** The resulting debt relief, including additional bilateral debt relief from most Paris Club creditors, reduced the end-2003 NPV of debt-to-exports ratio to an estimated 137 percent.^{2, 3} At that time, the ratio was projected to increase to 154 percent in 2004 and decline thereafter.

¹ According to the World Bank Country and Policy Institutional Assessment (CPIA) Index, Madagascar is rated as a medium performer. The indicative thresholds applicable for that category of countries are: (i) 150 percent for NPV of debt-to-exports ratio, (ii) 40 percent for the NPV of debt-to-GDP ratio, (iii) 250 percent for the NPV of debt to fiscal revenues ratio, (iv) 20 percent for the debt service to exports ratio and (v) 30 percent for the debt service to revenue ratio.

² Total debt relief to Madagascar under the Initiative amounts to US\$836 million in NPV terms. To date, Madagascar has secured more than 90 percent of that amount through agreements reached with all multilateral and Paris-Club creditors, as well as some non-Paris Club creditors.

³ Most Paris Club creditors have written-off their outstanding claims after full delivery of HIPC debt relief, reducing claims on Madagascar by further US\$466 million in NPV terms.

3. **At end-2005, Madagascar's external public debt (including arrears) amounted to US\$3.5 billion in nominal terms.** ⁴ The decline from the end-2003 level (US\$4.8 billion) was due to debt write-offs granted by most Paris Club creditors, and has consequently been accompanied by a drastic change in the creditor composition. As of end-2005, bilateral and commercial creditors represented only 23 percent of total outstanding obligations (with Paris Club creditors accounting for less than 5 percent), compared to about 46 percent by end-2003. The bilateral Paris Club debt that remains is mainly to Russia. Conversely, the share of multilateral creditors has increased to more than 75 percent at end-2005 from 54 percent at end-2003.⁵

Madagascar : External Debt Outstanding 2005		
Creditor	Amounts (millions of \$US)	In percent of GDP
Total external debt	3,510.28	69.7
Bilateral Creditors	784.4	15.6
: Paris Club	163.4	3.2
: Other countries	620.9	12.3
Private creditors	18.1	
Multilateral	2707.8	53.8

Source: Madagascar authorities and Fund Staff estimates

4. **Full delivery of debt relief under MDRI will significantly reduce Madagascar's external debt.** IMF's debt relief under the MDRI became effective in January 2006 and amounts to US\$197 million.⁶ MDRI debt relief from IDA is expected to be implemented starting in July 2006 through the 100 percent reduction of the debt outstanding and disbursed as of end-2003. Total MDRI debt service relief from IDA is estimated at SDR1.2 billion

⁴ As of end-2005, Madagascar has estimated US\$405 million in arrears towards non-Paris Club and private creditors that are not delivering HIPC debt relief (Algeria, Libya and Iraq are the largest). Madagascar continues to make efforts to contact these creditors, regularize the payments and obtain full debt relief under the HIPC Initiative.

⁵ The change in creditor composition also reflects the fact that multilateral creditors deliver their share of HIPC debt relief primarily through debt service reductions instead of debt write-offs.

⁶ See SM/05/353, EBS/05/158, and EBS/05/174 for details on the implementation of the MDRI by the IMF.

(equivalent to about US\$1,878 million).⁷ As for the ADF, debt relief under the MDRI will be delivered through a write-off of the outstanding obligations as of end-December 2004, with retroactive application to January-2006. Estimated MDRI debt relief from the ADF amounts to US\$327 million. The implementation of MDRI by the IMF, IDA and the ADF is expected to reduce Madagascar's outstanding debt at end-2006 by almost two thirds compared to end-2005.

C. Baseline Medium- and Long-Term Scenario

5. **The baseline scenario is built on a number of key macroeconomic assumptions, the implementation of sound macroeconomic and structural policies and external financing that is through grants and highly concessional loans.** Key macroeconomic assumptions are indicated in Box 1. With respect to external financing, new borrowing is projected to remain largely at highly concessional terms. External assistance as a share of GDP which had climbed very rapidly to close to 14 percent as a share of GDP in 2004 due to large inflows of external aid and borrowing to finance recovery after the 2002 political crises, will remain relatively high in the short term (close to 8 percent on average of GDP in 2005 and 2006 based on recent information from donors) and gradually decrease to about 6 percent of GDP by the end of the projection period. The borrowing is largely for financing infrastructure projects, improvements in ports and other facilities aimed at lowering costs and enhancing competitiveness, and to help Madagascar attain the Millennium Development Goals (MDGs).

6. **Under the baseline scenario which includes MDRI, Madagascar's external debt indicators remain well below the thresholds throughout the projection period** (Figure 1a and Table 1a). The debt indicators drop sharply (by about 50 percent) in 2006 as result of the MDRI (Table 1a). The NPV of debt to GDP ratio which was at about 36 percent in 2005 (a level already below the threshold for moderate performers) drops to 15 percent in 2006 (Figure 1a and Table 1a); it increases subsequently to peak at 24 percent in 2016 and drops after to about 20 percent in the outer years. The NPV of debt-to-exports and NPV of debt-to-revenue ratios (Table 2a) exhibit a similar profile. The increase in these ratios in the initial years (from the low post MDRI levels) reflects relatively high new borrowing albeit at concessional terms to finance needed investment expenditures. The slow performance of the Export Processing Zones (EPZ) sector due to the textile shock and also the weak performance of agricultural prices for the projection period, limits the increase in the value of exports and the improvements in the debt indicator based on exports. Given the highly concessional nature of the existing debt and new borrowing, the debt service ratios are well

⁷ For details on the implementation of the MDRI by IDA, see IDA/SecM2005 and IDA/SecM2006-0131.

below the indicative thresholds throughout the projection period but show a rising trend due to the accumulation of new debt.

7. **Madagascar’s total public debt ratios, including domestic debt, also stay well below the external debt sustainability thresholds under the base case scenario (Figure 2a and Table 2a).** The domestic debt is projected to remain under 10 percent of GDP through the projection period, as primary expenditure is assumed to be broadly kept in check with available financing from tax revenue and external assistance, and the fiscal deficit is projected to remain predominantly financed by external assistance on concessional terms.

D. Sensitivity Analysis

External Public Debt Indicators

8. **The sensitivity analysis suggests that the external debt indicators could deteriorate with inappropriate policies, and/or if confronted by adverse shocks.**⁸.

- The debt indicators in the **historical scenario** (Scenario A1 in Figure 1A and Table 1b based on the average of the years 1999-2005) follow a lower trajectory than under the base line. It should be noted, however, that the years leading up to 2005 include years of political turmoil, large terms of trade shocks, cyclones and natural disasters. Given the above and the limited availability of data, only the last five years have been kept for the purpose of this scenario. During that period, real growth averaged only about 3 percent, imports and the current account deficit were also low as the EPZ sector (recently put in place) was growing at very high growth rates from a very small base. These factors explain the relatively benign trajectory of the debt indicators under the historic scenario. If the years of the political crisis (decline of 12.7 percent in 2002) and the recovery from this (growth of 9.8% in 2003) are excluded, the average growth is significantly higher at 5 percent, which is much closer to the baseline scenario.

- The **financing scenario** (Scenario A2) reveals that Madagascar’s external debt indicators are particularly sensitive to the terms of new borrowing. Under this scenario, the NPV of debt to GDP remains below the threshold but peaks at 34 percent in 2016, and remains at about that level through 2026. The NPV of debt to exports ratio, however, does

⁸ . The stress tests performed under the sensitivity scenario assumed permanent modifications of key baseline assumptions (“alternative scenarios”) as well as temporary deviations (“bound tests”). The “alternative scenarios” include a “historical scenario”, under which the main variables that determine the debt dynamics are assumed to remain at their historical average, and a “financing scenario” that depicts the impact of lower concessionality in new borrowing. The “bound tests” are designed to examine the impact on debt and debt service indicators of shocks, based on the country’s historical volatility, to key variables.

breach the threshold and remains above it, stabilizing at about 155 percent in the outer years i.e. 2025 and 2026. The projected path of these two ratios, together with the continuous rising trend of the debt service ratio, points to the risks to debt sustainability from new borrowing at less favorable terms than assumed in the baseline scenario.⁹

9. **The bound tests also reveal some underlying vulnerabilities.** These are underscored under the most extreme stress tests represented by the combined exports and growth shock (Scenario B5) on the NPV of debt-to-GDP ratio, and the exports shock (Scenario B2) on the NPV of debt-to-exports ratio. The NPV of debt-to-GDP increases significantly (to 36 percent) but does not cross the threshold level. On the other hand, the export based indicator--the NPV of debt to exports, crosses the threshold and remains above the threshold throughout the period. The shock to exports is somewhat extreme (the standard deviation is about 35) as it is influenced by the rapid increase in exports in the historical period from textiles exports in the export processing zones, and the large decline in exports that took place during the political crises and the subsequent rapid recovery . The implications for vulnerability are nevertheless to be noted, as it illustrates the impact of shocks to certain export commodities (such as textiles) which have become large as a share of total exports in Madagascar (about 40 percent in 2005), as a result of exogenous factors such as the termination of the ATC and AGOA. The risks stemming from the potential volatility to exports is also demonstrated by the result that the debt indicator based on exports would reach the threshold even if the standard deviation is reduced to a third of that in the above extreme bound test (i.e. to 10 as opposed to 35— Scenario B7¹⁰). While declines in textile exports (largely from the export processing zones) could in reality have offsets in terms of imports (which are not captured given the partial nature of the shock), the bound tests point to some real potential risks.

Total Public Debt Indicators

10. **Total public debt indicators are most sensitive to economic growth shocks.** A temporary or permanent deviation from the baseline real GDP growth path would put the total public debt on an unsustainable path, if spending plans were kept unchanged, which is unlikely in view of past experience (Table 2b, Scenarios A3 and B1).

⁹ This scenario could also be assimilated to a sharp decline in grant financing, compared to the baseline, compensated by loans.

¹⁰ This scenario is equivalent to excluding the exceptional crisis years 2002-03 from the historical scenario.

D. Debt Distress Classification and Conclusions

11. **Madagascar's risk of debt distress is moderate, albeit in the low range of that category.** In the baseline scenario Madagascar's debt indicators are below the thresholds. The debt situation, however, appears vulnerable to shocks. The export based indicator reaches the threshold if borrowing is undertaken at non-concessional terms. Debt sustainability also appears vulnerable if large export shocks materialize, which is a risk in the medium term given the expected termination of AGOA.

12. **In conclusion, the debt situation seems under control but is not exempt of risks.** In that regard, there is a need not only for implementing the policies underpinning the baseline scenario, but also for careful monitoring of borrowing policies and export performance. The latter is critical given the concentration of exports in textiles and clothing and the termination of the ATC and AGOA renders exports highly vulnerable given the concentration of exports in textiles. The baseline projections assume that the current structural weakness in this sector will be offset by export increases and diversification, given a positive response to the large depreciation which has taken place in 2004 and from the policies put in place which would enhance competitiveness. Borrowing at non-concessional terms as well new borrowing beyond the levels assumed under the baseline could also raise Madagascar's risk of debt distress.

Box 1. Baseline Macroeconomic Assumptions

Real GDP growth is projected at a little under 6 percent on average, accelerating from 5.5 percent in the initial years to 6 percent subsequently as the reform measures take hold.

Inflation as measured by the GDP deflator averages about 6 percent, with higher rates 8 percent in the initial years and decelerating to 5 per cent subsequently.

Export volumes grow a little under 6 percent on average and support GDP growth, despite a sharp slowdown in the initial years to about 4.5 percent due to a slowdown in textiles exports (impact of the shock related to the termination of the AGOA and ACTA). Subsequently exports accelerate to slightly above 6 percent, supported by exports of commodities related to mining, agro industry products, shrimps, gems and other commodities.

Import volumes average about 6 percent for the period. Imports slow down to under 4 percent in the initial years due to declines in 2005 and 2006 largely in response to the winding of tax related effects which raised the levels of investment related imports to very high levels in earlier years. After this initial slowdown, imports grow at a higher pace than GDP, reflecting disbursements of external support for infrastructure and other projects and the associated high levels of investment activity.

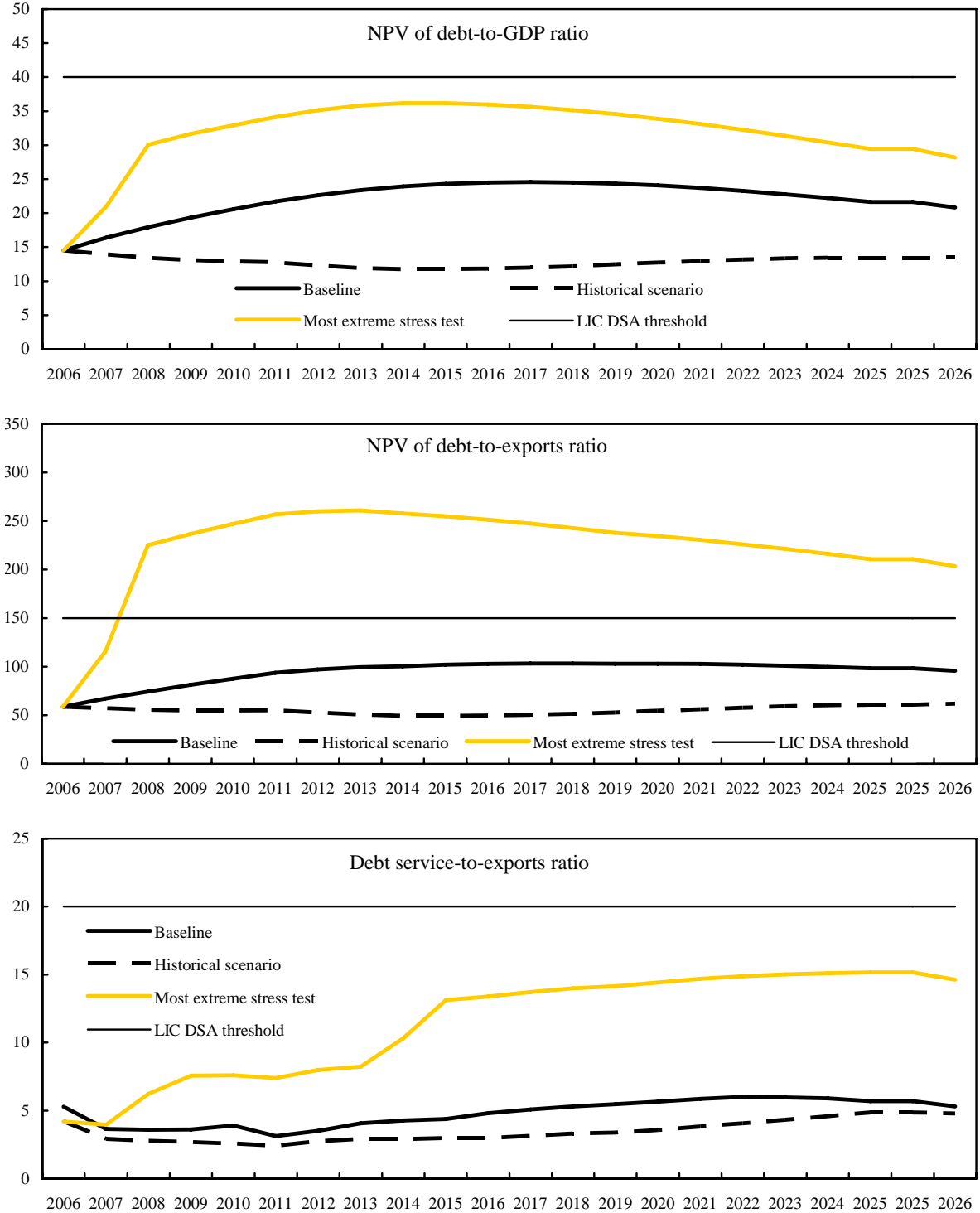
The current account deficit is projected to gradually decline from its high level of over 12 percent in 2005 to about 11 per cent by 2011 and further to about 7 per cent by the end of the projection period.

Tax revenues are projected to increase from 10.1 percent of GDP in 2005 to about 16.4 percent of GDP in 2026, owing to the termination of ad hoc tax and import duty exemptions and steadfast improvements in tax and custom administration.

Non-interest expenditures are broadly kept in check with available financing from tax revenue and external assistance, resulting in a moderate increase of about 1.5 percent of GDP over the projection period.

External assistance progressively unwinds from the exceptionally high level of about 11 percent of GDP reached during the period 2004 to 2006 to about 6 percent of GDP observed during the late 1990s. The share of grants gradually increases from less than half in the initial years to more than half in the later years.

Figure 1a. Madagascar : Indicators of Public and Publicly Guaranteed External Debt Under Alternative Scenarios, 2006-2026 (In percent)



Source: Staff projections and simulations.

Table 1a. Madagascar: External Debt Sustainability Framework, Baseline Scenario, 2006-2026 1/

	Actual										Projections												
	1998	1999	2000	2001	2002	2003	2004	2005	Historical Average 6/		Standard Deviation 6/		2006	2007	2008	2009	2010	2011	2006-11 Average	2016	2026	2012-26 Average	
External debt (nominal) 1/	103.7	118.4	104.1	87.5	92.7	83.2	79.9	69.7						25.6	28.8	31.1	33.2	35.0	36.8	41.1	35.5		
o/w public and publicly guaranteed (PPG)	103.7	118.4	104.1	87.5	92.7	83.2	79.9	69.7						25.6	28.8	31.1	33.2	35.0	36.8	41.1	35.5		
Change in external debt	...	-14.7	-14.3	-16.6	5.2	-9.5	-3.3	-10.2						-44.1	3.1	2.3	2.1	1.9	1.8	0.3	-1.2		
Identified net debt-creating flows	...	-0.7	-3.8	-16.8	1.2	-15.4	-6.6	-7.0						1.2	4.1	3.4	3.0	2.2	2.0	0.4	-0.6		
Non-interest current account deficit	5.2	4.2	4.3	0.4	5.0	4.2	8.1	10.0	5.2	2.9				10.0	10.2	10.0	9.9	9.7	9.5	7.4	6.2	7.0	
Deficit in balance of goods and services	7.8	8.0	7.3	3.2	6.6	9.0	15.1	14.1						13.7	13.5	13.2	13.0	12.7	12.5	10.0	7.4		
Exports	21.4	24.4	30.7	29.1	16.0	23.1	32.6	26.7						24.6	24.4	24.1	23.8	23.5	23.1	23.8	21.7		
Imports	29.3	32.4	38.0	32.3	22.6	32.1	47.7	40.7						38.3	38.0	37.3	36.8	36.2	35.6	33.8	29.1		
Net current transfers (negative = inflow)	-2.3	-3.5	-3.5	-3.2	-2.2	-5.5	-7.6	-4.8	-4.1	1.8				-4.4	-3.7	-3.6	-3.5	-3.4	-3.3	-2.9	-2.5	-2.8	
Other current account flows (negative = net inflow)	-0.3	-0.3	0.5	0.4	0.6	0.7	0.6	0.8						0.7	0.4	0.4	0.4	0.4	0.4	0.4	1.2		
Net FDI (negative = inflow)	-3.4	-6.8	-5.1	-2.9	-4.2	-4.9	-37.0	-7.2	-8.9	11.4				-6.2	-5.3	-5.6	-5.9	-6.3	-6.3	-5.3	-5.1	-5.2	
Endogenous debt dynamics 2/	1.8	1.8	-3.1	-14.3	0.4	-14.6	22.4	-9.9						-2.7	-0.8	-1.0	-1.1	-1.2	-1.3	-1.7	-1.7		
Contribution from nominal interest rate	...	1.4	1.3	0.9	1.0	0.8	1.2	0.8						0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.4		
Contribution from real GDP growth	...	-4.9	-5.4	-5.4	-11.0	-7.6	-5.5	-3.2						-3.1	-1.3	-1.5	-1.6	-1.7	-1.8	-2.2	-2.0		
Contribution from price and exchange rate changes	...	5.3	1.0	-9.8	-11.6	-7.8	-26.6	-7.5						...	...	...	...	...	...	...	...	...
Residual (3-4) 3/	15.4	-10.4	0.2	4.0	5.9	3.3	-3.2							-4.53	-1.0	-1.1	-0.9	-0.3	-0.2	-0.2	-0.6		
o/w exceptional financing	...	-1.5	-2.0	0.0	0.0	0.0	0.0	0.0						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
NPV of external debt 4/	...	...	...	...	...	...	...	35.8						14.5	16.4	17.9	19.3	20.6	21.7	24.5	20.8	
In percent of exports	...	...	...	...	...	...	...	134.3						38.8	67.2	74.3	81.3	87.6	93.8	102.9	95.9	
NPV of PPG external debt	...	...	...	...	...	...	...	35.8						14.5	16.4	17.9	19.3	20.6	21.7	24.5	20.8	
In percent of exports	...	...	...	...	...	...	...	134.3						38.8	67.1	74.3	81.3	87.6	93.8	102.9	95.8	
Debt service-to-exports ratio (in percent)	23.9	17.3	13.3	8.8	17.5	10.2	107.0	8.4						5.3	3.6	3.6	3.6	3.9	3.1	4.8	5.3		
PPG debt service-to-exports ratio (in percent)	23.9	17.3	13.3	8.8	17.5	10.2	107.0	8.4						5.3	3.6	3.6	3.6	3.9	3.1	4.8	5.3		
Total gross financing need (billions of U.S. dollars)	...	62.8	126.8	2.5	162.1	84.9	266.1	257.5						278.5	339.4	329.5	333.0	313.5	315.5	382.2	383.6		
Non-interest current account deficit that stabilizes debt ratio	...	-10.4	18.6	17.0	-0.2	13.7	11.4	20.2						54.1	7.1	7.7	7.8	7.8	7.7	7.2	7.4		
Key macroeconomic assumptions																							
Real GDP growth (in percent)	3.9	4.7	4.7	6.0	42.7	9.8	5.3	4.6	3.2	5.9				4.7	5.6	5.6	5.6	5.6	5.6	5.9	6.0	5.9	
GDP deflator in US dollar terms (change in percent)	...	-4.9	-0.8	10.4	15.3	9.2	-24.2	10.4	2.2	13.6				2.6	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.3	
Effective interest rate (percent) 5/	...	1.3	1.2	1.0	1.1	1.0	1.2	1.2	1.1	0.1				0.6	2.2	2.0	1.9	1.8	1.7	1.7	1.5	1.4	
Growth of exports of G&S (US dollar terms, in percent)	...	13.3	30.6	11.0	44.6	72.9	12.8	-5.6	12.9	35.5				-0.8	7.1	6.7	6.4	6.4	6.4	8.1	8.2	7.9	
Growth of imports of G&S (US dollar terms, in percent)	...	10.1	22.0	-0.5	-29.6	70.4	18.6	-1.3	12.8	30.6				1.1	7.0	6.1	6.5	6.1	6.3	5.5	7.1	6.0	
Grant element of new public sector borrowing (in percent)	...	...	...	...	...	...	...	...	...	...				43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
<i>Memorandum items:</i>																							
Nominal GDP (billions of US dollars)	3738.1	3723.1	3867.0	4527.6	4557.1	5463.8	4357.7	5033.1						5409.5	5846.3	6315.4	6816.6	7357.1	7942.5	11727.9	26371.1		
Source: Staff Simulations.																							

1/ Includes public sector external debt.

2/ Derived as $(1 - g - \rho)(1 + g - \rho)$ times previous period debt ratio, with $r =$ nominal interest rate, $g =$ real GDP growth rate, and $\rho =$ growth rate of GDP deflator in U.S. dollar terms.

3/ Includes exceptional financing (i.e., changes in arrears and debt relief); changes in gross foreign assets; and valuation adjustments. For projections also includes contribution from price and exchange rate changes.

4/ Assumes that NPV of private sector debt is equivalent to its face value.

5/ Current-year interest payments divided by previous period debt stock.

6/ Historical averages and standard deviations are generally derived over the past 10 years, subject to data availability.

Table 1b. Madagascar: Sensitivity Analyses for Key Indicators of Public and Publicly Guaranteed External Debt, 2006-26
(In percent)

	Projections								
	2006	2007	2008	2009	2010	2011	2016	2025	2026
NPV of debt-to-GDP ratio									
Baseline	14	16	18	19	21	22	24	22	21
A. Alternative Scenarios									
A1. Key variables at their historical averages in 2007-26 1/	14	14	13	13	13	13	12	13	13
A2. New public sector loans on less favorable terms in 2007-26 2/	14	18	20	23	25	27	34	34	33
B. Bound Tests									
B1. Real GDP growth at historical average minus one standard deviation in 2007-08	14	18	21	23	24	26	29	25	25
B2. Export value growth at historical average minus one standard deviation in 2007-08 3/	14	20	28	30	30	31	31	24	23
B3. US dollar GDP deflator at historical average minus one standard deviation in 2007-08	14	19	24	26	27	29	33	29	28
B4. Net non-debt creating flows at historical average minus one standard deviation in 2007-08 4/	14	18	22	23	24	25	27	23	22
B5. Combination of B1-B4 using one-half standard deviation shocks	14	21	30	32	33	34	36	29	28
B6. One-time 30 percent nominal depreciation relative to the baseline in 2007 5/	14	23	25	27	29	31	35	31	29
B7. Export value growth at historical average minus one third of standard deviation in 2007-08 3/	14	20	28	30	30	31	31	24	23
NPV of debt-to-exports ratio									
Baseline	59	67	74	81	88	94	103	98	96
A. Alternative Scenarios									
A1. Key variables at their historical averages in 2007-26 1/	59	57	56	55	55	55	50	61	62
A2. New public sector loans on less favorable terms in 2007-26 2/	59	73	85	96	107	118	142	156	154
B. Bound Tests									
B1. Real GDP growth at historical average minus one standard deviation in 2007-08	59	67	74	81	88	94	103	98	96
B2. Export value growth at historical average minus one standard deviation in 2007-08 3/	59	115	225	237	247	257	251	211	204
B3. US dollar GDP deflator at historical average minus one standard deviation in 2007-08	59	67	74	81	88	94	103	98	96
B4. Net non-debt creating flows at historical average minus one standard deviation in 2007-08 4/	59	75	90	97	103	108	113	103	100
B5. Combination of B1-B4 using one-half standard deviation shocks	59	85	123	132	139	146	149	132	128
B6. One-time 30 percent nominal depreciation relative to the baseline in 2007 5/	59	67	74	81	88	94	103	98	96
B7. Export value growth at historical average minus one third of standard deviation in 2007-08 3/	59	88	132	139	145	151	147	124	119
Debt service ratio									
Baseline	5	4	4	4	4	3	5	6	5
A. Alternative Scenarios									
A1. Key variables at their historical averages in 2007-26 1/	4	3	3	3	3	2	3	5	5
A2. New public sector loans on less favorable terms in 2007-26 2/	4	3	3	3	4	4	6	10	10
B. Bound Tests									
B1. Real GDP growth at historical average minus one standard deviation in 2007-08	4	3	3	3	3	3	5	7	7
B2. Export value growth at historical average minus one standard deviation in 2007-08 3/	4	4	6	8	8	7	13	15	15
B3. US dollar GDP deflator at historical average minus one standard deviation in 2007-08	4	3	3	3	3	3	5	7	7
B4. Net non-debt creating flows at historical average minus one standard deviation in 2007-08 4/	4	3	3	3	3	3	6	7	7
B5. Combination of B1-B4 using one-half standard deviation shocks	4	3	4	4	4	4	8	9	9
B6. One-time 30 percent nominal depreciation relative to the baseline in 2007 5/	4	3	3	3	3	3	5	7	7
B7. Export value growth at historical average minus one third of standard deviation in 2007-08 3/	4	3	4	4	4	4	8	9	9
<i>Memorandum item:</i>									
Grant element assumed on residual financing (i.e., financing required above baseline) 6/	41	41	41	41	41	41	41	41	41

Source: Staff projections and simulations.

1/ Variables include real GDP growth, growth of GDP deflator (in U.S. dollar terms), non-interest current account in percent of GDP, and non-debt creating flows.

2/ Assumes that the interest rate on new borrowing is by 2 percentage points higher than in the baseline, while grace and maturity periods are the same as in the baseline.

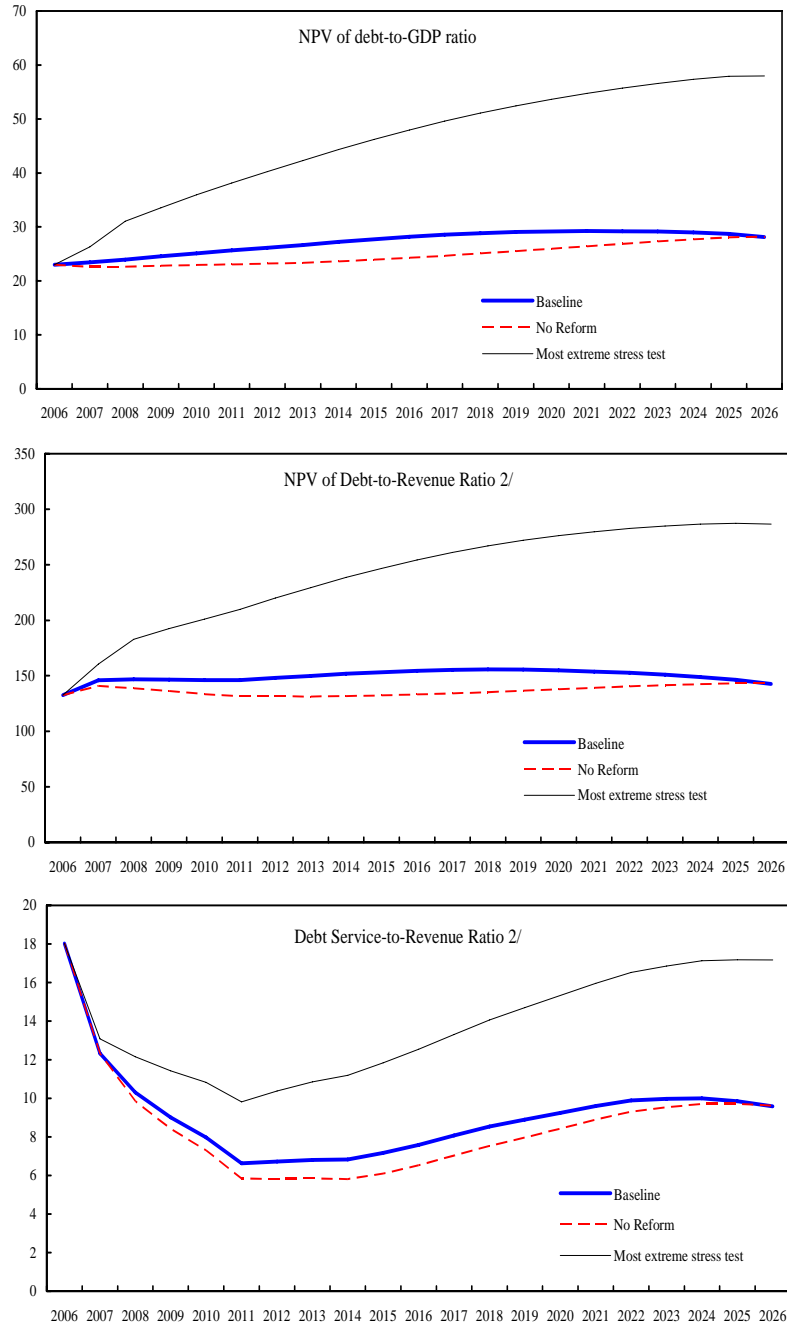
3/ Exports values are assumed to remain permanently at the lower level, but the current account as a share of GDP is assumed to return to its baseline level after the shock (implicitly assuming an offsetting adjustment in import levels).

4/ Includes official and private transfers and FDI.

5/ Depreciation is defined as percentage decline in dollar/local currency rate, such that it never exceeds 100 percent.

6/ Applies to all stress scenarios except for A2 (less favorable financing) in which the terms on all new financing are as specified in footnote 2.

Figure 2a. Madagascar: Indicators of Public Debt Under Alternative Scenarios, 2006-2026 1/



Source: Staff projections and simulations.
 1/ Most extreme stress test is test that yields highest ratio in 2016.
 2/ Revenue including grants.

Table 2a. Madagascar: Public Sector Debt Sustainability Framework, Baseline Scenario, 2003-2026
(In percent of GDP, unless otherwise indicated)

	Actual					Estimate					Projections				
	2003	2004	2005	Historical Average 5/ Standard Deviation 5/	Standard Deviation 5/	2006	2007	2008	2009	2010	2011	2006-11 Average		2012-26 Average	
												2016	2026		
Public sector debt 1/	99.2	92.3	80.2			34.2	35.8	37.1	38.4	39.6	40.8	44.7	42.8		
o/w foreign-currency denominated	83.2	80.0	69.7			25.6	28.8	31.1	33.2	35.0	36.8	41.1	35.5		
Change in public sector debt	-7.9	-6.8	-12.2			-46.0	1.7	1.3	1.3	1.2	1.2	0.5	-1.0		
Identified debt-creating flows	-18.9	23.4	-4.6			-46.3	1.9	1.6	1.4	1.3	1.2	0.5	-1.0		
Primary deficit	2.0	2.0	2.0	1.6	1.4	2.6	3.5	3.2	3.2	3.2	3.3	3.1	1.8	2.6	
Revenue and grants	15.4	20.3	16.7			17.3	16.0	16.3	16.8	17.2	17.5	18.2	19.7		
of which: grants	5.1	8.2	5.7			5.7	4.2	3.9	3.9	3.8	3.7	3.5	2.9		
Primary (noninterest) expenditure	17.4	22.2	18.7			19.9	19.5	19.5	20.0	20.4	20.8	21.3	21.5		
Automatic debt dynamics	-18.9	23.8	-4.9			-4.3	-1.5	-1.6	-1.7	-1.9	-2.0	-2.5	-2.8		
Contribution from interest rate growth differential	-9.4	-5.8	-5.0			-4.0	-1.4	-1.5	-1.6	-1.8	-1.3	-1.7	-1.6		
of which: contribution from average real interest rate	0.2	-0.8	-0.9			-0.3	0.4	0.4	0.3	0.2	0.8	0.8	0.9		
of which: contribution from real GDP growth	-9.5	-5.0	-4.1			-3.6	-1.8	-1.9	-2.0	-2.0	-2.1	-2.5	-2.5		
Contribution from real exchange rate depreciation	-9.5	29.6	0.1			-0.4	-0.1	-0.1	-0.1	-0.1	-0.7	...	...
Other identified debt-creating flows	-2.0	-2.4	-1.7			-44.5	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0		
Privatization receipts (negative)	-0.2	-0.4	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Recognition of implicit or contingent liabilities	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Debt relief (HIPC and other)	-1.8	-2.0	-1.7			-44.5	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0		
Other (specify, e.g. bank recapitalization)	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Residual, including asset changes	11.0	-30.2	-7.6			0.3	-0.3	-0.2	-0.1	-0.1	-0.1	0.0	0.0		
NPV of public sector debt	...	...	46.2			23.0	23.4	23.9	24.6	25.1	25.6	28.2	28.1		
o/w foreign-currency denominated	...	...	35.8			14.5	16.4	17.9	19.3	20.6	21.7	24.5	20.8		
o/w external	...	...	35.8			14.5	16.4	17.9	19.3	20.6	21.7	24.5	20.8		
NPV of contingent liabilities (not included in public sector debt)	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Gross financing need 2/	18.7	20.5	16.4			14.6	12.8	11.1	10.1	9.3	8.6	7.5	10.0		
NPV of public sector debt-to-revenue ratio (in percent) 3/	...	...	277.5			132.6	146.0	146.9	146.7	146.1	146.2	154.4	142.6		
o/w external	...	...	215.0			85.5	102.2	100.0	115.5	119.5	123.8	134.2	105.7		
Debt service-to-revenue ratio (in percent) 3/4/	26.5	25.9	26.4			18.0	12.3	10.3	9.0	8.0	6.6	7.6	9.6		
Primary deficit that stabilizes the debt-to-GDP ratio	9.8	8.8	14.2			48.6	1.8	1.9	1.9	2.0	2.1	2.6	2.8		
Key macroeconomic and fiscal assumptions															
Real GDP growth (in percent)	9.8	5.3	4.6	3.2	5.9	4.7	5.6	5.6	5.6	5.6	5.6	5.4	5.9	6.0	5.9
Average nominal interest rate on forex debt (in percent)	1.1	2.0	1.5	1.8	0.8	0.7	1.5	1.4	1.3	1.3	1.3	1.3	1.1	1.3	1.3
Average real interest rate on domestic currency debt (in percent)	7.5	-2.3	-1.4	-0.5	4.7	5.4	6.8	8.0	8.9	9.1	9.2	7.9	8.3	7.5	8.2
Real exchange rate depreciation (in percent, + indicates depreciation)	-11.4	37.6	0.1	4.2	14.8	-0.5	...	...	...	...	...	...	...	...	...
Inflation rate (GDP deflator, in percent)	2.8	14.3	18.3	10.8	5.2	11.5	9.9	7.2	5.6	5.1	7.4	5.1	5.1	5.3	5.1
Growth of real primary spending (deflated by GDP deflator, in percent)	41.8	34.7	-12.1	9.2	21.2	11.7	3.5	5.6	7.8	8.1	7.5	7.4	6.5	5.9	6.1
Grant element of new external borrowing (in percent)	0.0	0.0	43.2	4.3	13.7	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2

Sources: Madagascar authorities and Fund staff estimates and projections.

1/ Central government. Gross public debt.

2/ Gross financing need is defined as the primary deficit plus debt service plus the stock of short-term debt at the end of the last period.

3/ Revenues including grants.

4/ Debt service is defined as the sum of interest and amortization of medium and long-term debt.

5/ Historical averages and standard deviations are generally derived over the past 10 years, subject to data availability.

Table 2b.Madagascar: Sensitivity Analysis for Key Indicators of Public Debt 2006-2026

	Projections							
	2006	2007	2008	2009	2010	2011	2016	2026
NPV of Debt-to-GDP Ratio								
Baseline	23	23	24	25	25	26	28	28
A. Alternative scenarios								
A1. Real GDP growth and primary balance are at historical averages	23	22	22	22	21	21	21	25
A2. Primary balance is unchanged from 2006	23	23	23	23	23	23	24	28
A3. Permanently lower GDP growth 1/	23	24	25	26	28	29	39	64
B. Bound tests								
B1. Real GDP growth is at historical average minus one standard deviations in 2007-2008	23	26	31	34	36	38	48	58
B2. Primary balance is at historical average minus one standard deviations in 2007-2008	23	23	23	24	25	25	28	28
B3. Combination of B1-B2 using one half standard deviation shocks	23	23	24	24	25	25	26	25
B4. One-time 30 percent real depreciation in 2007	23	29	29	28	28	28	29	28
B5. 10 percent of GDP increase in other debt-creating flows in 2007	23	32	32	32	32	32	33	31
NPV of Debt-to-Revenue Ratio 2/								
Baseline	133	146	147	147	146	146	154	143
A. Alternative scenarios								
A1. Real GDP growth and primary balance are at historical averages	133	137	132	127	122	118	111	115
A2. Primary balance is unchanged from 2006	133	141	139	136	134	132	133	143
A3. Permanently lower GDP growth 1/	133	148	152	156	160	165	211	310
B. Bound tests								
B1. Real GDP growth is at historical average minus one standard deviations in 2007-2008	133	161	183	193	201	210	254	287
B2. Primary balance is at historical average minus one standard deviations in 2007-2008	133	143	143	143	143	143	152	142
B3. Combination of B1-B2 using one half standard deviation shocks	133	144	144	142	139	138	140	124
B4. One-time 30 percent real depreciation in 2007	133	181	176	170	164	160	158	144
B5. 10 percent of GDP increase in other debt-creating flows in 2007	133	202	196	190	185	181	178	155
Debt Service-to-Revenue Ratio 2/								
Baseline	18	12	10	9	8	7	8	10
A. Alternative scenarios								
A1. Real GDP growth and primary balance are at historical averages	18	13	10	8	7	5	5	9
A2. Primary balance is unchanged from 2006	18	12	10	8	7	6	7	10
A3. Permanently lower GDP growth 1/	18	12	11	9	9	7	10	19
B. Bound tests								
B1. Real GDP growth is at historical average minus one standard deviations in 2007-2008	18	13	12	11	11	10	13	17
B2. Primary balance is at historical average minus one standard deviations in 2007-2008	18	12	10	9	8	6	8	10
B3. Combination of B1-B2 using one half standard deviation shocks	18	13	10	9	8	6	7	9
B4. One-time 30 percent real depreciation in 2007	18	13	11	10	9	8	9	11
B5. 10 percent of GDP increase in other debt-creating flows in 2007	18	12	15	12	11	9	8	10

Sources: Country authorities; and Fund staff estimates and projections.

1/ Assumes that real GDP growth is at baseline minus one standard deviation divided by the square root of 20 (i.e., the length of the projection period).

2/ Revenues are defined inclusive of grants.