INTERNATIONAL MONETARY FUND

REPUBLIC OF MADAGASCAR

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STAFF-MONITORED PROGRAM AND REQUEST FOR DISBURSEMENT UNDER THE RAPID CREDIT FACILITY—DEBT SUSTAINABILITY ANALYSIS[1]

Approved By
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Prepared by the Staffs of the International Monetary Fund and the International Development Association

Risk of external debt distress:	**Moderate**
Augmented by significant risks stemming from domestic public and/or private external debt?	**No**

Madagascar's risk of external debt distress is assessed to be 'moderate'. This represents an increase in the risk rating relative to the last DSA carried out in 2014. The deterioration in debt dynamics is mainly attributed to a significant nominal exchange rate depreciation in 2015. The public DSA suggests that Madagascar's total public and publically guaranteed (PPG) debt dynamics are sustainable, although weak fiscal revenue generation is a source of vulnerability.

[1] Prepared by IMF and World Bank staff, in consultation with the country authorities, during the September 2015 staff mission to negotiate an RCF. This DSA follows the IMF and World Bank Staff Guidance Note on the Application of the Joint Fund-Bank Debt Sustainability Framework for Low-Income Countries, November 5, 2013 (available at http://www.imf.org/external/pp/longres.aspx?id=4827).

INTRODUCTION

1. **This joint DSA has been prepared by IMF and World Bank staff**. It is based on the framework for LICs 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.[2] The assessment comprises a baseline scenario and a set of alternative scenarios.

2. **This DSA includes public debt and guarantees of the *general* government.** The DSA does not include the debt of local government or state owned enterprises (other than through direct guarantees). The measure of debt is on a *gross* rather than *net* basis. And the *residency* criterion is used to determine the split between external and domestic debt.

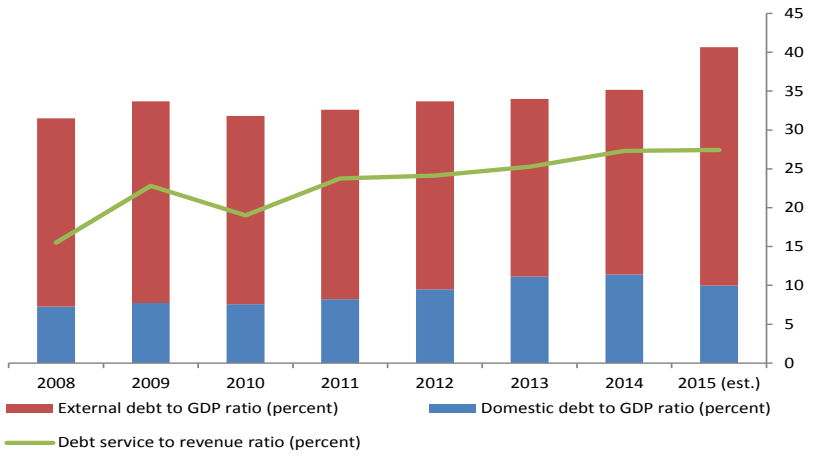
RECENT DEVELOPMENTS AND CURRENT DEBT SITUATION

3. **Over 2008-14, domestic debt was the main driver of total PPG debt in Madagascar** (Figure 1). A significant reduction in loans from development partners during the 2008-13 crisis period resulted in a greater reliance on domestic sources to finance budget deficits. In 2008, domestic debt was 7.3 percent of GDP, but increased to 11.4 percent by end-2014. This debt includes domestic budgetary arrears, which increased sharply in 2013. In contrast, external PPG debt was maintained at around 24 percent of GDP over 2008-14. The authorities also refrained from borrowing externally on non-concessional terms, which helped to maintain debt sustainability. Overall, total public debt rose from around US $2.5 billion (33 percent of GDP) in 2007 to US$3.5 billion (35 percent of GDP) in 2014. This modest increase in debt remains substantially below the pre-HIPC peak of 95 percent of GDP. The debt service to revenue ratio, however, has increased due to a greater reliance on domestic financing and declining fiscal revenues.

4. **A significant nominal exchange rate depreciation in 2015 increased the burden of external debt**. In 2015, a projected depreciation of 8 percent in the period average nominal effective exchange rate (22 percent depreciation against the dollar) is expected to increase external debt by 6 percentage points of GDP. And exchange rate base effects will lead to a further deterioration in the debt-to-GDP ratio in 2016. Nominal debt increased by a relatively modest

[2] According to the World Bank Country and Policy Institutional Assessment (CPIA) Index, Madagascar is rated as a 'low' performer, unchanged from the last DSA. The indicative thresholds for external debt applicable for that category of countries are: (i) 30 percent for the PV of debt-to-GDP ratio; (ii) 100 percent for PV of debt-to-exports ratio; (iii) 200 percent for the PV of debt to fiscal revenues ratio; (iv) 15 percent for the debt service to exports ratio; and (v) 18 percent for the debt service to revenue ratio. The indicative threshold for the PV of total PPG debt is 38 percent of GDP.

Figure 1: Debt Level and Service Ratios



Sources: Malagasy authorities; and IMF staff estimates and projections.

3 percentage points of GDP, and this was largely offset by real GDP growth. The larger than expected exchange rate depreciation, therefore, is the primary driver of the deterioration in debt dynamics in 2015, relative to the forecast in the 2014 DSA.

5. **The majority of external debt is owed to multilateral creditors on highly concessional terms**. Table 1 summarizes PPG debt by creditor type. Around one-third of total debt is held by domestic creditors mainly in the form of bonds and loans to the private sector. Debt to the central bank and arrears were also relatively high at around 2.5 percent of GDP respectively in 2014. The vast majority of external debt is held by multilateral creditors, in particular the World Bank and African Development Bank. This debt is highly concessional.

Table 1: Break-down of Total PPG Debt (end-2014)

Creditor	Amount (US$m)	Percent of GDP	Percent of total
Domestic debt, of which:	**1,217**	**11.4**	**34.1**
Treasury bills	425	4.0	11.9
Debt to the Central Bank	276	2.6	7.7
Arrears	282	2.6	7.9
Other inc. loans	234	2.2	6.5
External debt, of which:	**2,357**	**23.7**	**65.9**
Multilateral	1,854	18.7	51.9
Paris Club	107	1.1	3.0
Non-Paris Club	380	3.8	10.6
Commercial	17	0.2	0.5
Total PPG debt	**3,574**	**35.1**	**100.0**

Sources: Malagasy authorities; and IMF staff estimates and projections.

6. **Private external debt is mainly issued by local subsidiaries of multinational companies.** According to the authorities, external debt owed by *domestically* owned companies and households is negligible. There are, however, a number of multinational companies—for instance in the mining, banking, telecommunication sector—which wholly own local subsidies with external debt. The authorities do not have comprehensive data on these obligations. But by far the largest of these debtors is the Nickel/Cobalt mine and processing facility, which has external debt of around US$2bn (21 percent of GDP). This obligation has caused total external debt to increase from 24 percent of GDP in 2007 to 44 percent at end-2014. It is projected that this commercial loan will be fully repaid by around 2030.

UNDERLYING ASSUMPTIONS

7. **The key variables driving debt dynamics are forecast to improve over coming years** (Box 1). The DSA projections are consistent with the authority's plan to scale-up much needed infrastructure and social spending. Much of this investment will be financed through concessional external borrowing and grants, although some non-concessional borrowing is envisaged throughout the forecast horizon. This will increase during the forecast horizon, and as such, the average grant element of new borrowing is projected to decline from 40 percent today to around 30 percent in 2035. The current assumptions are somewhat more conservative than the 2014 DSA.

8. **The main risks to these assumptions relate to revenue generation and donor grant support, although these are symmetrical in nature**. Continued weak revenue performance and a low donor grant support (perhaps as a result of the failure to reform on revenue) pose significant risks to debt sustainability. However, there is also significant upside potential to generate revenues, especially from such a low base. This has the potential to boost the ability to service higher debt levels and stimulate greater donor support. In this sense, risks are both to the upside and downside.

Box 1. Baseline Macroeconomic Assumptions

Real GDP growth. Growth is expected to be lower in the near term than projected in the 2014 DSA, largely as a result of natural disasters and continued political uncertainty, which held back reforms and private investment. Growth is expected to steadily increase over the next 5 years, stabilizing at 5 percent for the medium term. This is driven by improved confidence, further re-engagement of development partners, and increased mining exports.

Current account. The decline in global oil and rice prices led to an improvement in the current account, which was only partially offset by lower than expected mining revenues. In coming years, a bounce back in imports is projected, as domestic consumption and investment recover. Over the medium term, the non-interest current account deficit is expected to stabilize at 3.0-3.5 percent of GDP, similar to the 2014 DSA.

Grants. Donor grant support has been significantly lower in 2014 and 2015 than anticipated in the 2014 DSA. This has led to a downward revision to medium term projections of grant support to around 2.5 percent of GDP per annum. Over the long-run, grants are assumed to decline to 0.6 percent of GDP by 2035.

Revenues. This is an area of vulnerability for debt sustainability. Tax revenues have fallen from (a relatively modest) 12.1 percent of GDP in 2008, to 9.9 in 2014. This is lower than anticipated in the 2014 DSA, and so the path of revenue going forward is projected to rise at a more modest pace.

Expenditure. Expenditure will be somewhat constrained by the lower than expected revenue projection, and so is somewhat below the 2014 DSA. However, the primary deficit is expected to be higher in the near term in order to accommodate a modest scaling up of capital investment and social spending.

Table 2: Madagascar; Baseline Macroeconomic Assumptions

		2015	2016	2017	2018	2019
Real GDP growth (percent)	2015 DSA	3.2	4.3	4.4	4.5	4.7
	2014 DSA	4.0	4.5	4.5	4.5	4.5
Non-interest current account deficit (percent GDP)	2015 DSA	1.5	1.5	1.8	3.1	3.3
	2014 DSA	5.4	5.2	5.0	4.3	3.9
Primary deficit (percent of GDP)	2015 DSA	3.5	1.9	3.6	2.9	2.7
	2014 DSA	1.4	0.7	1.4	1.3	1.3
Total revenues (percent of GDP)	2015 DSA	12.4	13.5	13.8	14.2	14.4
	2014 DSA	15.0	16.0	15.7	15.9	16.3
Grants (percent of GDP)	2015 DSA	2.1	3.0	2.6	2.7	2.4
	2014 DSA	3.7	3.7	3.7	3.7	3.7
Non-Interest Expenditure (percent of GDP)	2015 DSA	15.9	15.4	17.4	17.1	17.1
	2014 DSA	16.4	16.7	17.1	17.2	17.5

Source: IMF staff projections.

EXTERNAL DSA

Baseline scenario

9. **The level of PPG external debt in 2014 is a little over US$2.5 billion, and is projected to grow gradually throughout the forecast horizon**. PPG external debt is forecast to increase from 24 percent of GDP in 2014 to peak at 34 percent of GDP in 2020 (Table 3). This is driven by a step-up in foreign financed investment, consistent with the authority's National Development Plan. As domestic debt markets deepen (see below), PPG external debt will decline as a proportion of GDP to around 30 percent of GDP. A persistent trade deficit and outflows from the mining sector[3] are balanced with increasing grant inflows (over the next decade) and relatively strong growth. FDI inflows are assumed to be lower than that experienced over the last few years, during which major mining projects were being constructed.

10. **Under the baseline projection, all PPG external debt indicators remain below the policy-dependent debt burden thresholds** (Figure 2). The present value (PV) of the 2014 level of external debt, 13 percent of GDP, is projected to increase to 20 percent by 2035. This projection is broadly consistent with the medium term forecast from the last DSA conducted in 2014.

11. **Private external debt is projected to decline slowly, as the mining project loans are repaid.** Given the exceptional nature of this project, the DSA does not forecast substantial new external borrowing from the private sector. Furthermore, this debt is not assessed to pose a significant threat to external sustainability, as the ultimate liability of these loans is to the multinational shareholders, rather than resident entities (such as domestic banks or the government).

Alternative scenarios

12. **The two standard DSA stress test scenarios are applied to the baseline external PPG debt projection.** First, the standard bounds test applies pre-defined shocks to the key macroeconomic variables that drive external debt (summarized in Footnote 1 of Figure 2). Second, a historical scenario where macroeconomic variables are assumed to equal their average over 2004-13 is imposed on the baseline projection. These shocks are detailed in Table 4.

13. **For the standard bounds tests, two scenarios cause a breach of the thresholds for PPG external**. A one-time 30 percent depreciation shock would cause the PV of debt-to-GDP to peak at 32 percent, slightly above the 30 percent threshold implied by Madagascar's CPIA rating. The breach for the PV of debt-to-revenue is larger, peaking at just below 249 percent compared

[3] The large residual in Table 3 is partly related to mining activity. Mining exports are recorded in full in the balance of payment statistics. However, only a fraction of these receipts actually returns to Madagascar, with the remainder being repatriated to the parent companies.

to a threshold of 200 percent. For this metric, the standard shock to exports[4] also causes a breach of the threshold.

14. **The historical scenario[5] projects a rapid increase in all debt metrics and causes a breach for three of the five external debt thresholds.** These scenarios cause a substantial breach in the thresholds, especially for the PV of debt-to-GDP and the PV of debt-to-revenue. But there is reason to place less weight on this scenario—the very large current account deficit in 2008 and 2009 (over 20% of GDP in both years) was mainly driven by substantial imports associated with large mining investments, which were partly financed through non-debt creating FDI. These did not lead to a build-up of PPG external debt, and this period is not representative of the normal economic environment in Madagascar.

PUBLIC DSA

Baseline scenario

15. **Domestic PPG debt as a proportion of GDP is projected decline over the next decade**, with authorities substituting away from local financing into concessional borrowing, as donor relations normalize. Domestic PPG debt is then expected to grow as a proportion of GDP thereafter, as domestic markets deepen.

16. **The *present value* of total PPG debt is projected to remain around 25-30 percent of GDP throughout the forecast - below the threshold** (Figure 3 and Table 5)**.** Madagascar's relatively weak revenue to GDP ratio leaves the authorities somewhat vulnerable on the debt service to revenue measure. This risk is likely to increase through time as higher interest payments (associated with less concessional financing) increases at a faster rate to revenue mobilization.

Alternative scenarios

17. **All three of the alternative scenarios used to stress-test the baseline breach the risk threshold** (Figure 3). The scenario whereby the primary deficit as a proportion of GDP remains unchanged throughout the forecast generates the highest debt to GDP ratio trajectory. However, staff and authorities agree that reducing the current gap between revenue and spending is a priority.

CONCLUSION

18. **The authorities agree with the analysis presented in this DSA.** The DSA was discussed with authorities during the September mission, and there was broad agreement on the risks to debt sustainability. The authorities have begun using the LIC DSA template to help develop their

[4] Export value growth at historical average minus one standard deviation

[5] Key macroeconomic variables (non-interest current account, growth, GDP deflator, growth of exports, current official transfers and net FDI) remain fixed at the average of the 2004-13 period.

medium-term debt strategy and assess risks. Reforms to enhance debt resilience should focus on i) increasing tax revenues to increase the capacity of the state to service debt; ii) ensure that debt continues to be financed on the most concessional terms possible; iii) ensure that investments are carefully prioritized to enhance growth and human capital accumulation; and iv) improve debt monitoring capacity, especially in terms of controlling debt guarantees and potential contingent liabilities.

Table 3. Madagascar: External Debt Sustainability Framework, Baseline Scenario, 2012-35[1]

(In percent of GDP; unless otherwise indicated)

	Actual			Historical Average [6/]	Standard Deviation [6/]	Projections									
	2012	2013	2014			2015	2016	2017	2018	2019	2020	2015-2020 Average	2025	2035	2021-2035 Average
External debt (nominal) 1/	**44.9**	**43.9**	**44.3**	**38.0**	**14.5**	**51.3**	**52.0**	**49.6**	**47.7**	**45.9**	**44.8**	**48.6**	**37.5**	**35.3**	**36.2**
of which: public and publicly guaranteed (PPG)	24.2	22.8	23.7	24.2	16.3	31.2	32.6	32.7	33.0	33.3	33.8	32.8	32.9	28.4	31.3
Change in external debt	2.6	-1.0	0.5	2.1	16.2	7.0	0.7	-2.5	-1.9	-1.7	-1.2	0.1	-1.6	0.6	-0.6
Identified net debt-creating flows	-1.2	-2.5	-3.0			-2.8	-3.8	-3.6	-2.5	-2.4	-2.7		-2.7	-3.2	
Non-interest current account deficit	**6.5**	**5.3**	**-0.1**	**8.9**	**7.0**	**1.5**	**1.5**	**1.8**	**3.0**	**3.2**	**3.2**	**2.4**	**3.5**	**2.6**	**3.1**
Deficit in balance of goods and services	9.5	8.4	4.3	13.8	6.3	3.3	3.3	3.7	5.0	5.5	5.4	4.4	5.8	5.1	5.5
Exports	29.2	30.3	32.8			34.3	37.4	37.8	37.1	37.1	37.5		38.1	43.3	39.7
Imports	38.7	38.7	37.1			37.6	40.7	41.5	42.2	42.6	42.9		43.9	48.5	45.2
Net current transfers (negative = inflow)	-6.0	-6.0	-6.9	-6.4	2.6	-5.1	-5.5	-5.5	-5.4	-5.4	-5.4	-5.4	-5.4	-5.4	-5.4
of which: official	-1.2	-1.3	-2.0	-2.1	1.7	-2.0	-2.1	-2.4	-2.2	-2.0	-1.9	-2.1	-1.4	-0.8	-1.2
Other current account flows (negative = net inflow)	3.0	2.9	2.5	1.5	1.0	3.3	3.7	3.6	3.4	3.1	3.2	3.4	3.1	2.8	3.0
Net FDI (negative = inflow)	**-7.8**	**-5.2**	**-2.9**	**-5.3**	**2.3**	**-3.1**	**-3.3**	**-3.5**	**-3.7**	**-3.9**	**-4.1**	**-3.6**	**-4.1**	**-4.1**	**-4.1**
Endogenous debt dynamics 2/	**0.2**	**-2.6**	**0.0**	**-3.2**	**4.1**	**-1.2**	**-2.0**	**-1.9**	**-1.8**	**-1.7**	**-1.7**	**-1.7**	**-2.1**	**-1.6**	**-1.9**
Contribution from nominal interest rate	0.3	0.3	0.3	0.3	0.1	0.4	0.3	0.3	0.3	0.4	0.4	0.3	0.4	0.6	0.5
Contribution from real GDP growth	-1.3	-1.0	-1.4	-1.3	1.5	-1.6	-2.3	-2.1	-2.1	-2.1	-2.2	-2.1	-1.8	-1.6	-1.7
Contribution from price and exchange rate changes	1.2	-1.9	1.2			...	...	...	...	...	...		...	...	
Residual (3-4) 3/	**3.8**	**1.4**	**3.4**	**-4.2**	**14.1**	**9.8**	**4.5**	**1.1**	**0.5**	**0.6**	**1.5**	**3.0**	**1.1**	**3.9**	**2.2**
of which: exceptional financing	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
PV of external debt 4/	...	...	33.8			37.7	38.2	36.0	34.4	32.9	31.9		26.5	27.1	
In percent of exports	...	...	103.2			109.8	102.2	95.3	92.6	88.7	85.0		69.5	62.4	
PV of PPG external debt	**...**	**...**	**13.2**			**17.5**	**18.7**	**19.1**	**19.7**	**20.3**	**20.9**		**21.9**	**20.2**	
In percent of exports	**...**	**...**	**40.3**			**51.1**	**50.1**	**50.6**	**53.1**	**54.6**	**55.8**		**57.5**	**46.6**	
In percent of government revenues	**...**	**...**	**130**			**169**	**172**	**169**	**168**	**166**	**164**		**157**	**127**	
Debt service-to-exports ratio (in percent)	**2.0**	**1.7**	**2.9**			**2.7**	**3.0**	**2.9**	**2.7**	**2.7**	**2.7**		**3.3**	**3.9**	
PPG debt service-to-exports ratio (in percent)	**2.0**	**1.7**	**2.9**			**2.7**	**3.0**	**2.9**	**2.7**	**2.7**	**2.7**		**3.3**	**3.9**	
PPG debt service-to-revenue ratio (in percent)	**6.2**	**5.5**	**9.5**			**9.0**	**10.1**	**9.8**	**8.6**	**8.2**	**7.9**		**9.0**	**10.2**	
Total gross financing need (Millions of U.S. dollars)	-77.4	71.0	-221.2			-64.7	-63.8	-58.1	35.8	34.9	4.9		108.6	29.1	
Non-interest current account deficit that stabilizes debt ratio	3.8	6.4	-0.6			-5.5	0.8	4.2	4.9	5.0	4.4		5.1	1.9	
Key macroeconomic assumptions															
Real GDP growth (in percent)	3.0	2.3	3.3	2.9	3.5	3.2	4.3	4.4	4.5	4.7	5.0	4.3	5.0	5.0	5.0
GDP deflator in US dollar terms (change in percent)	-2.7	4.5	-2.6	6.7	9.9	-11.9	-8.8	2.1	2.2	2.4	1.7	-2.1	1.8	1.9	1.9
Effective interest rate (percent) 5/	0.7	0.6	0.8	0.8	0.3	0.7	0.6	0.6	0.7	0.9	1.0	0.7	1.2	1.9	1.6
Growth of exports of G&S (US dollar terms, in percent)	9.4	11.0	8.9	10.6	16.3	-4.8	3.6	7.7	5.0	7.1	8.0	4.4	7.7	8.6	8.0
Growth of imports of G&S (US dollar terms, in percent)	2.1	6.9	-3.6	8.4	21.5	-7.8	2.8	8.7	8.5	8.2	7.7	4.7	7.6	8.5	7.8
Grant element of new public sector borrowing (in percent)	...	...	...	...	...	42.8	37.4	40.4	37.3	36.7	36.5	38.5	34.0	28.2	31.5
Government revenues (excluding grants, in percent of GDP)	9.6	9.6	10.1	10.7	1.0	10.3	10.9	11.3	11.8	12.2	12.8	11.6	14.0	14.7	14.5
Aid flows (in Millions of US dollars) 7/	120	134	246			404	441	401	438	426	417		382	279	
of which: Grants	120	134	246			200	239	253	264	248	249		245	206	
of which: Concessional loans	0.0	0.0	0.0			204.0	202.1	148.5	173.5	178.2	167.6		136.6	72.8	
Grant-equivalent financing (in percent of GDP) 8/	...	...	...			3.5	4.1	3.8	3.7	3.4	3.1	3.6	2.3	1.3	2.0
Grant-equivalent financing (in percent of external financing) 8/	...	...	...			64.2	61.9	67.2	65.2	62.8	63.1	64.1	59.4	42.6	52.6
Memorandum items:															
Nominal GDP (Millions of US dollars)	9920	10602	10674			9700	9223	9824	10494	11249	12011		16781	32896	
Nominal dollar GDP growth	0.3	6.9	0.7			-9.1	-4.9	6.5	6.8	7.2	6.8	2.2	6.9	7.0	6.9
PV of PPG external debt (in Millions of US dollars)			1311.6			1480.3	1685.5	1845.3	2038.0	2251.1	2462.9		3616.8	6538.7	
(PVt-PVt-1)/GDPt-1 (in percent)						1.6	2.1	1.7	2.0	2.0	1.9	1.9	1.4	1.1	1.4
Gross workers' remittances (Millions of US dollars)	...	...	...			...	...	...	...	...	...		...	...	
PV of PPG external debt (in percent of GDP + remittances)	...	...	13.2			17.5	18.7	19.1	19.7	20.3	20.9		21.9	20.2	
PV of PPG external debt (in percent of exports + remittances)	...	...	40.3			51.1	50.1	50.6	53.1	54.6	55.8		57.5	46.6	
Debt service of PPG external debt (in percent of exports + remittances)	...	...	2.9			2.7	3.0	2.9	2.7	2.7	2.7		3.3	3.9	

Sources: Country authorities; and staff estimates and projections.

1/ Includes both public and private sector external debt.

2/ Derived as [r - g - ρ(1+g)]/(1+g+ρ+gρ) times previous period debt ratio, with r = nominal interest rate; g = real GDP growth rate, and ρ = 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 PV of private sector debt is equivalent to its face value.

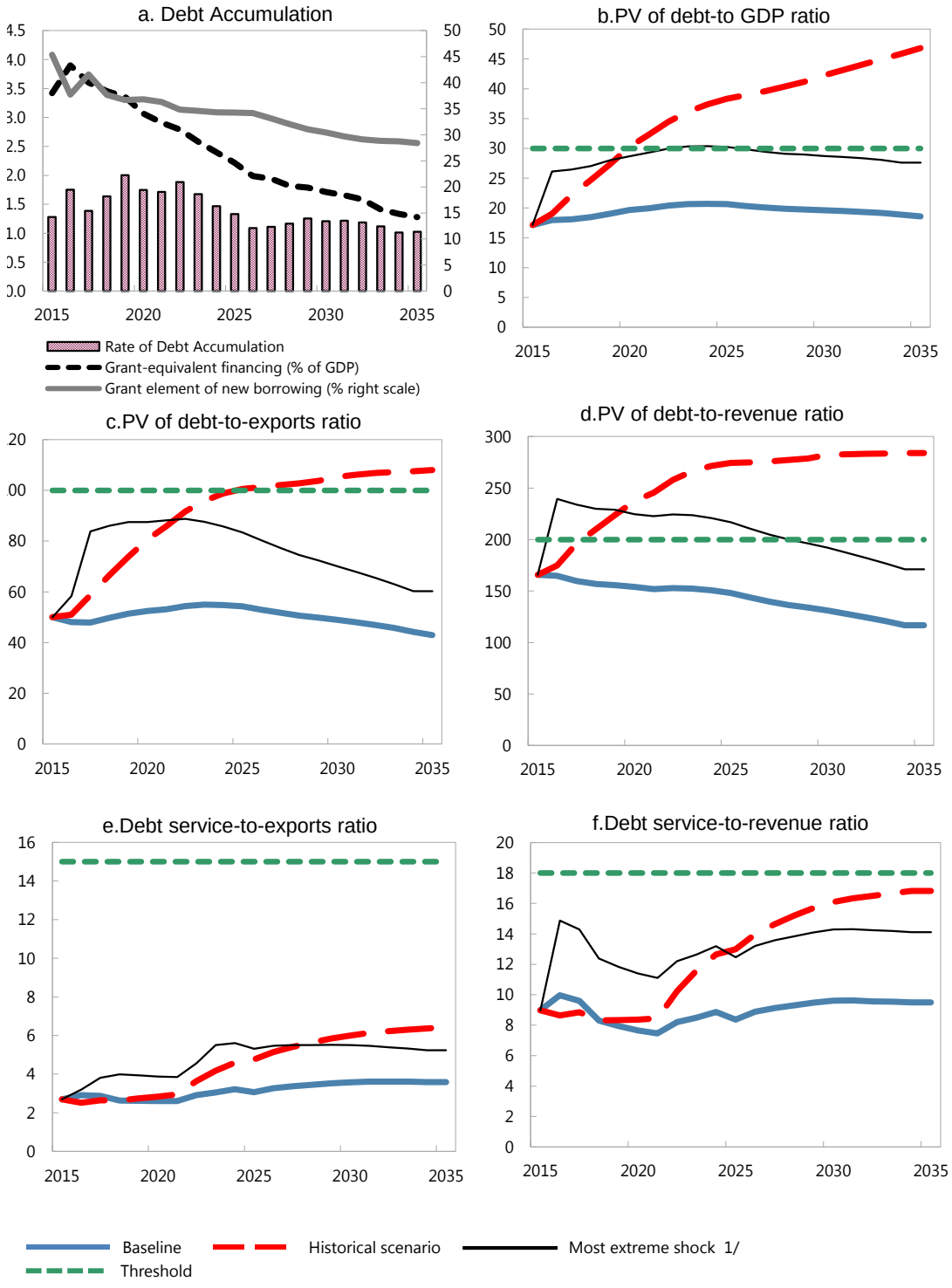
5/ Current-year interest payments divided by previous period debt stock.

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

7/ Defined as grants, concessional loans, and debt relief.

8/ Grant-equivalent financing includes grants provided directly to the government and through new borrowing (difference between the face value and the PV of new debt).

Figure 2. Madagascar: Indicators of Public and Publicly Guaranteed External Debt under Alternatives Scenarios, 2015-35 1/



Sources: Country authorities; and staff estimates and projections.

1/ The most extreme stress test is the test that yields the highest ratio on or before 2025. In figure b. it corresponds to a One-time depreciation shock; in c. to a Exports shock; in d. to a One-time depreciation shock; in e. to a Exports shock and in figure f. to a One-time depreciation shock

Table 4. Madagascar: Sensitivity Analysis for Key Indicators of Public and Publicly Guaranteed External Debt, 2015-35

(In percent)

	Projections																				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	**2025**	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
PV of debt-to GDP ratio																					
Baseline	17	18	18	18	19	20	20	20	21	21	**21**	20	20	20	20	20	20	19	19	19	19
A. Alternative Scenarios																					
A1. Key variables at their historical averages in 2015-2035 1/	17	19	22	25	27	30	32	34	36	37	**38**	39	40	40	41	42	43	44	45	46	47
A2. New public sector loans on less favorable terms in 2015-2035 2	17	18	19	20	22	23	24	25	25	26	**26**	26	26	26	27	27	27	27	28	28	28
B. Bound Tests																					
B1. Real GDP growth at historical average minus one standard deviation in 2016-2017	17	18	20	20	21	21	22	22	23	23	**23**	22	22	22	22	21	21	21	21	21	20
B2. Export value growth at historical average minus one standard deviation in 2016-2017 3/	17	20	25	25	26	26	26	27	26	26	**25**	25	24	23	23	22	22	22	21	20	20
B3. US dollar GDP deflator at historical average minus one standard deviation in 2016-2017	17	17	18	18	19	19	20	20	20	20	**20**	20	20	19	19	19	19	19	19	18	18
B4. Net non-debt creating flows at historical average minus one standard deviation in 2016-2017 4/	17	19	21	21	21	22	22	23	23	22	**22**	22	21	21	21	20	20	20	20	19	19
B5. Combination of B1-B4 using one-half standard deviation shocks	17	16	18	18	19	19	19	20	20	20	**20**	20	19	19	19	19	19	18	18	18	18
B6. One-time 30 percent nominal depreciation relative to the baseline in 2016 5/	17	26	26	27	28	29	29	30	30	30	**30**	30	29	29	29	29	29	28	28	28	27
PV of debt-to-exports ratio																					
Baseline	50	48	48	50	51	52	53	54	55	55	**54**	53	52	51	50	49	48	47	46	44	43
A. Alternative Scenarios																					
A1. Key variables at their historical averages in 2015-2035 1/	50	51	59	67	74	81	86	92	96	99	**101**	101	102	103	104	105	106	107	107	107	108
A2. New public sector loans on less favorable terms in 2015-2035 2	50	49	51	55	58	60	63	66	68	69	**69**	68	68	67	67	67	67	66	66	65	64
B. Bound Tests																					
B1. Real GDP growth at historical average minus one standard deviation in 2016-2017	50	47	47	49	51	51	52	54	54	54	**53**	52	51	50	49	48	47	46	45	43	42
B2. Export value growth at historical average minus one standard deviation in 2016-2017 3/	50	58	84	86	88	87	88	89	88	86	**83**	80	77	75	72	70	68	65	63	60	58
B3. US dollar GDP deflator at historical average minus one standard deviation in 2016-2017	50	47	47	49	51	51	52	54	54	54	**53**	52	51	50	49	48	47	46	45	43	42
B4. Net non-debt creating flows at historical average minus one standard deviation in 2016-2017 4/	50	51	55	56	58	58	59	60	60	59	**58**	57	55	53	52	51	50	48	47	45	44
B5. Combination of B1-B4 using one-half standard deviation shocks	50	46	52	54	55	56	57	58	59	59	**58**	56	55	54	53	52	51	50	48	47	45
B6. One-time 30 percent nominal depreciation relative to the baseline in 2016 5/	50	47	47	49	51	51	52	54	54	54	**53**	52	51	50	49	48	47	46	45	43	42
PV of debt-to-revenue ratio																					
Baseline	166	165	160	157	156	154	152	153	152	151	**148**	144	140	136	134	131	128	124	121	117	117
A. Alternative Scenarios																					
A1. Key variables at their historical averages in 2015-2035 1/	166	175	196	210	224	237	246	258	266	271	**274**	275	276	277	279	282	283	283	284	284	319
A2. New public sector loans on less favorable terms in 2015-2035 2	166	168	171	173	177	178	180	185	187	188	**188**	185	183	182	181	180	178	176	174	171	188
B. Bound Tests																					
B1. Real GDP growth at historical average minus one standard deviation in 2016-2017	166	169	174	172	171	168	166	167	167	165	**162**	157	153	149	146	143	140	136	132	128	139
B2. Export value growth at historical average minus one standard deviation in 2016-2017 3/	166	182	223	216	212	205	201	199	194	188	**181**	174	167	160	155	150	144	138	133	127	137
B3. US dollar GDP deflator at historical average minus one standard deviation in 2016-2017	166	151	156	153	153	150	148	149	149	147	**144**	140	136	133	131	128	125	121	118	114	124
B4. Net non-debt creating flows at historical average minus one standard deviation in 2016-2017 4/	166	173	182	178	176	171	169	169	167	163	**159**	153	148	144	140	137	132	128	124	119	129
B5. Combination of B1-B4 using one-half standard deviation shocks	166	144	156	153	152	149	147	148	148	145	**143**	138	134	131	128	125	122	119	115	111	121
B6. One-time 30 percent nominal depreciation relative to the baseline in 2016 5/	166	239	234	230	229	225	223	224	224	221	**217**	211	205	200	196	192	187	182	177	171	186

Table 4. Madagascar: Sensitivity Analysis for Key Indicators of Public and Publicly Guaranteed External Debt, 2015-35 (concluded)

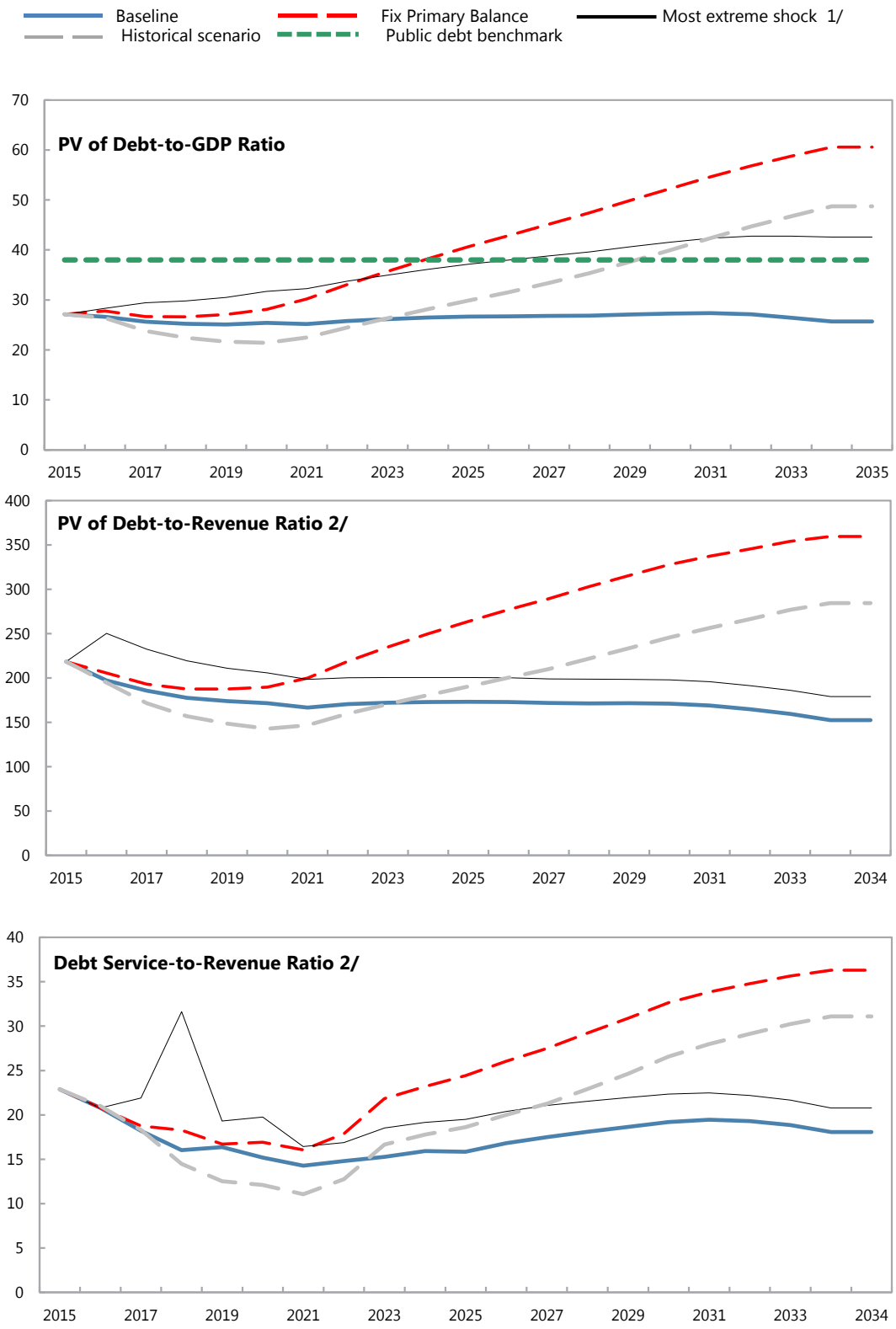
(In percent)

	Projections																				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	**2025**	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Debt service-to-exports ratio																					
Baseline	3	3	3	3	3	3	3	3	3	3	**3**	3	3	3	4	4	4	4	4	4	4
A. Alternative Scenarios																					
A1. Key variables at their historical averages in 2015-2035 1/	3	3	3	3	3	3	3	4	4	5	**5**	5	5	6	6	6	6	6	6	6	6
A2. New public sector loans on less favorable terms in 2015-2035 2	3	3	3	3	3	3	3	4	4	4	**4**	4	5	5	5	5	5	5	5	5	5
B. Bound Tests																					
B1. Real GDP growth at historical average minus one standard deviation in 2016-2017	3	3	3	3	3	3	3	3	3	3	**3**	3	3	3	4	4	4	4	4	4	4
B2. Export value growth at historical average minus one standard deviation in 2016-2017 3/	3	3	4	4	4	4	4	5	6	6	**5**	5	6	6	6	6	5	5	5	5	5
B3. US dollar GDP deflator at historical average minus one standard deviation in 2016-2017	3	3	3	3	3	3	3	3	3	3	**3**	3	3	3	4	4	4	4	4	4	4
B4. Net non-debt creating flows at historical average minus one standard deviation in 2016-2017 4/	3	3	3	3	3	3	3	3	4	4	**4**	4	4	4	4	4	4	4	4	4	4
B5. Combination of B1-B4 using one-half standard deviation shocks	3	3	3	3	3	3	3	3	3	4	**3**	4	4	4	4	4	4	4	4	4	4
B6. One-time 30 percent nominal depreciation relative to the baseline in 2016 5/	3	3	3	3	3	3	3	3	3	3	**3**	3	3	3	4	4	4	4	4	4	4
Debt service-to-revenue ratio																					
Baseline	9	10	10	8	8	8	7	8	8	9	**8**	9	9	9	9	10	10	10	10	9	9
A. Alternative Scenarios																					
A1. Key variables at their historical averages in 2015-2035 1/	9	9	9	8	8	8	8	10	12	13	**13**	14	15	15	16	16	16	16	17	17	19
A2. New public sector loans on less favorable terms in 2015-2035 2	9	10	9	8	8	8	9	10	10	11	**11**	12	12	13	13	13	13	13	14	14	16
B. Bound Tests																					
B1. Real GDP growth at historical average minus one standard deviation in 2016-2017	9	11	11	9	9	9	8	9	9	10	**9**	10	10	10	11	11	11	11	11	11	12
B2. Export value growth at historical average minus one standard deviation in 2016-2017 3/	9	10	10	10	10	9	9	10	12	12	**12**	12	12	12	12	12	12	11	11	11	12
B3. US dollar GDP deflator at historical average minus one standard deviation in 2016-2017	9	9	10	8	8	8	7	8	8	9	**8**	9	9	9	9	10	10	9	9	9	11
B4. Net non-debt creating flows at historical average minus one standard deviation in 2016-2017 4/	9	10	10	9	9	8	8	9	10	10	**10**	10	10	10	10	10	10	10	10	10	11
B5. Combination of B1-B4 using one-half standard deviation shocks	9	9	9	8	8	7	7	8	8	9	**8**	9	9	9	9	9	9	9	9	9	10
B6. One-time 30 percent nominal depreciation relative to the baseline in 2016 5/	9	15	14	12	12	11	11	12	13	13	**12**	13	14	14	14	14	14	14	14	14	16
Memorandum item:																					
Grant element assumed on residual financing (i.e., financing required above baseline) 6/	31	31	31	31	31	31	31	31	31	31	**31**	31	31	31	31	31	31	31	31	31	31

Sources: Country authorities; and staff estimates and projections.

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 3.Madagascar: Indicators of Public Debt Under Alternative Scenarios, 2015-35



Sources: Country authorities; and staff estimates and projections.
1/ The most extreme stress test is the test that yields the highest ratio on or before 2025.
2/ Revenues are defined inclusive of grants.

Table 5. Madagascar: Public Sector Debt Sustainability Framework, Baseline Scenario, 2012-35

(In percent of GDP, unless otherwise indicated)

	Actual					Projections									
	2012	2013	2014	Average 5/	Standard Deviation 5/	2015	2016	2017	2018	2019	2020	2015-20 Average	2025	2035	2021-35 Average
Public sector debt 1/	33.7	34.0	35.2	38.9	16.8	40.6	40.1	38.8	38.0	37.6	37.8	38.8	37.3	32.6	36.1
of which: foreign-currency denominated	24.2	22.8	23.7	29.7	16.3	30.7	31.5	31.2	31.2	31.6	32.0	31.4	31.3	26.4	29.5
Change in public sector debt	1.1	0.3	1.2			5.5	-0.5	-1.4	-0.8	-0.3	0.1		-0.3	-1.1	
Identified debt-creating flows	-1.1	-0.9	2.7			8.4	0.4	1.7	1.1	1.0	1.1		-1.7	-2.7	
Primary deficit	1.8	3.2	1.6	1.1	1.3	3.5	1.9	3.6	2.9	2.7	2.5	2.8	0.0	-1.5	-0.5
Revenue and grants	10.8	10.9	12.4	14.2	3.5	12.4	13.5	13.8	14.2	14.4	14.8	13.9	15.4	15.3	15.7
of which: grants	1.2	1.3	2.3	3.5	2.9	2.1	2.6	2.5	2.4	2.2	2.1	2.3	1.5	0.6	1.2
Primary (noninterest) expenditure	12.6	14.1	14.0	15.3	2.6	15.9	15.4	17.4	17.1	17.1	17.3	16.7	15.4	13.8	15.2
Automatic debt dynamics	-1.6	-1.9	1.0			4.1	-2.1	-2.3	-2.0	-1.8	-1.4		-1.6	-1.2	
Contribution from interest rate/growth differential	-1.0	-0.7	-1.4			-1.4	-2.0	-2.1	-1.9	-1.8	-1.9		-1.9	-1.4	
of which: contribution from average real interest rate	0.0	0.0	-0.3			-0.3	-0.3	-0.4	-0.3	0.0	-0.1		-0.1	0.2	
of which: contribution from real GDP growth	-1.0	-0.7	-1.1			-1.1	-1.7	-1.7	-1.7	-1.7	-1.8		-1.8	-1.6	
Contribution from real exchange rate depreciation	-0.6	-1.2	2.4			5.4	0.0	-0.2	-0.1	-0.1	0.5		...	...	
Other identified debt-creating flows	-1.4	-2.2	0.1			0.8	0.6	0.3	0.2	0.2	0.0		0.0	0.0	
Privatization receipts (negative)	0.0	0.0	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)	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Reduction of domestic arrears	-1.4	-2.2	0.1			0.8	0.6	0.3	0.2	0.2	0.0		0.0	0.0	
Residual, including asset changes	2.2	1.2	-1.5	0.0	1.7	-2.9	-1.0	-3.1	-1.9	-1.4	-0.9	-1.8	1.4	1.6	1.7
Other Sustainability Indicators															
PV of public sector debt	...	...	24.6			27.1	26.6	25.6	25.2	25.1	25.4		26.7	24.8	
of which: foreign-currency denominated	...	...	13.2			17.2	18.0	18.1	18.5	19.1	19.7		20.7	18.6	
of which: external	...	...	13.2			17.2	18.0	18.1	18.5	19.1	19.7		20.7	18.6	
Gross financing need 2/	7.9	10.1	9.4	12.5	13.8	11.5	9.2	10.0	8.5	8.1	7.4	9.1	5.0	4.5	5.2
PV of public sector debt-to-revenue and grants ratio (in percent)	...	...	198.1			218.5	197.1	185.6	177.6	173.9	171.5		173.1	162.2	
PV of public sector debt-to-revenue ratio (in percent)	...	...	243.0			262.1	244.1	226.5	214.3	205.2	199.2		191.2	169.1	
of which: external 3/	...	...	130.4			165.8	164.7	159.8	156.8	155.7	154.0		148.0	127.0	
Debt service-to-revenue and grants ratio (in percent) 4/	21.4	22.3	22.3	41.1	67.6	22.9	20.8	18.2	16.0	16.4	15.2	18.2	15.8	19.3	17.4
Debt service-to-revenue ratio (in percent) 4/	24.1	25.3	27.3	66.3	130.3	27.4	25.7	22.2	19.3	19.3	17.6	21.9	17.5	20.1	18.8
Primary deficit that stabilizes the debt-to-GDP ratio	0.7	2.9	0.4	1.4	1.4	-2.0	2.4	5.0	3.7	3.0	2.3	2.4	0.2	-0.4	-0.2
Key macroeconomic and fiscal assumptions															
Real GDP growth (in percent)	3.0	2.3	3.3	2.9	3.5	3.2	4.3	4.4	4.5	4.7	5.0	4.3	5.0	5.0	5.0
Average nominal interest rate on forex debt (in percent)	1.2	1.2	1.5	1.1	0.3	1.4	1.0	0.8	0.9	1.3	1.3	1.1	1.4	2.3	1.8
Average real interest rate on domestic debt (in percent)	1.5	0.7	-2.7	1.0	3.4	-1.0	-0.2	-0.2	0.9	4.7	4.8	1.5	4.8	4.8	4.8
Real exchange rate depreciation (in percent, + indicates depreciation	-2.6	-5.0	10.7	0.2	5.7	23.8	...	...	...	...	...	...	...	...	...
Inflation rate (GDP deflator, in percent)	5.5	5.1	6.6	9.1	3.7	7.6	7.4	6.4	5.7	5.3	5.1	6.3	5.0	5.0	5.0
Growth of real primary spending (deflated by GDP deflator, in percer	-0.9	14.3	2.6	1.6	4.6	17.0	1.2	18.0	2.2	4.9	6.1	8.2	5.5	-5.3	3.5
Grant element of new external borrowing (in percent)	...	...	...	...	...	45.4	37.7	41.6	37.7	36.7	36.8	39.3	34.3	28.4	32.0

Sources: Country authorities; and staff estimates and projections.

1/ General government gross 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 excluding 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 6. Madagascar: Sensitivity Analysis for Key Indicators of Public Debt 2015-35

	Projections																				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
PV of Debt-to-GDP Ratio																					
Baseline	27	27	26	25	25	25	25	26	26	26	27	27	27	27	27	27	27	27	26	26	25
A. Alternative scenarios																					
A1. Real GDP growth and primary balance are at historical averages	27	26	24	22	22	21	22	24	26	28	30	32	33	35	38	40	42	45	47	49	50
A2. Primary balance is unchanged from 2015	27	28	27	27	27	28	30	33	36	38	41	43	45	47	50	52	55	57	59	61	62
A3. Permanently lower GDP growth 1/	27	27	26	26	26	27	28	29	30	31	32	33	35	36	37	39	40	41	42	43	43
B. Bound tests																					
B1. Real GDP growth is at historical average minus one standard deviations in 2016-2017	27	28	29	30	30	32	32	34	35	36	37	38	39	40	41	42	42	43	43	43	42
B2. Primary balance is at historical average minus one standard deviations in 2016-2017	27	27	25	25	25	25	25	25	26	26	26	26	26	27	27	27	27	27	26	25	25
B3. Combination of B1-B2 using one half standard deviation shocks	27	27	26	26	26	27	28	29	30	31	31	32	33	33	34	35	35	36	35	35	34
B4. One-time 30 percent real depreciation in 2016	27	34	32	31	30	31	30	30	30	31	31	31	31	31	31	32	32	31	31	30	29
B5. 10 percent of GDP increase in other debt-creating flows in 2016	27	34	33	32	31	32	31	32	32	32	32	32	32	32	32	32	32	31	31	30	29
PV of Debt-to-Revenue Ratio 2/																					
Baseline	219	197	186	178	174	172	167	170	172	173	173	173	172	171	171	171	169	165	159	152	162
A. Alternative scenarios																					
A1. Real GDP growth and primary balance are at historical averages	219	195	172	157	148	143	147	160	170	181	190	200	210	222	234	246	256	266	277	284	324
A2. Primary balance is unchanged from 2015	219	206	193	187	188	190	200	219	235	250	264	277	289	303	316	328	337	346	354	359	406
A3. Permanently lower GDP growth 1/	219	199	189	183	183	183	182	190	197	203	209	214	220	226	234	241	246	249	252	253	282
B. Bound tests																					
B1. Real GDP growth is at historical average minus one standard deviations in 2016-2017	219	208	209	206	208	211	211	221	228	234	239	244	247	251	255	259	260	259	257	252	275
B2. Primary balance is at historical average minus one standard deviations in 2016-2017	219	200	182	174	171	169	164	168	169	170	171	171	170	169	169	169	167	163	158	151	161
B3. Combination of B1-B2 using one half standard deviation shocks	219	201	183	179	180	182	181	188	194	199	202	206	208	211	214	217	217	215	212	207	225
B4. One-time 30 percent real depreciation in 2016	219	250	233	219	211	206	198	200	200	201	201	200	199	199	198	198	196	191	186	179	192
B5. 10 percent of GDP increase in other debt-creating flows in 2016	219	250	237	223	218	214	207	210	211	210	209	207	205	203	202	200	197	191	185	176	187
Debt Service-to-Revenue Ratio 2/																					
Baseline	23	21	18	16	16	15	14	15	15	16	16	17	17	18	19	19	19	19	19	18	19
A. Alternative scenarios																					
A1. Real GDP growth and primary balance are at historical averages	23	21	18	14	13	12	11	13	17	18	19	20	21	23	25	27	28	29	30	31	35
A2. Primary balance is unchanged from 2015	23	21	19	18	17	17	16	18	22	23	24	26	27	29	31	33	34	35	36	36	41
A3. Permanently lower GDP growth 1/	23	21	18	16	17	16	16	17	17	19	19	21	22	23	24	26	27	27	28	27	31
B. Bound tests																					
B1. Real GDP growth is at historical average minus one standard deviations in 2016-2017	23	22	20	18	20	19	18	19	20	21	21	23	24	25	26	27	28	28	28	27	30
B2. Primary balance is at historical average minus one standard deviations in 2016-2017	23	21	18	16	15	15	14	15	15	16	16	17	17	18	18	19	19	19	19	18	19
B3. Combination of B1-B2 using one half standard deviation shocks	23	21	19	16	14	17	16	17	18	18	18	20	21	22	22	23	24	24	24	23	25
B4. One-time 30 percent real depreciation in 2016	23	23	22	20	20	19	18	19	20	21	21	22	23	24	25	26	26	26	26	25	28
B5. 10 percent of GDP increase in other debt-creating flows in 2016	23	21	22	32	19	20	16	17	19	19	19	20	21	22	22	22	22	22	22	21	22

Sources: Country authorities; and staff estimates and projections.

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

2/ Revenues are defined inclusive of grants.