STRENGTHENING NATURAL DISASTER RESILIENCE: A SAVINGS FUND PROPOSAL

The Bahamas is disproportionately exposed to natural disasters – both in terms of frequency and associated costs. An appropriate disaster risk-management strategy should be wide ranging, from strengthening resilience through capital and infrastructure investments, having a multilayer disaster risk financing plan, and strengthening fiscal and external buffers. Along these lines, staff proposes the creation of a natural disaster savings fund of a target size of 2-4 percent of GDP.

A. Introduction

1. The Caribbean countries are among the most vulnerable in the world to natural disasters (NDs). The Bahamas, due to the geographical spread of the islands, is particularly exposed. Over the last 30 years, The Bahamas has recorded more frequent NDs and annual average damages, including both public and private losses, at 1.4 percent of GDP, higher than the Caribbean regional average of 1.2 percent. Four out of the eight hurricanes that hit The Bahamas since 1990 resulted in estimated total damages—public and private—of at least 5 percent of GDP, resulting in an implied probability of a disaster of that magnitude of close to 15 percent in any given year.

2. Staff proposes the creation of a ND savings fund as part of a multilayer disaster risk financing strategy. This proposal is in line with the layered approach proposed by the World Bank in 2016—an approach including different financial instruments for different layers of risk, as well as the IMF paper on small states resilience to natural disasters and climate change (December 2016). In line with this approach and consistent with the results of staff’s quantitative analysis, staff suggests the creation of a savings fund of 2-4 percent of GDP to ensure funding to cope with the fiscal consequences of natural disasters. This fund would stabilize at a low risk of depletion with annual inflows of 0.5 percent of savings, during non-disaster years.

3. This paper is organized in six sections. Section B provides the background and context for disaster risk mitigation and strategies in The Bahamas. Section C gives a more detailed description

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of existing financing options, in line with the proposed framework. Section D presents the methodology used in the simulation exercise and includes the calibration of the case of The Bahamas. Section E presents the results, and section F provides recommendations.

B. Context

4. **Small states are more vulnerable to NDs than larger countries.** The average damages for small states is nearly 13 percent of GDP, compared to less than 1 percent of GDP for larger states. A greater part of the population in small states are also affected compared to larger states, 10 percent versus 1 percent respectively (IMF, Small States Resilience Paper, 2016). It is therefore critical that the governments of small island states take steps to strengthen resilience and ensure adequate buffers to smooth the impact of NDs.

5. **The economic consequences of NDs are far-reaching.** The impact of NDs include everything from emergency cash handouts to the reconstruction of uninsured or underinsured infrastructure, including critical infrastructure such as roads, bridges or ports, as well as foregone fiscal revenue due to temporary tax relief measures. In addition, the pressures on spending from the overnight destruction of a country’s infrastructure can result in higher borrowing costs, lower credit ratings, reduced investment, and lower productivity and output.

6. **The Bahamas has traditionally absorbed ND shocks through the re-prioritization of public spending and borrowing.** The Bahamian government has often resorted to budget reallocations or debt issuance to cover the full cost of immediate reconstruction needs. The economic impact is seen primarily through worsening current account, declines in foreign reserves and widening fiscal deficits. Public assets remain uninsured to this day. In 2004, The Bahamas was hit by Hurricane Frances and recorded public and private sector losses of almost 20 percent of GDP. At the time, foreign insurance payments amounted to 3.5 percent of GDP. Since then, insurance coverage in the hotel industry has been extended to include wind and flood damages. Additional post-hurricane reconstructions were then financed by donations and budget reallocations, and thus had limited impact on the fiscal balance. Local insurance companies report widespread underinsurance among households, with homeowners’ insurance being prevalent only when there is a mortgage or among wealthy individuals.
7. **Because of its elevated exposure to NDs, the Caribbean region has been proactive in developing new risk transfer tools.** The Caribbean Catastrophe Risk Insurance Facility (CCRIF) was created in 2007 by 16 Caribbean countries with technical assistance and initial capitalization provided by the World Bank. The CCRIF provides parametric insurance and works by pooling risks into a single diversified portfolio. According to CCRIF, insurance costs are less than half of what individual countries would pay if buying the same coverage or by accessing international markets. Governments can buy coverage of maximum USD100 million per disaster and year. Between June 2007 and October 2017, the CCRIF disbursed a total of US$130.5 million to affected countries. Payments are determined by the coverage a government buys and the deductible selected. Damages are estimated through an index in which hazard levels are used as a proxy for losses. The Bahamas tapped the CCRIF following cyclone Irma in the autumn of 2017, for which it received a payment of USD397,598, covering only a small part of the estimated total damages, at USD135 million (CCRIF webpage; authorities’ estimates).

C. **Managing Disaster Risk – A Layering Approach**

8. **A comprehensive framework to mitigate risks from NDs is needed.** Fund policy on small states’ resilience to NDs and climate change dictates that ex-ante risk reduction should be the priority in order to reduce financing uncertainty in the event of a disaster, but also to reduce ex-post damages (IMF, 2016). Policies include risk identification, strengthening engineering and building standards, appropriate legislation; zoning laws to prevent building in flood plains, supportive business environment, and ensuring adequate safety nets to ensure adequate protection of the most vulnerable.
9. **Layering of financing strategies minimizes the cost of disaster management.** Clark and others (2016) use a country case, similar to that of The Bahamas, to model the most cost-efficient disaster financing strategies. Overall, the framework specifies that ex-ante measures to strengthen resilience are critical, together with the extended insurance coverage of public and private assets. Low-impact, high-frequency disasters are best funded by budget reallocations or savings, in the form of a pre-financed reserve fund, which can be complemented with, contingent credit lines or post-disaster credit when appropriate.\(^2\) In principle, a government could allocate fiscal savings to debt reduction (of an amount commensurate to the expected cost of reconstruction) and save on interest expenditures, and then borrow when hit by a ND to cover reconstruction costs. However, it can take up to nine months from the time of a disaster takes place to the time of accessing resources. If the disaster impacts the asset quality of financial institutions, or if deposits start to decline as the population spend for reconstruction, borrowing costs may also increase. For a small economy such as The Bahamas, disaster borrowing might also affect marginal interest rates. The Bahamas' high-income status prevents it from accessing financing on concessional terms.

10. **For the most severe NDs, ex-ante risk mitigation is critical, in conjunction with greater penetration of private and public insurance.** Greater insurance is associated with far lower output and income losses from NDs, as noted by Melecky and Raddatz (2011) and von Peter and Saxena (2012). It is also less costly than relying on revenue measures or expenditure allocation for large scale disasters. Market insurance and re-insurance are effective ways to cover losses in the private and public-sector assets. While the hotel industry is covered for losses related to NDs, evidence show that 20-25 percent of homeowners remain under, or uninsured. Public sector assets, including infrastructure, remain uninsured. Additional protection, for the most extreme events, could be provided by catastrophe (CAT) bonds, which enables the government to transfer the risk to international investors. The bond structure typically involves a special purpose vehicle (SPV) that signs a reinsurance contract which pays premiums to the investors in exchange for coverage.

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\(^2\) In March 2018, The Bahamas requested a 5-year USD100 million contingent credit line to the Inter-American Development Bank (IDB). This facility does not require any initial payment, but can be drawn upon under specific parameters following ND.
D. Methodology to Determine the Size of a Savings Fund

11. The first step is to estimate a model for The Bahamian economy that captures the dynamics of output and the main fiscal variables in response to NDs. For this purpose, staff uses a vector auto-regression (VAR) model with historical data for 1985-2016. The endogenous variables in the VAR include the cyclical components of GDP, government revenues; including tax and non-tax revenue; current primary expenditures, and capital expenditures.\(^3\) Control variables are included to account for other major sources of shock. The estimated distribution of residuals is then used to map random ND shocks. These control variables include US real effective exchange rate (to capture competitiveness pressures given that the Bahamian dollar is pegged to the U.S. dollar); U.S. real GDP growth – the main source of tourism revenues; oil prices (as these account for a large part of Bahamian imports); and dummies for the September 2001 shock that significantly disrupted tourism arrivals; the bankruptcy of Baha Mar in 2015; the introduction of the value-added tax in 2015, which impacted revenue performance; and for election years (that are associated with widening fiscal deficits). The underlying assumption is that the control variables “remove” the main alternative shocks to be left only with NDs as the most significant remaining ones.

12. The second step is to run a Monte Carlo experiment. Using the distribution of residuals from the VAR, staff ran one thousand simulations, each corresponding to 15-year periods and representing a plausible path for the cyclical component of the endogenous variables in the model, i.e. fiscal revenues and expenditures. The simulations generate data that mimic historical patterns in terms of the volatility, persistence, and co-movement of the cyclical components of GDP in response to shocks that are independent of the controls (and therefore include NDs as the main shock and other smaller shocks). Using the simulated paths, staff focused on events with a probability of occurrence of 15 percent or less. To account for re-prioritization of spending, staff assumed that disasters of this magnitude induce a re-allocation of spending for 0.5 percent of GDP, on average. This is implemented by adding 0.5 percent of GDP to the simulated paths of the cyclical component of primary expenditure.

13. The inflows to the fund that are required to stabilize the fund balance are equal to the average fiscal impact in any given year of a disaster of the chosen probability. Data collected by the World Bank show that NDs, with damages of at least 5 percent of GDP, occur on average every seven years in The Bahamas, implying a probability of 15 percent in any given year. On average 150 out of the 1000 simulations in each year would be identified as a ND.

E. Results

14. A savings fund of 2-4 percent of GDP and annual savings of ½ percent of GDP would achieve sustainability with a low probability of depletion. The outcome shows that a savings

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\(^3\) The cyclical components used in the empirical model are calculated as the ratio of the variable with respect to its estimated trend, where the trend is approximated by the Hodrick-Prescott filter on 1985-2016 annual data. All variables are transformed into real terms using the GDP deflator and expressed in natural logarithms. The identification of shocks is performed according to the Choleski decomposition, according to the ordering presented.
fund of between 2-4 percent of GDP is needed to obtain a probability of depletion within the subsequent ten years of 11 percent or less, after reaching the target size. To stabilize the fund at the target size, under the historical probability distribution of natural disasters, the fund requires inflows for ½ percent of GDP during non-disaster years. The above charts show the sensitivity of the results to changes in the probability of disaster. With the probability set to 0.15, annual savings of 0.5 percent of GDP are needed to achieve financial sustainability of the fund over time. As the frequency of disasters increases, higher inflows are required to stabilize the fund at the target size. In the 2 percent of GDP scenario, there is a 11 percent risk of depleting the fund over the ten-year period after reaching the target size. In the 4-percent scenario, the probability falls significantly to 2 percent.

F. Conclusions

15. A comprehensive disaster risk management strategy, including adequate financial protection, is critical to confront the consequences of natural disasters. To this end, and as part of a multilayer disaster risk-financing strategy, a savings fund of 2-4 percent of GDP, with annual inflows for ½ percent of GDP during non-disaster years, would enhance fiscal and macroeconomic resilience. Insuring public sector assets and encouraging the broader use of insurance among households would offer additional layers of protection.

16. The savings fund should be governed by clear rules on inflows and outflows as well as transparency requirements. Clear objectives and disbursement rules and triggers based on verifiable criteria are critical. The fund should have prudent and transparent investment policies and should be consolidated with budgetary information to allow assessment of the overall fiscal situation. At a minimum, the fund balance should appear in financial statements, and drawdowns should appear in budget execution reports.
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