


# TRUST FUNDS AND FISCAL RISKS IN THE NORTH PACIFIC

## ANALYSIS OF TRUST FUND RULES AND SUSTAINABILITY IN THE MARSHALL ISLANDS AND THE FEDERATED STATES OF MICRONESIA

ASIAN DEVELOPMENT BANK

ADB

PACIFIC STUDIES SERIES

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Note: In this publication, "$" refers to US dollars.
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# Foreword

Pacific island nations share many characteristics that set them apart from other developing countries, and that present unique development challenges. One such characteristic is the relative importance of aid flows in their current account balances. A long-term goal shared by these countries, and their bilateral and multilateral development partners, is to improve country autonomy and reduce aid dependence.

One avenue through which goals of increased autonomy and reduced aid dependence have been pursued is the establishment of sovereign wealth or trust funds, and deposit of assistance flows and fiscal surpluses into the funds. Investment income from the funds can then be used to fund government expenditure generally, or—in other cases—for earmarked activities (e.g., health services or education) or specific types of projects. Typically, development partner organizations contribute to the capitalization of these funds with a view to establishing an ongoing source of revenue for the country, and usually exercise some shared control over the use of the trust fund with the country's government.

Apart from alleviating aid dependence and fostering increasing autonomy, trust funds also provide fiscal buffers that help governments respond to external economic shocks. This is particularly helpful in the Pacific where economies share the characteristic of being particularly sensitive to external factors due to their relatively small size, generally undiversified economies, and vulnerability to climate change and extreme climate events.

The sustainability and governance of trust funds is the primary concern in the design of trust funds, and like governments in other world regions, Pacific governments have struggled to maintain fund balances in the face of global financial volatility and political pressures to use fund resources. The Pacific has witnessed a small number of instances when national trust funds in the region have suffered serious mismanagement resulting in funds failing to deliver on obligations and closure (most notably the Nauru Phosphate Royalties Trust). Of course, with rising international standards for fund management—as encapsulated in the Santiago principles—fund management standards are improving while funds continue to struggle with volatile market returns and long run sustainability.

This report focuses on the impact of investment return uncertainty on the long run sustainability and stability of income from the Compact Trust Funds (CTFs) of the Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM) in light of the rules governing withdrawals of fund resources. Both CTFs were primarily capitalized from contributions of the United States government , with the RMI CTF receiving some additional funds from Taipei,China. Over the next eight years, RMI and FSM—with their development partners using annual budget transfers provided under the Compacts of Free Association as amended—plan to build up resources saved in the CTFs. Drawdowns from the CTFs are set to begin after 2023, when most of the budget transfers under the Compacts are scheduled to cease. This will involve a switch in the source of fiscal resources for the RMI and the FSM from stable and predictable grant income, to volatile investment returns from

the CTFs. This will raise additional challenges to both countries post-2023. In particular, given that CTF income is expected to be significant relative to GDP for both RMI and FSM, it is important that elected leaders understand and properly manage the level, volatility, and predictability of CTF income.

This report uses stochastic investment return modelling tools to assess the rules governing drawdowns from the CTFs post-2023. Analysis shows that future revenues from the funds are likely to be volatile and unsustainable. It examines simple rule changes to improve both long run fund sustainability and short term income stability of the funds. This adds to previous analyses of the CTFs which have focussed on investment strategy and funding shortfalls, without considering strategies to mitigate the potential volatility of drawdowns under the current rules.

This project was supported by the Asian Development Bank's (ADB) Pacific Economic Management technical assistance project. This regional capacity development TA responds to challenges that Pacific countries have faced in their efforts to improve economic monitoring as well as the formulation and implementation of policy in response to changing global financial and economic conditions. The project aims to promote the incorporation of state-of-the-art monitoring, analysis, and policy advice into government decision making and public policy dialogue through advisory and technical support missions as well as the sponsoring of regional workshops and conferences. Analysing the evolution of the ongoing development partnerships between the US and the governments of the RMI and the FSM, the report hopes to contribute to the ongoing technical assistance that ADB provides to both RMI and FSM regarding fiscal planning and the financial sustainability of the CTFs. The report may also help to guide the post-2023 assistance ADB and other multilateral and bilateral development partners will provide to these Pacific states.

Xianbin Yao
Director General
Pacific Department

# Abbreviations

| | |
|---|---|
| Compact | Amended Compact of Free Association |
| CTF | Compact Trust Fund |
| FY | fiscal year |
| FSM | Federated States of Micronesia |
| GDP | gross domestic product |
| FSMTF | FSM Trust Fund |
| RMI | Republic of the Marshall Islands |
| US | United States |
| TFA | Trust Fund Agreement |

NOTE

The fiscal year (FY) of the government ends on 30 September. As such, in this report, FY2008 denotes the year ending on 30 September 2008, for example.

The currency unit used in this report is USD. All modeling results are presented in end FY2023 constant prices.

# Acknowledgments

The author would like to specially thank Christopher Edmonds for his valuable input in formulating and guiding this research and publication of this report. The author would also like to acknowledge Olimpia Henriques da Silva, Joel Hernandez, Rommel Rabanal, Emma Veve and other staff of the Asian Development Bank who assisted him in various phases of this research. In addition, the author would like to thank Asian Development Bank consultant Robert Boumphrey, as well as Kevin O'Keefe and Mark Sturton from Graduate School USA, who provided advice and feedback on earlier drafts that contributed to the production of this publication. Any errors or omissions remain the responsibility of the author.

# Executive Summary

## Introduction and Background

The Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM) are each party to an Amended Compact of Free Association (Compact) with the United States (US), an agreement in which the US provides significant economic support to the RMI and the FSM.

Economic support under the Compacts is provided in a stream of grants, and is primarily used for health, education, and capital expenditure. In 2013, these grants were about 20% of gross domestic product (GDP) in the RMI and 29% in the FSM. However, as part of the Amended Compact arrangements for the RMI and the FSM, additional grants are being provided by the US (with additional amounts provided to RMI by Taipei,China) to build up Compact Trust Funds (CTF) for each country. In 2023, most Compact grants are scheduled to cease and regular drawdowns of investment income from the CTFs to commence.

Given the significance of current US economic support, a key question is the extent to which income from the CTFs can replace Compact grants. This report focuses on the relatively complex account structure and drawdown rules of the two funds, which are the same in the CTFs of the RMI and the FSM. Using an investment return simulation model, this report assesses the amount, sustainability, and predictability of post-2023 income from the CTFs.

## Account Structure and Drawdown Rules

The CTFs of the RMI and the FSM consist of three accounts: a long-term savings account "A," a disbursement account "B," and a buffer account "C." These are governed by rules that are well explained in the International Monetary Fund paper, *Sovereign Wealth Funds in the Pacific Island Countries: Macro-Fiscal Linkages*:[1]

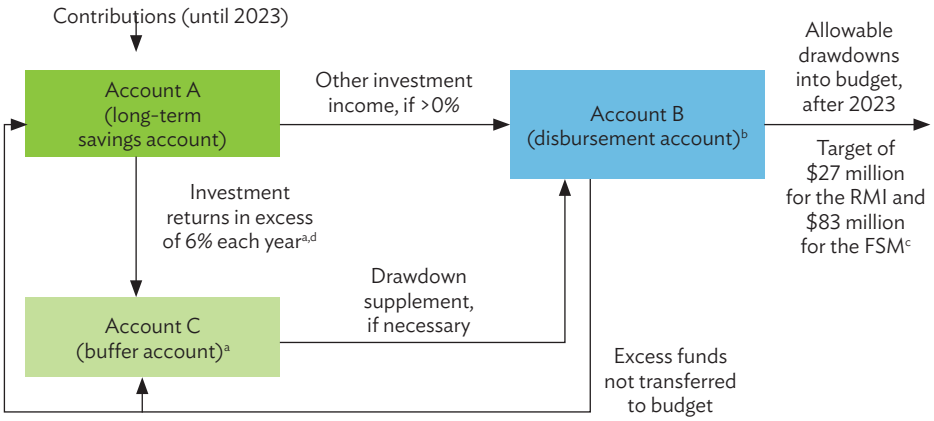
> Initial contributions are deposited into, and investment income accrues to, account A. Investment returns in excess of 6 percent per year are deposited in account C, which will operate as a stabilization account from FY2024 onwards. This account is capped at three times the projected FY2024 transfer from the CTF needed to fully replace U.S. budgetary grants; overflows return to account A. Account B, which will only be created in 2022, will receive all previous year's investment income from account A, transfer to the budget an amount equal to the real value of FY2023 U.S. budgetary grants, then transfer any remaining funds,

[1] Le Borgne, E. and P. Medas. 2007. Sovereign Wealth Funds in the Pacific Island Countries: Macro-Fiscal Linkages. *IMF Working Paper* WP/07/297. Washington, DC: International Monetary Fund (IMF). https://www.imf.org/external/pubs/ft/wp/2007/wp07297.pdf

firstly to account C if it has not reached its cap, and secondly back to account A. In case account A investment income is insufficient to provide account B with the funds needed for the budgetary transfers, account C will be used.

A key component of the structure is that account A is not allowed to be directly accessed to make drawdowns (budgetary transfers). In those years where investment returns and account C are insufficient to provide the desired drawdown, the drawdown must be reduced. This is depicted in Figure ES1. The real value of US grants in 2023, which is the target drawdown amount, is projected by the Graduate School USA to be $27 million for the RMI and $83 million for the FSM.[2]

Figure ES1: Compact Trust Fund Account Structure and Drawdown Rules (common to both funds)




FSM = Federated States of Micronesia, FY = fiscal year, RMI = Republic of the Marshall Islands.
[a] Subject to Account C's cap of 3 times the projected FY2023 Compact grant.
[b] To be created in October 2022.
[c] Targets will reflect the amount required to replace the inflation-adjusted amount of US Compact grants provided in FY2023. The model assumes this to be $27 million for the RMI and $83 million for the FSM in 2023 dollars.
[d] Until 2023.
Source: Author.

## Investment Return Simulation Model

To analyze the above account structure, this paper uses a Monte Carlo investment return simulation model. The key function of this model is to simulate the effects of investment return volatility, which is necessary for analyzing a structure such as in Figure ES1. Based on assumptions informed by historic financial data and theory, the model produces 10,000 simulations of possible future portfolio returns for the CTFs of the RMI and the FSM, with each simulation consisting of a progression of investment returns from 2014 to 2050. For each of these simulations, it is possible to calculate the size of the CTF in each projection year, the drawdown from the CTF in each projection year, as well as a host of other relevant statistics. Within the structure outlined in Figure ES1, the CTF governing bodies have some discretion in deciding drawdown amounts, and thus the modeling in this report assumes that drawdowns are reduced when Account C runs low (details are provided in Chapter II and Appendix 1).

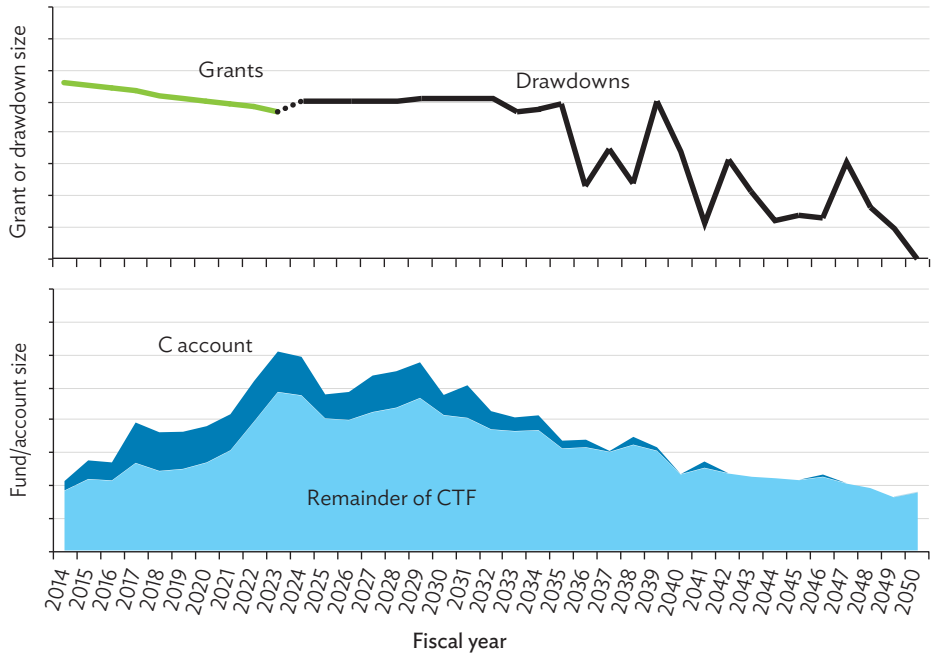
[2] Graduate School USA. 2014. Republic of the Marshall Islands Fiscal Year 2013 Economic Review Preliminary Report. Honolulu. http://www.pitiviti.org/news/wp-content/uploads/downloads/2014/08/RMI_EconPrelim_FY13.pdf. Graduate School USA. 2014. Federated States of Micronesia Fiscal Year 2013 Economic Review Preliminary Report. Honolulu. http://www.pitiviti.org/news/wp-content/uploads/downloads/2014/08/FSM_EconPrelim_FY13.pdf

## Modeling the Current Structure in the Marshall Islands

Unfortunately, the RMI has a chance of experiencing a progression similar to that depicted in Figure ES2. Figure ES2 displays one possible progression of FSM's CTF's fund size and drawdown amounts through time. It is designed to illustrate certain aspects of the current drawdown policy. The figure illustrates that drawdowns may start at a level equal to Compact grants but risk declining suddenly at some unpredictable time due to a diminished real CTF size and a depleted C account; this happens in 2036 in the illustration. Although RMI may experience a more favorable outcome where drawdowns are fairly stable and close to the 2023 grant amount, the possibility of experiencing a progression similar to that illustrated in Figure ES2 is a significant concern.

Overall, there is a 49% chance that the CTF will maintain its 2023 value to 2050, as per Figure ES3. While this is not as much of a concern as the corresponding figure for the FSM, it would be preferable for this figure to be comfortably above 50%. Volatility is a concern; reductions in drawdowns of more than 3% of GDP are expected to occur on average in 1.2 in every 20 years after 2023, and there is a possibility of experiencing drawdown reductions of more than 5% of GDP. Such shocks are more frequent in scenarios of poor investment returns. The average drawdown size during 2024–2050 is expected to be $26 million in 2023 dollars (as compared to the reduction in Compact sector grants post 2023, estimated at $27 million).

Figure ES2: Stylized Illustration of Drawdowns and Compact Trust Fund Size, Current Structure

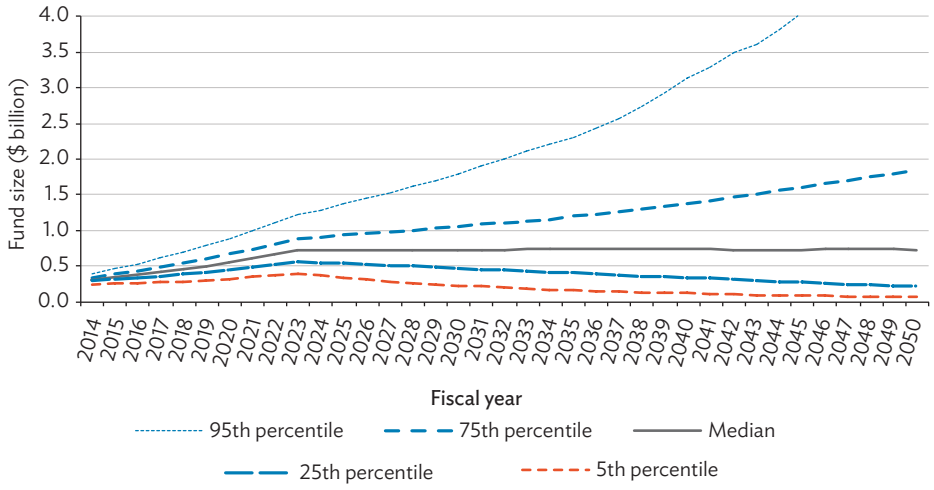



CTF = Compact Trust Fund.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

## Modeling the Current Structure in the Federated States of Micronesia

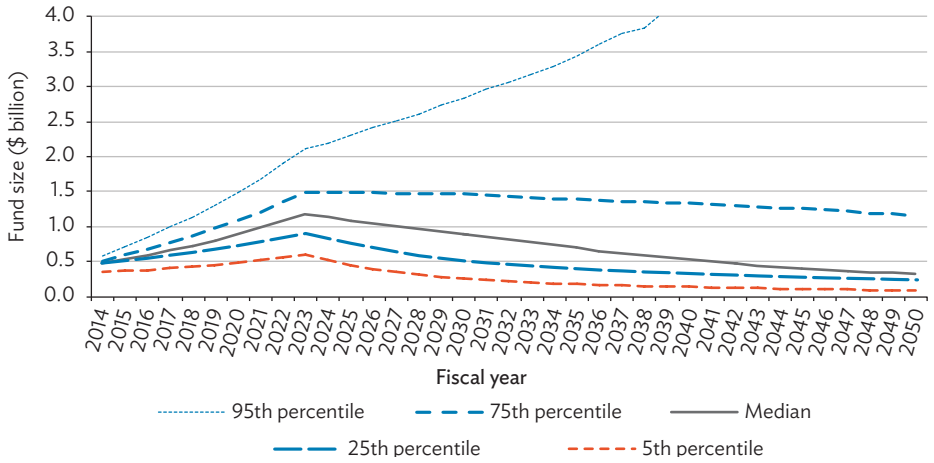
FSM's CTF is in a more problematic situation than RMI's CTF. In fact, FSM has only a small chance of avoiding the type of progression illustrated in Figure ES2. According to the model, there is only a 22% chance that the CTF will maintain its real 2023 value to 2050 (see Figure ES4), signifying a lack of sustainability, i.e. ability to maintain the CTF's drawdowns on an intergenerational basis. The volatility of drawdowns after the C account runs out is a material concern. Sudden, relatively unpredictable reductions in drawdowns of more than 5% of GDP are expected in about 2.6 in every 20 years after 2023, and there is a possibility of experiencing drawdown reductions of more than 10% of GDP, which would constitute an especially significant fiscal shock. Again, in scenarios where less favorable investment returns

**Figure ES3: Marshall Islands' Compact Trust Fund Size, Current Structure** (in 2023 prices)




Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

**Figure ES4: Federated States of Micronesia's Compact Trust Fund Size, Current Structure** (in 2023 prices)




Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

are realized, negative shocks are likely to be more frequent than this. The average drawdown size during 2024–2050 is expected to be $61 million in 2023 dollars (as compared to the reduction in Compact sector grants post 2023, estimated at $83 million).

## Consequences of the Current Structure

The most powerful way to ensure the sustainability of the CTFs is to make sure that the amounts of any drawdowns do not cause significant decline in the overall fund size. The current structure targets a drawdown amount that is fixed in dollar terms, and thus may be too high (and cause the fund size to fall). This fixed dollar amount is adjusted only in response to recent investment returns, which are an inadequate proxy for the CTF size. In the common situation where resources in either or both CTFs are too small to support these fixed dollar drawdowns, this can lead to imprudently drawing down too much of the fund balance too early, as illustrated in Figure ES2.

Therefore, although the current structure appears to be designed to replace Compact grants while safeguarding the sustainability of the CTF over time, it is unlikely to perform as intended, and can be expected to commonly result in a declining real fund size and sharp, unpredictable reductions in drawdowns.

## Alternative Possible Structure

Some of these difficulties could be mitigated by:

- defining the target drawdown amount as a percentage of the CTF size, rather than a fixed dollar amount (ensures sustainability).
- applying this drawdown percentage to the average of the CTF size over the last 3 years (improves predictability).

These changes would also suggest changing the C account's cap to be three times the target drawdown amount, rather than three times the 2023 Compact grant (which was the previous target drawdown amount). However, such changes would require modifications to the Trust Fund Agreements of the CTFs.

Figure ES7 presents a stylized illustration of the effects of the alternative possible structure. That is, ES7 takes the same scenario presented in ES2 and illustrates what would happen if the alternative structure were used instead of the current structure.

## Modeling a Possible Alternative Structure for the Marshall Islands

A 3.5% drawdown is modeled for RMI's CTF, based on the expected long-term real return of its investment portfolio of 4.0% per year. As per Table ES1, sustainability would be materially improved; instead of a 49% chance of the CTF maintaining its real 2023 size to 2050, there would be a 62% chance. This is reflected in Figure ES6, which shows the median CTF size growing over time, rather than remaining flat. The expected frequency of a negative drawdown shock of more than 3% of GDP would then be 1 in 43 years, instead of 1.2 in 20 years. Drawdowns would on average increase over time, and would constantly adjust so as to be sustainable given the CTF size.

## Modeling a Possible Alternative Structure for the Federated States of Micronesia

In the case of FSM's CTF, a 4% drawdown is modeled, based on the expected long-term real return of its investment portfolio of 4.5% per year. The benefits of changing to this structure would be significant, as shown in Figures ES5 and ES7. As per Table ES1, sustainability is greatly improved; instead of a 22% chance of the CTF maintaining its real 2023 size to 2050, there would be a 60% chance. This is reflected in Figure ES5, which shows the median CTF size growing over time, rather than falling. The expected frequency of a negative drawdown shock of more than 5% of GDP would then be 1 in 45 years, instead of 2.6 in 20 years. Drawdowns would start at a lower, more sustainable level and on average increase over time, rather than falling. The lower initial level of drawdowns (as illustrated in Figure ES7) does raise some questions about fiscal adjustment, which are addressed below.

## Potential Fiscal Cliff

If, under either the current or alternative structure, investment returns turn out to be such that drawdowns at the level of the 2023 Compact grant cannot be sustained, the governments of the RMI and/or the FSM could face the necessity of making a fiscal adjustment.

Under such a scenario, if the alternative structure discussed above were adopted, then this fiscal cliff would occur in 2024, i.e., as soon as drawdowns begin. On the other hand, retaining the current structure could be expected to result in the reduction in funding being delayed by drawing down unsustainably high amounts. This is possible because of the C account, however, it is not possible to know in advance if or when the C account will be depleted, and thus when the unsustainable drawdowns may no longer be possible.

Table ES1: Modeling Results for the Current and Alternative Drawdowns Strategies

| Item | Average Yearly Drawdown over the Projection Period[a] | | Drawdown Volatility–number of years in 20 where drawdowns fall by more than: | | | CTF Sustainability Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| Current structure | | | | | | | | |
| RMI | 26.1 | 7.8 | 1.2 | 0.2 | 0.0 | 49 | N | |
| FSM | 60.5 | 12.5 | 3.7 | 2.6 | 0.3 | 22 | N | |
| Alternative structure (Alternative 4 with drawdown percentage of 3.5% for RMI and 4% for FSM)[b] | | | | | | | | |
| RMI | 31.7 | 9.2 | 0.5 | 0.2 | 0.0 | 62 | 3.6 | 1.3 |
| FSM | 60.8 | 12.3 | 0.9 | 0.4 | 0.1 | 60 | 35.7 | 7.8 |

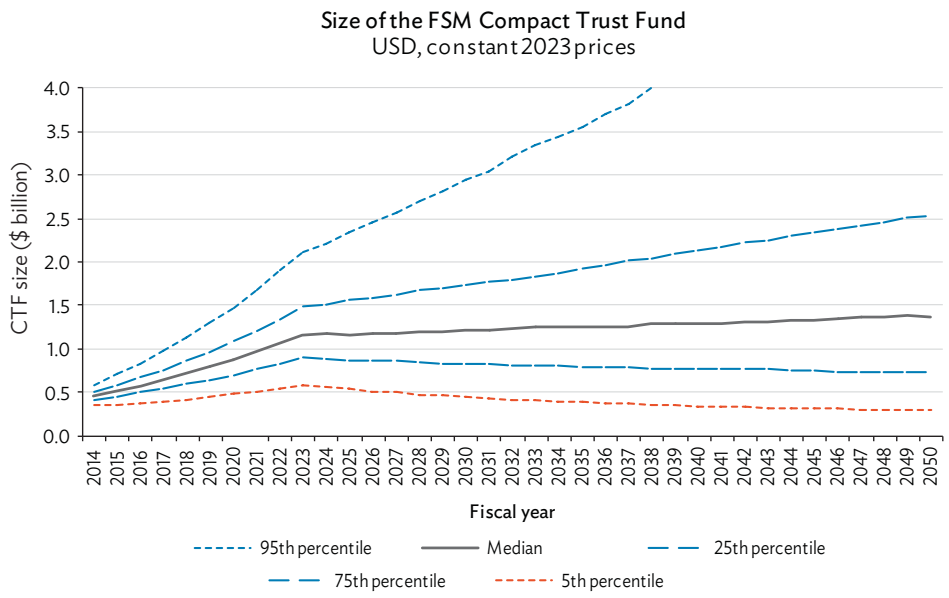
CTF = Compact Trust Fund, FSM = Federated States of Micronesia, GDP = gross domestic product,
N = none (reduction may occur later), RMI = Republic of the Marshall Islands.
Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.

[b] Alternative 4 involves modifying the current structure by defining the annual drawdown target as a fixed percentage of the average of the CTF size over the last 3 years. It also involves redefining the account C cap to be three times the target drawdown, rather than three times the 2023 US Compact grant. A 4% drawdown is modeled for the FSM and 3.5% for the RMI.

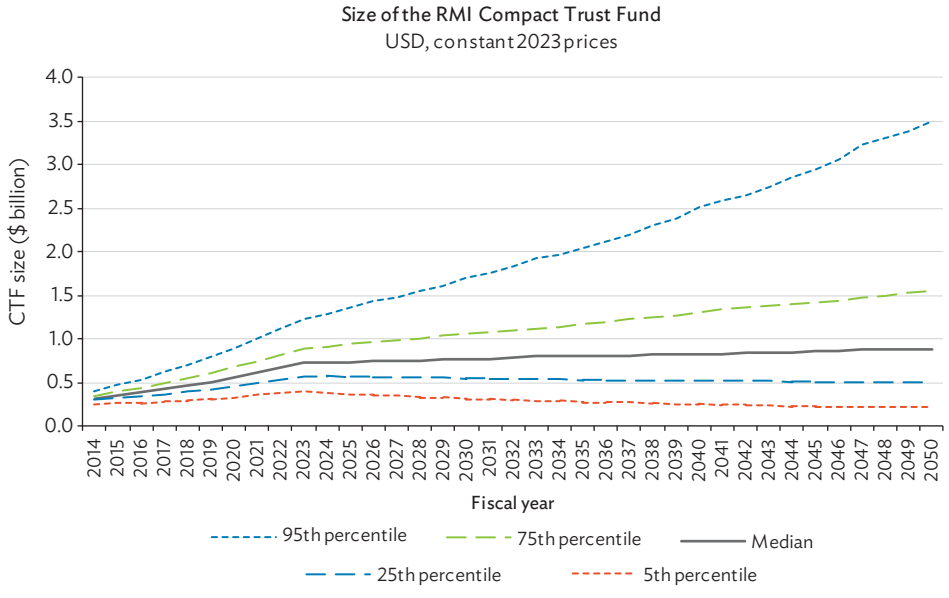
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

**Figure ES5: Federated States of Micronesia's Compact Trust Fund Size, Alternative Possible Structure** (in 2023 prices)



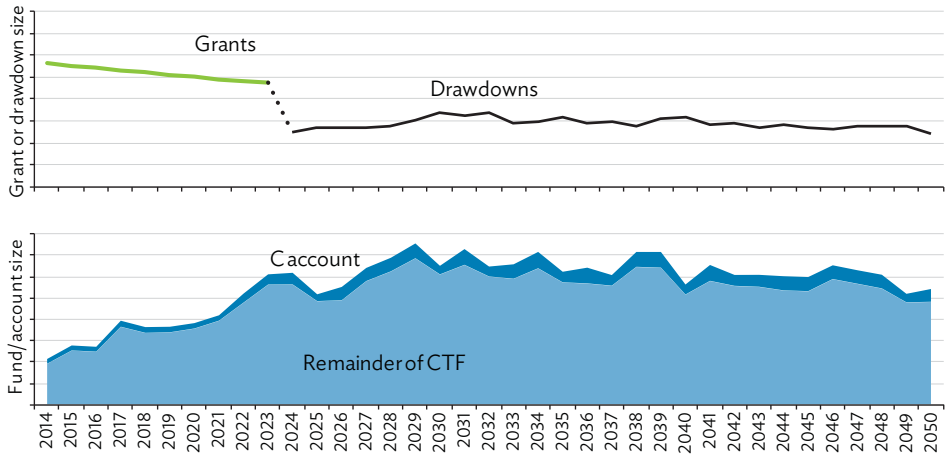

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

**Figure ES6: Marshall Islands' Compact Trust Fund Size, Alternative Possible Structure** (in 2023 prices)




Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Figure ES7: Stylized Illustration of Drawdowns and Compact Trust Fund Size, Alternative Possible Structure




CTF = Compact Trust Fund.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

This means that relative to the alternative structure, any fiscal cliff under the current structure, while delayed, would also be (i) uncertain in terms of its timing and amount, and (ii) would be associated with an unsustainable drawdown pattern, which results in a diminished real CTF size. Thus, the alternative structure offers significant advantages in facilitating the handling of a fiscal cliff.

Currently, the amount of any fiscal adjustment required due to moving from grants in 2023 to drawdowns in 2024 is uncertain, given the possibility for favorable or poor investment returns before these dates. However, as 2024 approaches, the likely size of the required adjustment will become clearer. At this stage, based on the model, the average adjustment for the RMI would be $3.6 million or 1.3% of GDP, and for FSM $35.7 million or 7.8% of GDP. Thus, the adjustment is likely to be manageable for the RMI but more of a concern for the FSM.

## Conclusion

Modeling results suggest that the current structure may make it difficult to meet long run CTF objectives. An alternative structure such as that proposed could be adopted to improve the sustainability of the CTFs and the predictability of drawdowns, toward the RMI and the FSM achieving budgetary self-reliance.

# I. Introduction

## Background

Amended Compact of Free Association (Compact) agreements define the relationship between the United States (US) and three Pacific countries: the Republic of the Marshall Islands (RMI), the Federated States of Micronesia (FSM), and Palau. The Compacts provide financial assistance from the US to Compact countries, visa-free travel between the US and Compact countries, and access by Compact countries to many US domestic programs and other benefits.

For the RMI and the FSM, the first Compact of Free Association commenced in 1986 for 15 years, and was renewed in 2003. A key feature of the 2003 renewal (the Amended Compacts) for these two countries was the creation of their respective Compact Trust Funds (CTFs), which are the subject of this paper. The CTFs are intended to be built up over 20 years to September 2023, after which investment income from the CTFs would replace the annual Compact grants (although some sources of the Compact grant funding from the US to the RMI will continue). The purpose of the CTFs as stated in their respective Trust Fund Agreements (TFAs) is to contribute to economic advancement and long-term budgetary self-reliance by providing an annual source of revenue after FY2023, for assistance in various sectors but with priorities in education and health care.[3]

The TFAs do not state any goal regarding the amount of revenue that the CTFs must provide. However, given RMI's and FSM's lack of significant alternative sources of funding and given that Compact grants form a sizeable portion of both RMI's and FSM's government revenues and gross domestic product (GDP), it is clear that income from their CTFs will be important once US Compact grants end in 2023. Therefore, this report will focus most strongly on the likely level and volatility of post 2023 drawdowns from the CTFs, as well as the sustainability of the CTFs in terms of their real size and thus ability to provide drawdowns on an ongoing basis. It also assesses possible alternative structures and drawdown rules. For these purposes, this paper uses a stochastic Monte Carlo model of investment returns to simulate investment return volatility.

[3] Agreement Between the Government of the Federated States of Micronesia and the Government of the United States of America Implementing Section 215 and Section 216 of the Compact, as amended Regarding a Trust Fund. 2002. http://www.uscompact.org/files/US Publications/Compact Trust Funds/FSM/Miscellaneous Documents/Trust Fund Agreement US FSM.pdf; Agreement between the Government of the United States of America and the Government of the Republic of Marshall Islands Implementing Section 216 and Section 217 of the Compact, as Amended regarding a Trust Fund. 2003. Appendix V: Trust Fund Agreement. *Subsidiary Agreements—Compilation for the RMI*. http://uscompact.org/files/RMI Publications/Compact Documents/Subsidiary Agreements.pdf

## Characteristics of the Marshall Islands' and the Federated States of Micronesia's Compact Grants and Trust Funds

The CTFs each have their own Trust Fund Committee. US representatives hold majority voting power on these committees. The Trust Fund Committees are responsible for determining drawdown amounts and making investment decisions, inter alia.

Compact grants are primarily used for health, education, and infrastructure expenditure. The Joint Economic Management Committee in the FSM and the Joint Economic Management and Fiscal Accountability Committee in the RMI currently govern the use of Compact grant monies. These committees may also oversee the allocation of CTF drawdowns authorized by the CTF committees post 2023. US representatives also hold majority voting power on these committees. The US currently provides additional grant assistance to these countries outside of the Compact arrangements, which, for the purposes of this analysis, is assumed to continue after 2023.

Table 1 presents a brief summary of the CTFs of the RMI and the FSM, as well as some contextual information.

## Investment Returns Offer "Tougher Love" than Grants

One of the more important challenges facing the RMI and the FSM after 2023 will be the uncertainty created by investment market volatility. While a stream of grants promised by the US government is very secure and predictable, investment earnings from growth-oriented portfolios are precisely the opposite. This could lead to significant changes in allowable drawdowns from one year to the next. Although this paper sets out strategies designed to mitigate this uncertainty, the fact that government financing for the RMI and the FSM will be partly at the whim of financial market fluctuations cannot be taken lightly.

In particular, planning and making public expenditure decisions in the face of uncertainty is not a trivial matter. The time within which stock market participants all around the world can significantly revise their valuations of the assets owned by the CTFs (a matter of months or even days) is much shorter than the time it takes to plan and build infrastructure, schools, and hospitals; and it is also shorter than the term of a typical government loan. Compounding this problem is the fact that investment market movements cannot be reliably predicted. In other words, an unexpected significant fiscal shock is worse than a significant fiscal shock. Appropriate management of this volatility is vital for the CTFs to replace US Compact grants in a reliable, sustainable manner.

The above comments are not intended as an argument against investing in risky assets. On the surface, given that the CTFs are intended to persist in perpetuity, a highly growth-oriented structure would seem appropriate to achieve a high expected return in the long term. However, this report does not comment on the appropriateness of particular investment portfolio allocation strategies; it instead focuses on the account structure and drawdown rules of the CTFs. For a more detailed investigation of different investment portfolio strategies on CTF sustainability, see the 2007 report by the US Government Accountability Office entitled *Trust Funds for Micronesia and the Marshall Islands May Not Provide Sustainable Income*.[4]

[4] US Government Accountability Office. 2007. *Compacts of Free Association: Trust Funds for Micronesia and the Marshall Islands May Not Provide Sustainable Income*. Washington, DC: http://www.gao.gov/assets/270/262065.pdf

Table 1: Summary Characteristics of the Compact Trust Funds of the Marshall Islands and the Federated States of Micronesia

| Item | RMI | FSM |
|---|---|---|
| Compact Trust Fund size ($ million) | 206[a] | 306[b] |
| Past contributions ($ million)[c]<br>United States<br>Taipei,China<br>RMI<br>FSM | <br>101<br>16<br>30 | <br>199<br><br><br>30 |
| Future yearly contributions ($ million current prices)[c]<br>United States<br><br><br>Taipei,China | <br>Projected by author to be 14 in FY2014,[d] and increase to 22 by 2023<br>2.4 per year to 2023 | <br>Projected by author to be 26 in FY2014,[d] and increase to 39 by 2023 |
| Investment return (%)[e] | 4.5 | 3.8 |
| Targeted portion of growth assets in portfolio (%)[f] | 80 | 98 |
| Size of other trust funds ($ million)[g] | 11[h] | 14[i] |
| Projected 2023 Compact grant ($ million)[j] | 27.4[k] | 82.6[k] |
| Projected 2023 Compact grant (% of projected GDP) | 9.4[k] | 18.1[k] |

FSM = Federated States of Micronesia, FY = fiscal year, GDP = gross domestic product, RMI = Republic of the Marshall Islands.
[a] As of 30 September 2013.
[b] As of 30 June 2013.
[c] Past contributions up to 30 June 2013. Further details of previous and expected contributions are in Appendix 1.
[d] Fiscal year ends on 30 September.
[e] Since inception (net of fees), per year up to 30 June 2012.
[f] For details of target asset class allocations, please refer to Appendix 1.
[g] Can contribute to post 2023 revenue. See page 6 for further detail on these trust funds.
[h] Account D within CTF, as of 30 September 2013.
[i] FSM Trust Fund, as of 30 June 2013.
[j] In 2023 dollars. Projections are sourced from Graduate School USA Economic Review reports for RMI and FSM.
[k] Projected 2023 grant amounts exclude Supplemental Education Grants (SEGs). Note that, in the RMI's case, not all US Compact grant funding will cease after 2023. The $27.4 million and 9.4% figures for the RMI consider only the portion of Compact grants ceasing after 2023.
Sources: Asian Development Bank (ADB) Fiscal Management Models for RMI and FSM; RMI and FSM governments; Graduate School USA 2013; Office of Insular Affairs. 2013. *Trust Fund for the People of Micronesia Fiscal Year 2012 Annual Report*. Washington, DC: US Department of Interior; Office of Insular Affairs. 2013. *Trust Fund for the People of the Republic of Marshall Islands Fiscal Year 2012 Annual Report*. Washington, DC: US Department of Interior; ADB projections and calculations.

In addition to volatility of allowable drawdown amounts, another risk relates to the sustainability of the CTFs. Specifically, this is the risk that the CTFs might lose value in real terms, and thus become unable to sustain drawdowns of a particular level. As expected, the drawdown rules have a significant bearing on the expected sustainability of the CTFs.

# II. Compact Trust Fund Account Structure and Drawdown Rules

## Details of Account Structure and Drawdown Rules

The Compact Trust Funds (CTFs) of the Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM) employ the same fairly complex account structure. This structure bears some similarity to the drawdown policy employed by the Tuvalu Trust Fund. This fund, which is not covered in detail here, employs a main investment account as well as a buffer account to smooth drawdowns, and has been held up as an example of high-quality sovereign wealth fund management within the context of small island states.[5]

The CTFs of the RMI and the FSM each consist of three accounts: a long-term savings account A, a disbursement account B, and a buffer account C. These are governed by rules that are well explained in the 2007 International Monetary Fund report entitled *Sovereign Wealth Funds in the Pacific Island Countries: Macro-Fiscal Linkages*:[6]

> Initial contributions are deposited into, and investment income accrues to, account A. Investment returns in excess of 6 percent per year are deposited in account C, which will operate as a stabilization account from FY2024 onwards. This account is capped at three times the projected FY2024 transfer from the CTF needed to fully replace U.S. budgetary grants; overflows return to account A. Account B, which will only be created in 2022, will receive all previous year's investment income from account A, transfer to the budget an amount equal to the real value of FY2023 U.S. budgetary grants, then transfer any remaining funds, firstly to account C if it has not reached its cap, and secondly back to account A. In case account A investment income is insufficient to provide account B with the funds needed for the budgetary transfers, account C will be used.

A key component of the structure is that account A is not allowed to be directly accessed to make drawdowns (budgetary transfers). In those years where investment returns and account C are insufficient to provide the desired drawdown, the drawdown must be reduced.

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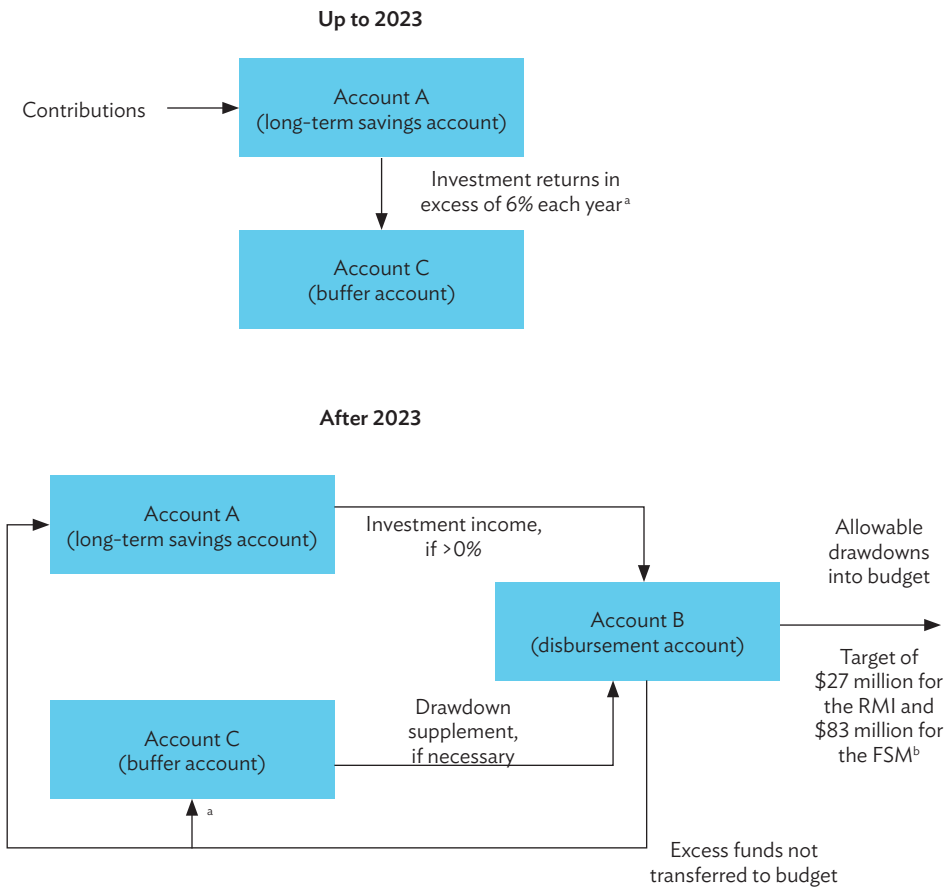
[5] ADB. 2005. Trust Funds in the Pacific: Their Role and Future. *Pacific Studies.* Manila.

[6] Le Borgne, E. and P. Medas. 2007. Sovereign Wealth Funds in the Pacific Island Countries: Macro-Fiscal Linkages. *IMF Working Paper* WP/07/297. Washington, DC: IMF. https://www.imf.org/external/pubs/ft/wp/2007/wp07297.pdf

The account structure and associated rules are depicted in Figure 1. They are also set out in the Trust Fund Agreements (TFAs) for the RMI and the FSM.[7]

**Figure 1: Graphic Depiction of the Marshall Islands' and the Federated States of Micronesia's Compact Trust Fund Account Structure and Drawdown Rules**




FSM = Federated States of Micronesia, RMI = Republic of the Marshall Islands.
[a] Subject to account C's cap of 3 times the projected FY2023 Compact grant.
[b] Targets will reflect the amount required to replace the amount of US Compact grants provided in FY2023. The model assumes this to be $27 million for the RMI and $83 million for the FSM in 2023 dollars.
Source: Author.

[7] Agreement Between the Government of the Federated States of Micronesia and the Government of the United States of America Implementing Section 215 and Section 216 of the Compact, as amended Regarding a Trust Fund. 2002. http://www.uscompact.org/files/US Publications/Compact Trust Funds/FSM/Miscellaneous Documents/Trust Fund Agreement US FSM.pdf; Agreement between the Government of the United States of America and the Government of the Republic of Marshall Islands Implementing Section 216 and Section 217 of the Compact, as Amended regarding a Trust Fund. 2003. Appendix V: Trust Fund Agreement. *Subsidiary Agreements—Compilation for the RMI*. http://uscompact.org/files/RMI Publications/Compact Documents/Subsidiary Agreements.pdf

Within the rules outlined in Figure 1, the CTF governing bodies have some discretion in deciding drawdown amounts. Therefore, the analysis in this paper assumes that drawdowns are reduced when Account C, the buffer account, runs low. Specifically, it is assumed that if the C account is below half of its cap level when it is needed to supplement drawdowns, then it can only be used to provide for half of the required supplement. In such circumstances, drawdowns will be lower than the target $27 million or $83 million level. On top of this, modeling results are also presented for the situation where the CTF governing bodies choose to self-impose a lower annual drawdown target than the full amount of the 2023 Compact grant.

In addition, in RMI's case, some Compact funding will continue post 2023. Although the Trust Fund Agreement (TFA) stipulates that the drawdown target will be the full 2023 Compact grant amount, it has instead been assumed for modeling purposes that this target is actually only the portion of Compact grants that will cease after 2023, which is projected to be $27 million in 2023 dollars by Graduate School USA. However, RMI's maximum drawdown could in fact exceed $27 million due to the wording of its TFA.

As indicated in Chapter 1, both countries have smaller trust funds in addition to their CTFs: the FSM Trust Fund (FSMTF) in the case of the FSM, and account D within the CTF in the case of the RMI.

- The FSMTF, which contained $14 million as at 30 June 2013, is the destination for additional monies that the FSM intends to put away to provide for post 2023 expenditure. These additional monies would come from budget surplus, which, in the model, is assumed to be $3 million per year, or about 1% of 2012 gross domestic product.
- RMI's additional fund is an account within its CTF, named account D. As of 30 September 2013, account D contained $11 million. Total contributions into this account are assumed to be $1 million per year up to 2023.

Unlike the main CTFs, the RMI and the FSM have full control over these additional funds, without the US having any direct influence. However, drawdowns from these funds post 2023 are expected to be much lower than that of the CTFs, because of the much smaller sizes of their current balances and expected future contributions. Therefore, although all metrics for fund size and drawdowns in this report include allowance for these additional smaller trust funds, the discussion focuses on the CTFs. Modeling of these extra funds assumes steady withdrawals are made after FY2023, rather than making withdrawals specifically to attempt to compensate for CTF drawdown shortfalls. This produces results that are comparable between the various alternative drawdown policies that will be explored later.

# III. Modeling Fund Investment Returns

## Investment Return Model Construction

In many economic commentaries of the Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM), a constant investment return is assumed for the respective trust funds. However, due to the volatility of investment returns, this is inadequate in the context of this study given the goal of assessing the performance of the account structure and associated rules. Although some previous analyses of the Compact Trust Funds (CTFs) have incorporated investment market volatility they have focused on assessing CTF sustainability and alternative investment strategies, rather than considering potential changes to drawdown rules, which are the focus of this paper.[8]

To relax the assumption of a constant investment return, this paper uses a stochastic asset model capable of producing a probability distribution of investment returns in each year. The asset model uses Monte Carlo simulation, and does the following:

- Based on a number of assumptions about different asset classes, the model randomly generates an annual rate of return for each asset class in each projection year (the assumptions used for this are detailed in Appendix 1). This creates a table looking similar to Table 2, which is fabricated.

Table 2: Example of Asset Class Return Simulations (%)

| Item | 2014 | 2015 | ... | 2023 | 2024 | ... | 2049 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Global equities | 15 | (3) | ... | 4 | 9 | ... | (8) | 20 |
| US fixed income | 2 | 9 | ... | 5 | 4 | ... | 6 | (1) |
| Others | ... | ... | ... | ... | ... | ... | ... | ... |

( ) = negative, ... = similar data not shown, US = United States..

Source: The author. Returns shown are fabricated, and are not the actual simulation results.

[8] US Government Accountability Office. 2007. *Compacts of Free Association:Trust Funds for Micronesia and the Marshall Islands May Not Provide Sustainable Income*. http://www.gao.gov/assets/270/262065.pdf; Economic Management Policy Advisory Team of the Federated States of Micronesia. 2002. *EMPAT Technical Note. Compact II Trust Fund Agreement: Principles and Problems*. 3 November.

- Using the FSM as an example, these returns are then combined according to FSM's long-term target asset class allocations to calculate FSM's rate of return in each year, as per Table 3.

Table 3: Example of Federated States of Micronesia's Portfolio Return Simulation (%)

| Item | 2014 | 2015 | ... | 2023 | 2024 | ... | 2049 | 2050 |
|---|---|---|---|---|---|---|---|---|
| FSM portfolio | 8.5 | 3.0 | ... | 4.5 | 6.5 | ... | (1.0) | 10.5 |

( ) = negative, ... = similar data not shown, FSM = Federated States of Micronesia.

Source: The author. Returns shown are fabricated, and are not the actual simulation results.

- This is then repeated another 9,999 times to create 10,000 simulations of FSM's future investment return experience, as per Table 4.

Table 4: Example of Many Portfolio Return Simulations (%)

| Item | 2014 | 2015 | ... | 2023 | 2024 | ... | 2049 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Simulation 1 | 0 | 9 | ... | 1 | 17 | ... | 10 | (2) |
| Simulation 2 | (2) | 9 | ... | 8 | 0 | ... | 15 | (8) |
| ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Simulation 10,000 | 1 | (2) | ... | 15 | (5) | ... | 7 | 12 |

( ) = negative, ... = similar data not shown.

Source: The author. Returns shown are fabricated, and are not the actual simulation results.

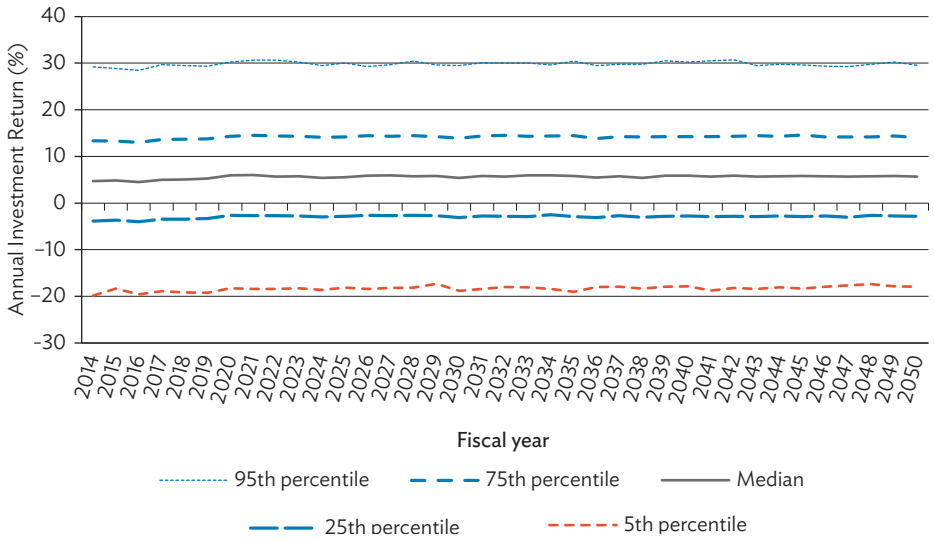
This produces a probability distribution of FSM's investment returns in each year, as shown in Figure 2, which can be interpreted as follows:

- There is an x% chance that the return will be below the xth percentile. For example, there is a 5% chance of the return being at least as negative as the 5th percentile line in each year. The median is the 50th percentile, and thus can also be considered as the halfway point of the distribution.
- There is a 50% chance of experiencing a return somewhere between the 25th and 75th percentile lines in each year, and a 90% chance of experiencing a return somewhere between the 5th and 95th percentile lines in each year.

## Results of Modeling the Portfolios in Isolation

Before factoring in CTF contributions, drawdowns, or the A, B, and C account structure, the model can be used to produce forward-looking measures of the CTF portfolios' expected return and level of investment risk. These are summarized in Table 5.

Figure 2: Annual Investment Return, Federated States of Micronesia's Compact Trust Fund Portfolio Allocations*




* Real annual investment return, net of investment management expenses.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Table 5: Expected Risk and Return Characteristics of the Marshall Islands' and the Federated States of Micronesia's Compact Trust Fund Portfolios*

| Item | RMI | FSM |
|---|---|---|
| Average annualized long-term real return (%) | 4.0 | 4.5 |
| Standard deviation of annual returns (%) | 13.0 | 15.2 |
| Expected frequency of negative annual returns (number of years in 20) | 4.7 | 5.1 |
| 5th percentile annual real return (%) | (15.6) | (18.3) |

( ) = negative, FSM = Federated States of Micronesia, RMI = Republic of the Marshall Islands.

Results in the above table summarise model outcomes across both time and simulations.

* Net of fees, excluding investment manager outperformance.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Notes on the measures set out above:

- **Average annualized long-term return:** This figure is an estimate of earnings that will be generated by the CTF each year. Formally, it is the average, across simulations, of the accumulated annualized real return over 37 projection years. Because of return volatility, this annualized figure is actually lower than a simple (arithmetic) average of the rates of return across time and simulations.
- **Standard deviation of annual returns:** Standard deviation is a measure of risk. It can be interpreted as follows: in approximately two-thirds of years, the annual return will be within one standard deviation above or below the average. Approximately 95% of the time, the annual return will be within two standard deviations of the average.

- **Expected frequency of negative annual returns:** This is another measure of risk, and is an estimate of how often the portfolio will lose money, in nominal terms.
- **5th percentile annual real return:** This is a measure of risk that focuses on the downside potential of the portfolio. It can be interpreted as follows: in 1 in every 20 years, the portfolio can be expected to experience a real return of this level or worse.

Evident in Table 5 are the effects of FSM's more growth-oriented investment strategy, as reflected in Tables A1.3 and A1.5 in Appendix 1 (for example the RMI CTF aims to invest 20% of its portfolio in US Fixed Income as opposed to FSM's 2.5%). Although the FSM is expected to achieve a higher long-term return, this comes at the price of higher risk, as measured by the standard deviation of the real return, the 5th percentile real return, and the expected frequency of negative (nominal) returns.

## Construction of the Marshall Islands' and the Federated States of Micronesia's Compact Trust Fund Models

Aside from assessing the risk and return characteristics of the RMI and the FSM investment portfolios in isolation, the investment return simulations can also be used as an input into other calculations, for example involving contributions and withdrawals. Thus, an extension of the investment return model was built to investigate the size progression of RMI's and FSM's CTFs and the drawdowns into the budget that they will be able to support over time.

This extension takes the simulated returns for the CTF as an input, and, for each simulation, calculates the sizes of the A, B, and C accounts, as well as the drawdown amounts under the established set of rules. Table 6 illustrates what this may look like for one particular simulation.

Table 6: Generic Example of Compact Trust Fund Simulation

| Item | 2014 | 2015 | ... | 2023 | 2024 | ... | 2049 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Simulated portfolio return (%) | (40.6) | 4.7 | ... | (10.8) | 12.4 | ... | 5.6 | (2.4) |
| Inflation (%) | 0.2 | 4.8 | ... | 5.0 | 3.3 | ... | 3.6 | 2.4 |
| Expenses (%) | 0.6 | 0.6 | ... | 0.6 | 0.6 | ... | 0.6 | 0.6 |
| Contributions ($ million) | 16.5 | 17.3 | ... | 24.2 | 0.0 | ... | 0.0 | 0.0 |
| (intermediate calculations) | ... | ... | ... | ... | ... | ... | ... | ... |
| **Results** | | | | | | | | |
| A account ($ million) | 107.0 | 130.9 | ... | 304.4 | 321.3 | ... | 941.9 | 911.0 |
| B account or drawdown amount ($ million) | 0.0 | 0.0 | ... | 0.0 | 19.3 | ... | 40.1 | 41.1 |
| C account ($ million) | 42.2 | 42.2 | ... | 92.6 | 103.0 | ... | 86.5 | 45.5 |
| Total CTF size, 2023 dollars ($ million) | 202.7 | 224.5 | ... | 396.9 | 410.5 | ... | 479.2 | 435.4 |

( ) = negative, CTF = Compact Trust Fund.

Note: in this table, dollar figures are in current values, unless where otherwise stated. However, elsewhere in this report, modeling results are given in constant 2023 dollars.

Source: The author.

After calculating the results and saving them for this scenario, the remainder of the 10,000 scenarios of investment returns will be input, and their results calculated and saved. This allows a detailed investigation of the volatility of the overall fund size and drawdowns into the budget, and gives an objective and comprehensive view of the various scenarios the RMI and the FSM may face given the possible behavior of investment markets.

## Limitations of the Models

It is important to bear in mind what this model should and should not be used for. The model is not appropriate for forecasting short-term returns, or working out how to "make money" using particular trading strategies. However, it is well suited to understanding the long-term risk and return characteristics of portfolios and assessing the implications of market volatility. It is a necessary tool to ensure that the risks taken by RMI's CTF and FSM's CTF are consistent with their fiscal objectives. The results presented in the remainder of this report will illustrate the power of such a model to shed light on the most important aspects of the CTFs: the nature of their future contributions to government revenues and their sustainability over time.

All modeling results in this report are presented in constant FY2023 US dollars, unless otherwise stated.

# IV. Modeling Results for the Marshall Islands

## Progression of the Marshall Islands' Compact Trust Fund Size

Based on the model for RMI's Compact Trust Fund (CTF), Figure 3 presents an estimate of the probability distribution of RMI's CTF size as of FY2023, including the projected impact of additional contributions from Taipei,China and the United States (US), just before drawdowns commence. The halfway point (median value) of this distribution is $691 million, but there is a wide spread of possible outcomes above and below this value.

Based on this model, RMI's CTF has less than a 50% chance of meeting the "sufficiency estimate" of $745 million provided in the FY2012 RMI economic review.[9] However, the notion of a "sufficiency estimate" is misleading, as this term implies some degree of certainty that RMI's CTF will achieve its objectives if such a level is reached. In reality, no such certainty exists. In particular, while most "sufficiency estimates" assume a constant investment return post 2023, there is always a chance of poor investment returns, in which case RMI's CTF may be unable to fulfill expectations.

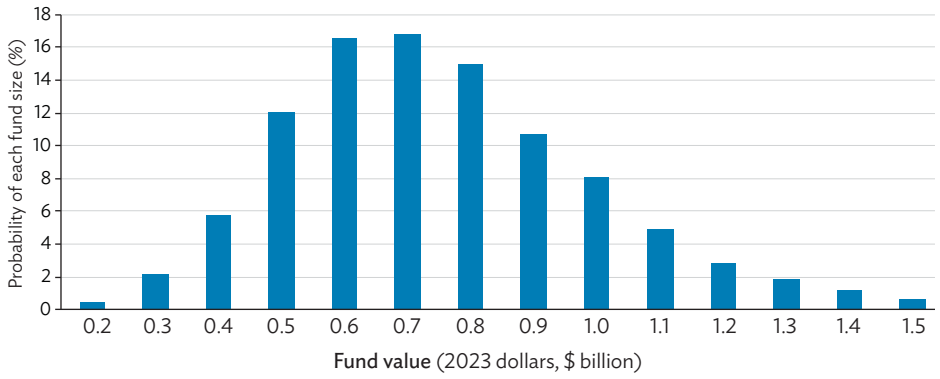
Figure 4 sets out the progression of RMI's CTF size over time, including the effects of drawdowns according to the account structure and rules explained in Chapter 2, under *Details of Account Structure and Drawdown Rules*.

Figure 4 shows the spread of possible values of RMI's CTF over time. It can be interpreted by recognizing that, e.g., 95% of simulations are below the 95th percentile line (and 5% are above), based on the CTF size in each simulation. Similarly, 5% of simulations are below the 5th percentile line (and 95% are above), and so on. The median is the 50th percentile and thus represents a halfway point. It is similar to, but not the same as, the mean.

Generally, as time progresses, the size of RMI's CTF becomes more uncertain, as shown by a widening gap between all the percentile lines in Figure 4. This is a normal phenomenon for an investment portfolio. There is also an obvious break after 2023 when drawdowns from RMI's CTF commence and the distribution of possible outcomes starts to widen more quickly.

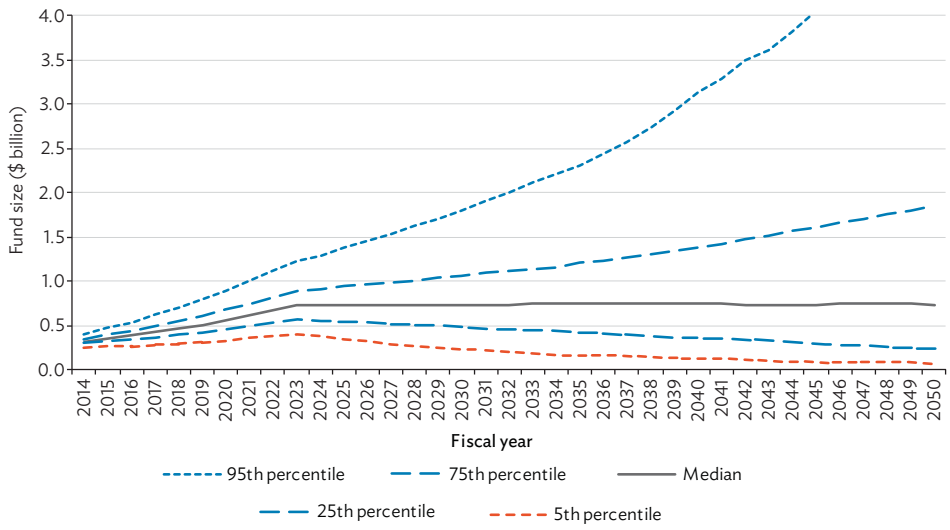
[9] Graduate School USA. 2013. *Republic of the Marshall Islands Fiscal Year 2012 Economic Review.* http://www.pitiviti.org/news/wp-content/uploads/downloads/2013/10/RMI_EconReview_FY12.pdf

**Figure 3: Probability Distribution of the Marshall Islands' Compact Trust Fund Size, FY2023**




Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

**Figure 4: Marshall Islands' Compact Trust Fund Size** (in 2023 prices)




Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

One insight from Figure 4 is that, since drawdowns have a fixed target in real dollars, there is a bifurcation of outcomes. That is, if the value of RMI's CTF is past a certain threshold point by the time drawdowns start, then its real value is more likely to grow, or at least be maintained. Conversely, if its value is below the threshold, then its real value is more likely to diminish. Given that the line showing the median is roughly flat after 2023, this seems to broadly represent the threshold level.

## Typical Patterns of Allowable Drawdowns

Before examining summary information of drawdowns across all simulations, it is worth inspecting individual simulations to understand how the size and drawdowns of RMI's CTF could progress over time. Figures 5 and 6 present stylized representations of two possible types of progression, with Figure 5 being slightly more likely to occur than Figure 6. These depictions are actually the outcomes of two handpicked simulations from the model. Therefore, they should be considered only as stylized illustrations, rather than as being objectively representative of all simulations generated by the model.

RMI's CTF, with its current setup, has a chance of playing out according to the first stylized pattern in Figure 5. In the particular simulation depicted therein, the CTF roughly maintains its overall size in real terms, and while there is volatility of drawdowns in times of poor investment returns (e.g., in 2040) drawdowns are generally reliable enough to replace US Compact grants.

However, if investment returns are less favorable, then drawdowns from RMI's CTF may experience a progression more similar to the second stylized pattern, shown in Figure 6. In this scenario, the C account is largely depleted by 2033, after which point drawdowns become highly volatile. In one instance in the simulation in Figure 6, the total drawdown reduces by $20 million, or 5% of projected gross domestic product (GDP), within 1 year. This magnitude of variation is larger than the average across all simulations. However, if a scenario similar to Figure 6 were in fact realized, it might cause significant problems for RMI's economy, especially when fiscal multiplier effects are considered.

## Drawdowns–Summary Statistics

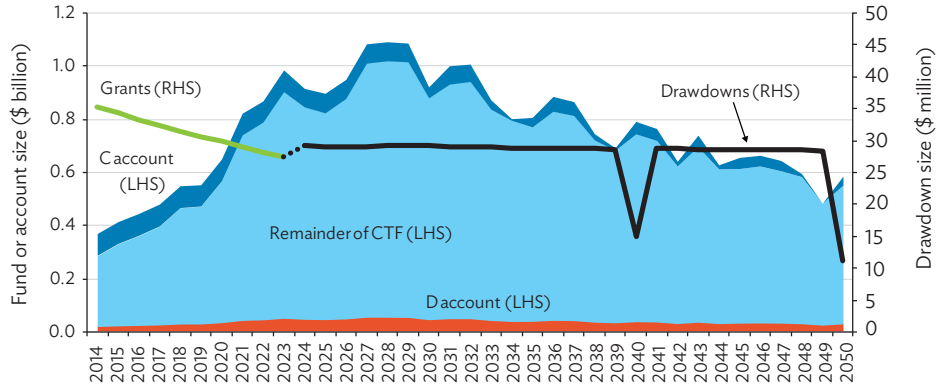
Figures 5 and 6 give an idea of what might be experienced in a typical scenario, but they do not represent a comprehensive consideration of possible outcomes, as they do not consider the full set of simulations generated. Therefore, the results and discussion below broaden the study by moving away from individual representative simulations to a more general characterization of drawdowns and their volatility, as well as the overall sustainability of RMI's CTF.

The main measures used are the following:

- Analyzing drawdowns, including:
  i. **Average yearly drawdown**, i.e., the average drawdown per year from 2024 to 2050, inclusive. Higher is better.
  ii. **Drawdown volatility**, i.e., the number of years in 20 where drawdowns fall by more than 3%, 5%, or 10% of GDP. This shows the expected frequency of funding shocks of these magnitudes. Lower is better. Additional modeling results illustrating the volatility of drawdowns are in Appendix 6.

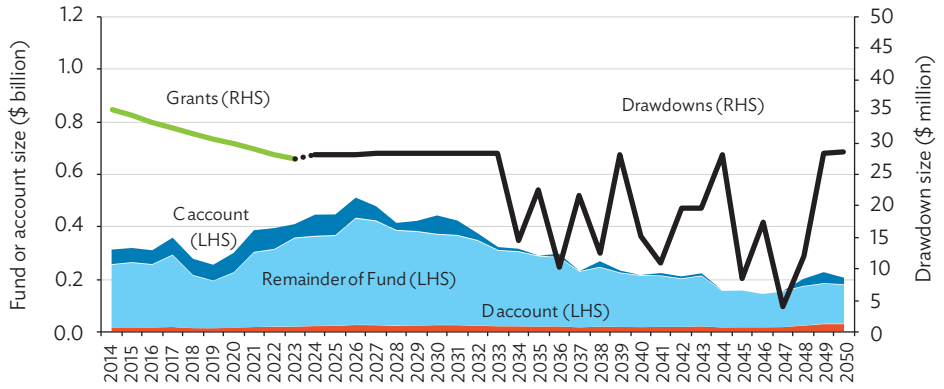
- Measuring **CTF sustainability**, through estimating the chance that the CTF maintains its real 2023 value up to 2050, i.e., the probability that the CTF is at least as large in 2050 as it is in 2023 in real terms. Higher is better.

**Figure 5: Marshall Islands Compact Trust Fund–Stylized Fund and Drawdown Pattern No. 1, Current Drawdown Rules**




CTF = Compact Trust Fund, LHS = left-hand side, RHS = right-hand side.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

**Figure 6: Marshall Islands Compact Trust Fund–Stylized Fund and Drawdown Pattern No. 2, Current Drawdown Rules**




CTF = Compact Trust Fund, LHS = left-hand side, RHS = right-hand side.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

- Measuring the severity of any fiscal adjustment in 2024, through estimating the average reduction in funding from 2023 to 2024, i.e., the difference between the 2023 dollar value of grants in 2023 and the trust fund drawdown in 2024, if the latter is less than the former. Lower is better.

Table 7: Modeling of the Marshall Islands' Compact Trust Fund's Current Drawdown Rules

| Item | Average yearly drawdown over the projection period[a] | | Drawdown Volatility - number of years in 20 where drawdowns fall by more than | | | CTF Sustainability - Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment - Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| Current structure | 26.1 | 7.8 | 1.2 | 0.2 | 0.0 | 49 | N | |

CTF = Compact Trust Fund, GDP = gross domestic product, N = none (reduction may occur later).
Results in the above table summarise model outcomes across both time and simulations.
[a] In 2023 dollars.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Although average drawdowns are reasonably close to replacing US Compact grants, there are two important problems with the current structure based on the measurements presented in Table 7:

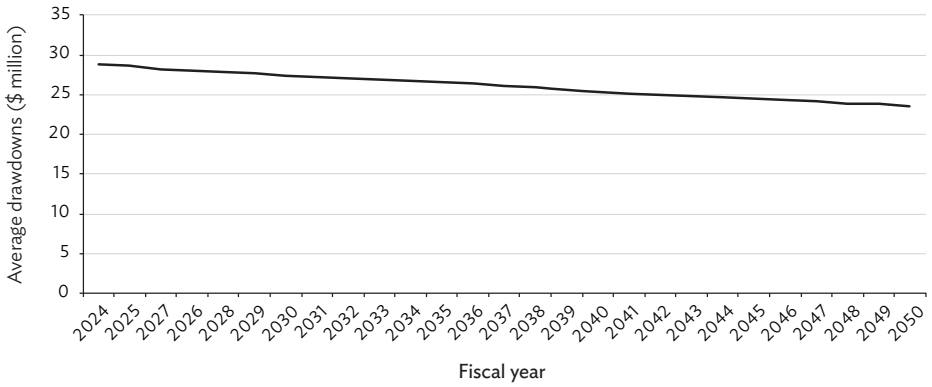
- **The sustainability of RMI's CTF is low.** The modeling results suggest that there is only a 49% chance of the CTF maintaining its real value over time.
- **Drawdowns could be volatile.** There is potential for drawdowns to reduce by 3% or even 5% of GDP from year to year. The numbers for the current structure in Table 7 are averages, meaning that reality could be much better or worse. For example, a reduction in drawdowns of 3% of GDP may not occur at all in the scenario of a larger fund size. However, if the fund size is lower, then such reductions may occur more frequently than 1.2 in every 20 years.

The two problems above are mainly caused by drawing down too much too early. As depicted in Figure 7 (and also evident in Figure 6), if RMI's CTF follows the existing drawdown rules, this will, on average, lead to a deterioration in the real size of the CTF and thus a reduction in the amounts available for drawdown. Note that the line depicted in Figure 7 is only smooth because it shows an average across 10,000 simulations, and thus is not representative of likely volatility of drawdowns. Figures 5 and 6 better capture the drawdown volatility the RMI could experience.

## Alternative Drawdown Rules

Given that there are problems caused by the existing account structure and associated drawdown rules of RMI's CTF, this report examines some alternative drawdown rules according to the same metrics. The first two alternatives to be examined are:

Figure 7: Average Drawdowns on the Marshall Islands Compact Trust Fund and Account D Over Time, Current Drawdown Rules




Note: Due to the drawdowns from account D, the total expected drawdowns under the current structure in the first year exceed the $27 million Compact Trust Fund target. To model account D consistently between different alternatives, drawdowns from account D are modeled as independent of Compact Trust Fund drawdowns.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

- **Alternative 1.** This alternative assumes that the existing A, B, and C account structure and set of rules are used, but with the target yearly drawdown amount (currently assumed to be $27 million in 2023 dollars) reduced by
  i. 15%, i.e., a target of $23 million; and
  ii. 30%, i.e., a target of $19 million.

- **Alternative 2.** To serve as a baseline comparator for the account structure and drawdown rules currently in place, Alternative 2 consists of an exceedingly simple rule of drawing down a fixed percentage of RMI's CTF every year. Since the long-term real annualized after-expenses return of RMI's CTF is modeled to be about 4.0% per year, the following fixed percentage drawdown rates are modeled:
  i. 3.0%,
  ii. 3.5%, and
  iii. 4.0%.

The results for Alternatives 1 and 2 are set out in Table 8.

Table 8: Modeling of the Marshall Islands' Compact Trust Fund Drawdown Rules, Alternatives 1 and 2

| Item | Average yearly drawdown over the projection period[a] | | Drawdown Volatility - number of years in 20 where drawdowns fall by more than | | | CTF Sustainability - Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment - Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| ***Current structure:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of $27m* | | | | | | | | |
| $27 million | 26.1 | 7.8 | 1.2 | 0.2 | 0.0 | 49 | N | |
| ***Alternative I:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of:* | | | | | | | | |
| $19 million | 20.0 | 5.9 | 0.2 | 0.0 | 0.0 | 64 | 6.9 | 2.5 |
| $23 million | 23.2 | 6.9 | 0.6 | 0.0 | 0.0 | 57 | 2.8 | 1.0 |
| ***Alternative II:*** *Simplified structure, fixed % of CTF drawn down each year* | | | | | | | | |
| 3.0% | 30.1 | 8.8 | 0.3 | 0.1 | 0.0 | 66 | 4.5 | 1.6 |
| 3.5% | 32.7 | 9.6 | 0.4 | 0.1 | 0.0 | 59 | 0.7 | 0.3 |
| 4.0% | 34.8 | 10.2 | 0.5 | 0.1 | 0.0 | 52 | | |

CTF = Compact Trust Fund, GDP = gross domestic product, N = none (reduction may occur later).

Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

From Table 8, it is evident that reducing the real drawdown target, as per Alternative 1, has the expected effects. These effects include less significant drawdown volatility, higher likelihood of CTF sustainability, but also lower expected drawdowns, both initially and on average. For example, the RMI could achieve a more reasonable level of CTF sustainability (64%) by reducing its annual drawdown target to $19 million. Although this would also provide considerable benefits in reduced drawdown volatility, it would result in drawdowns that are not enough to replace the reduction in Compact grants in real terms. In addition, it should be noted that in the absence of any guidance regarding a long-term sustainable level of drawdowns, the Alternative 1 scenarios are potentially optimistic. Specifically, when faced with the choice between a large sudden fiscal adjustment and drawing down the maximum allowable amount, it is quite plausible that significant pressure will exist to do the latter.

In any case, the litmus test of any complex structure such as that of RMI's CTF accounts and associated drawdown rules is whether it offers advantages over an exceedingly simple structure. The above measurements for Alternative 2 suggest that this is most likely not the case. The fixed-percentage strategies of Alternative 2 generally perform better than the fixed-dollar strategies on both the sustainability and average drawdown measures. They also produce improvements in drawdown volatility when compared with the current structure. They may appear to have a disadvantage relative to the current structure because they are likely to result in reduced overall Compact funding in 2024 as compared to 2023. However, this is somewhat deceptive, because the current structure usually would only delay this

reduction in revenue, not avoid it. In the author's view, this is actually an advantage of the Alternative 2 strategies relative to the current structure, as explained in *Potential Fiscal Cliff for the Marshall Islands* later in this chapter.

It is curious that simple rule changes as per the Alternative 2 strategies can lead to such significant improvements. Reasons for this can be understood intuitively by considering the most important unintended consequences of RMI's CTF account structure:

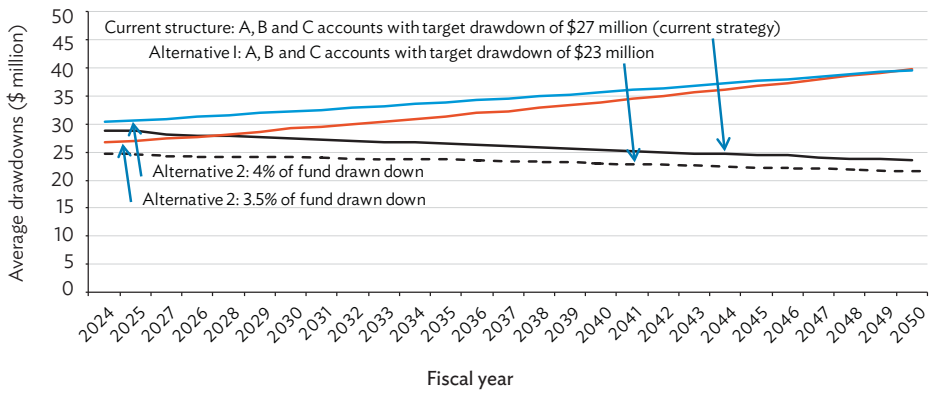
- **Drawdowns are not sensitive to CTF size.** Under the current structure and associated drawdown rules, drawdowns are not sensitive to the overall size of RMI's CTF, but only to recent investment returns. For example, depending on circumstances, the target drawdown of $27 million may become very large relative to the CTF size, in which case the real value of the CTF would be eroded over time. Conversely, the $27 million could become very small relative to the CTF size, in which case the CTF would not be providing as much benefit to the RMI as it could.
- **Too much is drawn down too early.** A related point, mentioned above but worth reemphasizing, is that the use of the C account to supplement transfers to the budget can lead to imprudently drawing down too much early on. This is relevant for those simulations in which the CTF size cannot support the particular level of fixed-dollar drawdowns adopted. This often results in a reduced CTF size and reduced drawdowns in later projection years (Figures 6 and 7).
- **Attempts to protect the A account do not (and cannot) work.** It is important to note that, although the value of the A account is intended to be protected under the existing structure, it is not the case because the A account is ultimately still exposed to negative investment returns when they occur. That is, even though the A account will not be drawn upon when investment returns are negative, the combination of fluctuating returns and drawdowns over multiple years may easily result in a diminished A account, in both real and nominal terms. More generally, with a growth-oriented investment portfolio strategy it is unreasonable to expect to be able to protect an investment fund against losing value; the nature of investment risk is such that if an investor desires a higher long-term expected return, he/she must accept the possibility of loss. It is not possible to circumvent this fundamental dynamic with a complicated set of drawdown rules.

Although the fixed-percentage strategies offer substantial improvements based on the above measures, they do produce a markedly different pattern of drawdowns. Figure 8 updates Figure 7 by showing the average drawdown over time for the alternative strategies.

A key issue is whether RMI's CTF drawdowns can replace US Compact grants, which are projected to be approximately $27 million in 2023. Figure 8 illustrates that the ability of the current drawdown rules to replace these grants is likely to diminish over time, reflecting the likely unsustainability of RMI's CTF. On the other hand, under the Alternative 2 strategies, the CTF is likely to grow on average, and thus the average drawdowns under these strategies exceeds those of the current and Alternative 1 strategies after a short period.

Although a reduction in overall revenue may occur in 2024 under the Alternative 2 strategies, the declining black line in Figure 8 reflects the fact that a similar reduction could still happen under the current structure. In particular, the smoothness of the black line above (which represents an average) belies the unpredictability of drawdowns the RMI may experience under the current structure, as per Figure 6. Thus, it is not clear that delaying the reduction by maintaining the current structure is a good choice. This issue is explored in more detail under *Potential Fiscal Cliff for the Marshall Islands* later in this chapter.

Figure 8: Average Drawdowns Over Time on the Marshall Islands' Compact Trust Fund




Note: Due to the drawdowns from account D, the total expected drawdowns under the current structure in the first year exceed the $27 million CTF target. To model account D consistently between different alternatives, drawdowns from account D are modeled as independent of CTF drawdowns.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Taking a step back, it appears that the A, B, and C account structure has been designed to try to reliably replace Compact grants while protecting the value of the A account. However, the modeling and analysis reveal some unexpected and unintended consequences.

In Table 9, the same modeling results are presented for two additional types of drawdown strategies to discover a set of rules that further improve the contribution of RMI's CTF to the budgetary objectives of the RMI. The drawdown strategies are as follows:

- **Alternative 3.** The fixed-percentage drawdowns of the previously examined Alternative 2 achieve greater sustainability by making drawdowns sensitive to the size of RMI's CTF. However, there is still scope for reducing the volatility of drawdowns. Alternative 3 attempts to realize such improvements. It is the same as Alternative 2 except that, instead of drawdowns being calculated as a fixed percentage of the current CTF size, they are calculated as a fixed percentage of the average size over the last 3 years. This is designed to lead to a smoother drawdown progression, as the averaging allows some of the volatility of the size of the RMI CTF to cancel itself out.
- **Alternative 4.** Alternatives 2 and 3 discard the A, B, and C account structure. Alternative 4, keeps the existing structure but builds on it by making it more similar to Alternative 3. Specifically,
  i. the drawdown target is changed from being a fixed real dollar amount to being a fixed percentage of the average of RMI's CTF value over the last 3 years; and
  ii. the maximum size of account C is capped at three times the target drawdown amount, instead of being capped at three times the 2023 US Compact grant amount (the previous target drawdown amount).

Table 9: Modeling of the Marshall Islands' Compact Trust Fund Drawdown Rules, Alternatives 3 and 4

| Item | Average yearly drawdown over the projection period[a] | | Drawdown Volatility - number of years in 20 where drawdowns fall by more than: | | | CTF Sustainability - Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment - Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| ***Alternative III:*** *Drawdown defined as % of average CTF size over the last 3 years* | | | | | | | | |
| 3.0% | 29.3 | 8.5 | 0.0 | 0.0 | 0.0 | 67 | 7.0 | 2.5 |
| 3.5% | 31.9 | 9.3 | 0.1 | 0.0 | 0.0 | 60 | 3.6 | 1.3 |
| 4.0% | 34.2 | 10.0 | 0.1 | 0.0 | 0.0 | 53 | 0.2 | 0.1 |
| ***Alternative IV:*** *Same as current structure but with target drawdown defined as % of average CTF size over the last 3 years* | | | | | | | | |
| 3.0% | 29.0 | 8.4 | 0.4 | 0.1 | 0.0 | 68 | 7.0 | 2.5 |
| 3.5% | 31.7 | 9.2 | 0.5 | 0.2 | 0.0 | 62 | 3.6 | 1.3 |
| 4.0% | 33.9 | 9.9 | 0.6 | 0.3 | 0.0 | 55 | 0.2 | 0.1 |
| Previous results, for comparison: | | | | | | | | |
| ***Current structure:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of $27m* | | | | | | | | |
| $27 million | 26.1 | 7.8 | 1.2 | 0.2 | 0.0 | 49 | N | |
| ***Alternative I:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of:* | | | | | | | | |
| $19 million | 20.0 | 5.9 | 0.2 | 0.0 | 0.0 | 64 | 6.9 | 2.5 |
| $23 million | 23.2 | 6.9 | 0.6 | 0.0 | 0.0 | 57 | 2.8 | 1.0 |
| ***Alternative II:*** *Simplified structure, fixed % of CTF drawn down each year* | | | | | | | | |
| 3.0% | 30.1 | 8.8 | 0.3 | 0.1 | 0.0 | 66 | 4.5 | 1.6 |
| 3.5% | 32.7 | 9.6 | 0.4 | 0.1 | 0.0 | 59 | 0.7 | 0.3 |
| 4.0% | 34.8 | 10.2 | 0.5 | 0.1 | 0.0 | 52 | N | |

CTF = Compact Trust Fund, GDP = gross domestic product, N = none (reduction may occur later).
Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

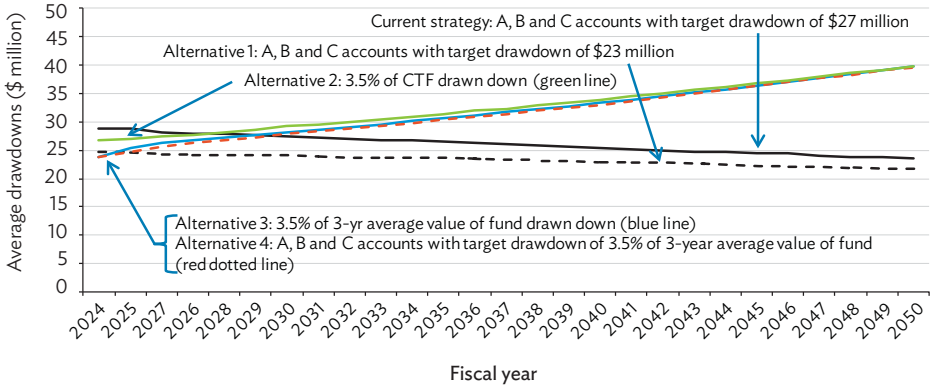
The modeling results for Alternatives 3 and 4 are presented in Table 9. The enhancement of Alternative 2 embodied in Alternative 3, i.e., using a 3-year average of the size of RMI's CTF instead of only the current size, has the intended effect of further reducing drawdown volatility. For example, for a 3.5% target drawdown, a year-on-year reduction in drawdown amount of more than 3% of GDP would only be expected to happen once every 200 years, instead of once every 50 years, on average across all scenarios. Alternative 3 also leads to marginally higher sustainability and marginally lower average drawdowns than Alternative 2, as well as increasing the expected size of the fiscal adjustment.

The similarity between Alternatives 3 and 4 based on these measures is quite strong, as they are both based on drawing down a fixed percentage of the 3-year average size of the RMI's CTF. The differences arise because of those years in which, under Alternative 4, account C becomes low or depleted and investment returns are insufficient to provide for the targeted drawdown, resulting in a cut in drawdowns. At the aggregate level, these cuts lead to slightly improved sustainability, slightly reduced average drawdowns, and a material increase in drawdown volatility. Alternative 4 relinquishes part of the gains made by moving to Alternative 3. In particular, while Alternative 3 exhibited very low volatility of drawdowns, Alternative 4 by comparison still has about half the volatility of drawdowns of the current structure, based on the measurements shown in Table 9. In any case, reduced drawdowns due to low levels of account C occur much less frequently under Alternative 4 than under the current structure.

The progression of the average drawdowns over time under Alternatives 3 and 4 are similar to that under Alternative 2, which as noted previously is quite different to the progression under Alternative 1 and the current structure. This is depicted in Figure 9.

Figure 9 updates Figure 8 with extra lines depicting Alternatives 3 and 4. It shows that, under these two new strategies, drawdowns increase over time, similarly to the simplified fixed-percentage strategy previously analyzed. However, it also emphasizes that the initial

Figure 9: Average Drawdowns Over Time on the Marshall Islands' Compact Trust Fund – All Alternatives




CTF = Compact Trust Fund.
Note: Due to the drawdowns from account D, the total expected drawdowns under the current structure in the first year exceed the $27 million CTF target. To model account D consistently between different alternatives, drawdowns from account D are modeled as independent of CTF drawdowns.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

expected size of drawdown amounts under Alternatives 3 and 4 are somewhat lower than under Alternative 2, which is matched by slightly higher sustainability.

## Choosing a Fixed Drawdown Percentage

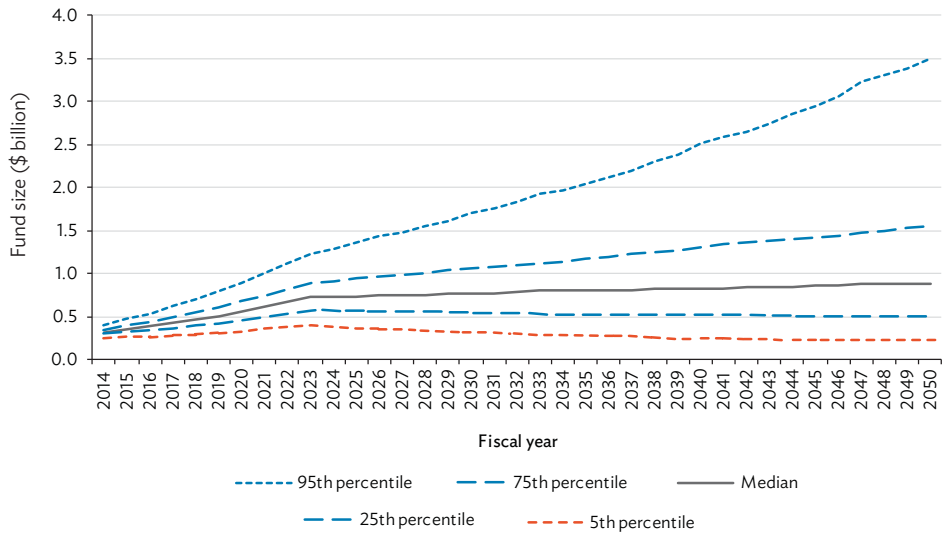
The fixed drawdown percentages for which modeling results are shown above were devised with reference to the expected long-run annualized real return of RMI's CTF portfolio, net of fees of 4.0%, as set out in Table 5. It makes sense that, to achieve sustainability, the drawdown percentage should not exceed this return figure. Appendix 4 provides some technical notes relating to how this figure is determined.

Choosing an appropriate drawdown percentage involves considering the trade-off between the amount of the drawdowns and the sustainability of the CTF. For example, although the 4% drawdown provides higher expected drawdowns over the next few decades, its likelihood of sustainability under Alternative 4 is only 55%, as compared with the more comfortable 62% figure when drawing only 3.5% of RMI's CTF each year. Thus, in choosing a drawdown percentage, the RMI will face a trade-off between additional income in the medium term and increased likelihood of sustainability.

## Conclusions

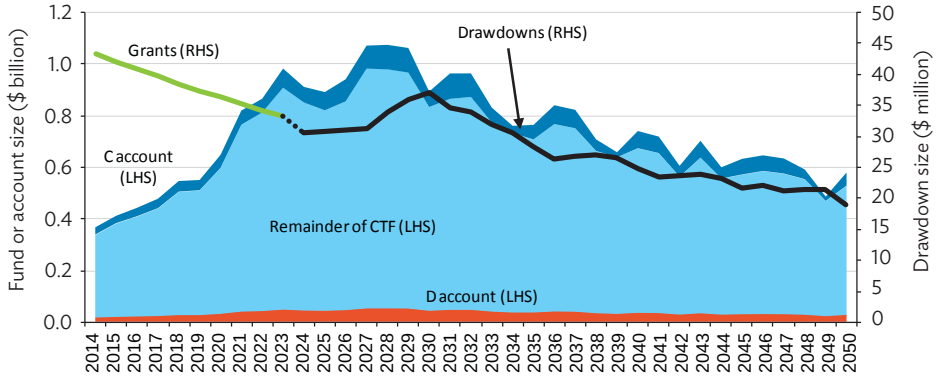
The modeling results in Table 9 show that under Alternative 4 a 3.5% drawdown may strike an appropriate balance for RMI's CTF. This would produce the CTF size progression in Figure 10, and the "typical" drawdown progressions in Figures 11 and 12, which use the same investment return simulations as in Figures 5 and 6 respectively. The increased

Figure 10: Marshall Island's Compact Trust Fund Size, Alternative 4



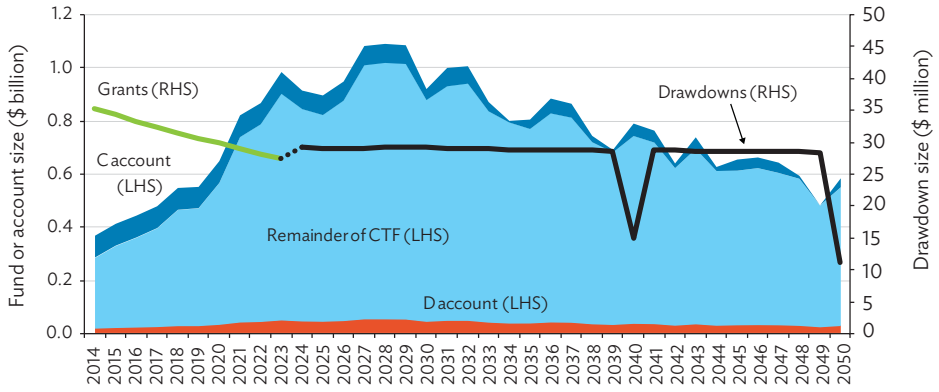

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Figure 11: Marshall Islands Compact Trust Fund–Stylized Fund and Drawdown Pattern No. 1, Alternative 4




CTF = Compact Trust Fund, LHS = left-hand side, RHS = right-hand side.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

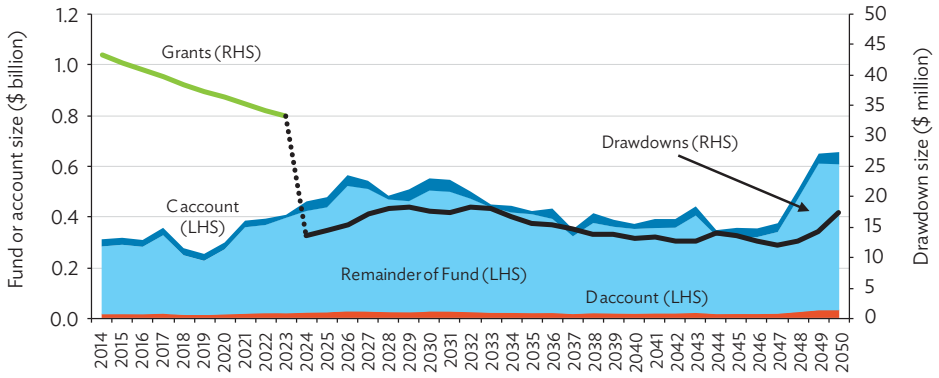
Figure 5 (repeated for comparison purposes): Marshall Islands Compact Trust Fund–Stylized Fund and Drawdown Pattern No. 1, Current Drawdown Rules




CTF = Compact Trust Fund, LHS = left-hand side, RHS = right-hand side.
Note: Figures 11 and 5 depict the outcomes from an individual simulation, and thus should be considered only as stylized illustrations, rather than as being representative of all simulations generated by the model.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

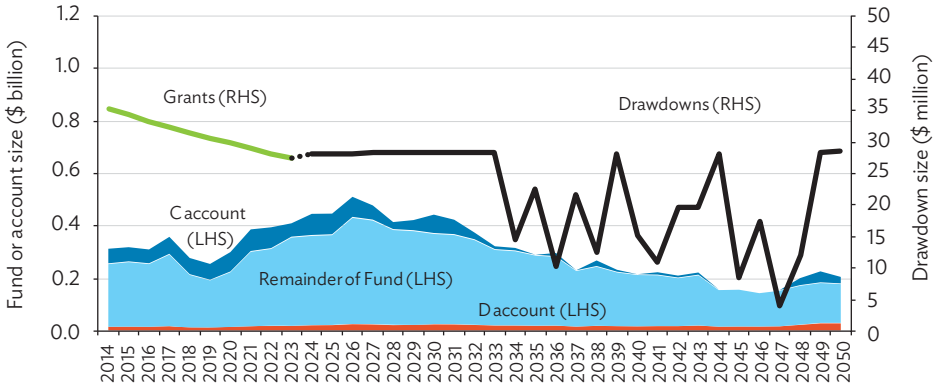
sustainability of RMI's CTF is evident in Figure 10, which shows an increasing median CTF size over time. Similarly, the increased predictability of drawdowns in stylized pattern no. 2 is evident in Figure 12. In addition, under the current structure, the amount of the drawdown in a particular year is often strongly influenced by the investment return during the previous year, meaning that there may often be only a few months' warning of any changes to the

**Figure 12: Marshall Islands Compact Trust Fund–Stylized Fund and Drawdown Pattern No. 2, Alternative 4**




LHS = left-hand side, RHS = right-hand side.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

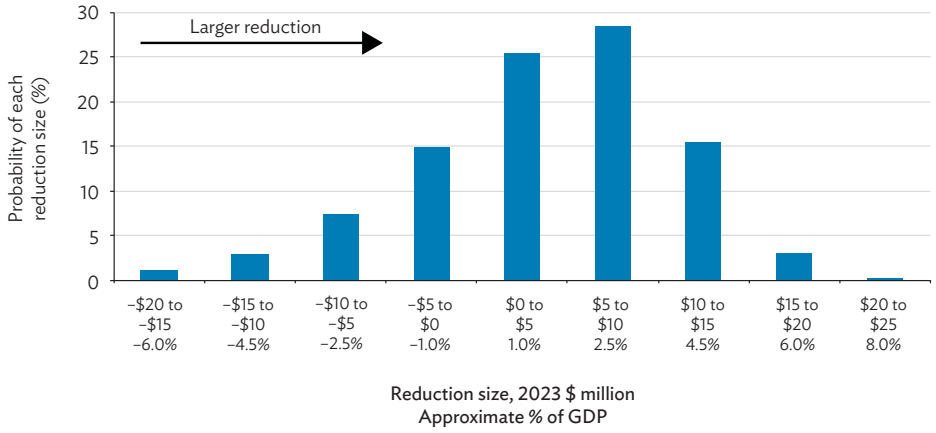
**Figure 6 (repeated for comparison purposes): Marshall Islands Compact Trust Fund–Stylized Fund and Drawdown Pattern No. 2, Current Drawdown Rules**




LHS = left-hand side, RHS = right-hand side.
Note: Figures 12 and 6 depict the outcomes from an individual simulation, and thus should be considered only as stylized illustrations, rather than as being representative of all simulations generated by the model.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

drawdown amount. By contrast, under the fixed-percentage strategies, the drawdown amounts will be approximately known years in advance, since they are based on the fund size rather than recent investment returns.

Figure 13: Marshall Islands–Prior Uncertainty of 2024 Reduction in Overall Compact Funding[a]




GDP = gross domestic product.

[a] For Alternative 4 with drawdown percentage of 3.5%.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

## Potential Fiscal Cliff for the Marshall Islands

Given the material size of the Compact grants relative to RMI's GDP, a key issue for the RMI is the potential for the overall amount of Compact funding to change because of the switch from Compact grants in 2023 to CTF drawdowns in 2024.

As previously shown in Figures 8 and 9, Alternatives 2, 3, and 4 entail on average some reduction in funding between 2023 and 2024. This is also set out in Table 9. However, the amount of the reduction is somewhat uncertain at this stage. Figure 13 sets out the possible range of the inflation-adjusted difference between the CTF drawdown in 2024 and the 2023 Compact grant, based on the model.

Although the average reduction in Compact funding from 2023 to 2024 under Alternative 4 is only approximately 1% of GDP (Table 9), there is significant variation of this amount between simulations as shown in Figure 13. In the extreme, the reduction could be as much as 6%–8% of GDP. However, there is a high (approximately 70%) chance that the reduction will be 1%–5% of GDP, which would be relatively manageable. There is also about a 25% chance that there will be an increase in Compact funding, rather than a decrease. It should be noted that this uncertainty exists mostly because the CTF investment returns between 2014 and 2023 are not known at this stage. As 2024 approaches, the amount of the first drawdown from the CTF in the case where a percentage-based alternative is adopted will become clearer.

Under the current structure, there will be no reduction in funding from 2023 to 2024. However, if the CTF were too small to comfortably support the $27 million drawdowns after 2023, this could be expected to further reduce the real size of the CTF and C account, eventually forcing drawdowns to be reduced. This is when, under the current structure,

the RMI would experience a fiscal cliff, and in the stylized example in Figure 6, this occurs from 2034. Further, as explained in the previous section in this chapter, under the current structure there may only be a few months' warning of this event, which could add to difficulties in expenditure planning.

Therefore, in contrast to the alternative fixed-percentage strategies, any fiscal cliff under the current structure, while delayed, could be expected to be (i) uncertain in timing and amount, and (ii) associated with an unsustainable drawdown pattern that results in a diminished real CTF size. In other words, the RMI can delay any reduction in Compact funding, but it will do so by borrowing against its future, and with no way of knowing when drawdowns will suddenly dry up.

# V. Modeling Results for the Federated States of Micronesia

## Progression of the Federated States of Micronesia's Compact Trust Fund Size

Based on the model for FSM's Compact Trust Fund (CTF), Figure 14 presents an estimate of the probability distribution of FSM's CTF size as of FY2023, including the projected impact of additional contributions from the United States (US), just before drawdowns commence. The halfway point (median value) of this distribution is $1.1 billion, but there is a wide spread of possible outcomes above and below this value.

It is notable that FSM's CTF is likely to fall short of the "sufficiency estimate" of $1.68 billion in the FY2012 FSM economic review.[10] However, the notion of a "sufficiency estimate" is misleading, as this term implies some degree of certainty that the CTF will achieve its objectives if such a level is reached. In reality, no such certainty exists. In particular, while most "sufficiency estimates" assume a constant investment return post 2023, there is always a chance of poor investment returns, in which case FSM's CTF may be unable to fulfill expectations.

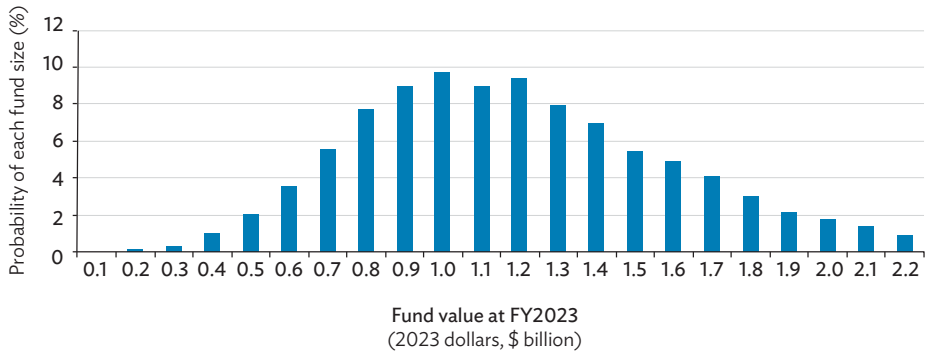
Figure 15 sets out the progression of FSM's CTF size over time, including the effects of drawdowns according to the account structure and rules explained in Chapter 2, under *Details of Account Structure and Drawdown Rules*.

Figure 15 shows the spread of possible values of FSM's CTF over time. It can be interpreted by recognizing that, e.g., 95% of simulations are below the 95th percentile line (and 5% are above), based on the CTF size in each simulation. Similarly, 5% of simulations are below the 5th percentile line (and 95% are above), and so on. The median is the 50th percentile and thus represents a "halfway" point. It is similar to, but not the same as, the mean.

Generally, as time progresses, the value of FSM's CTF becomes more uncertain, as shown by a widening gap between all the percentile lines in Figure 15. This is a normal phenomenon for an investment portfolio. There is also an obvious break after 2023 when drawdowns from FSM's CTF commence and the distribution of possible outcomes starts to widen more quickly.

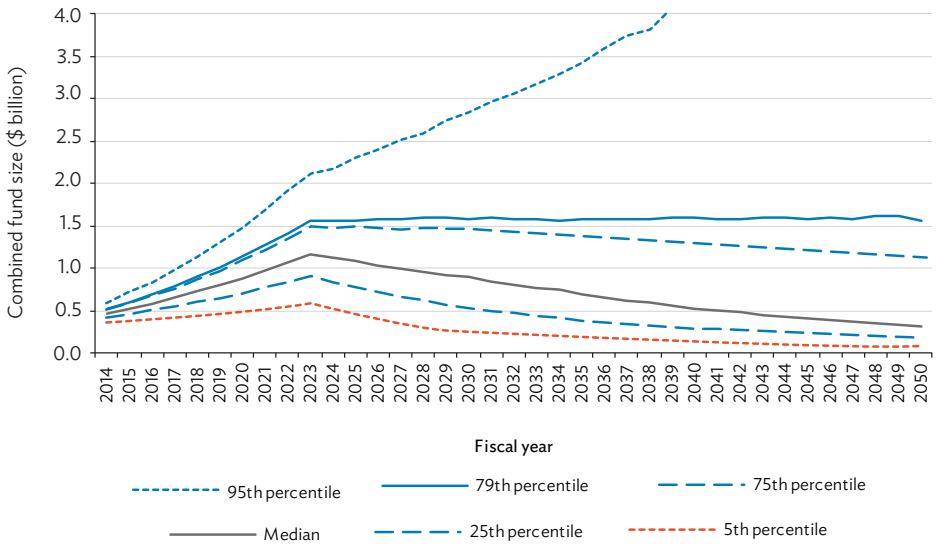
[10] Graduate School USA. 2013. *Federated States of Micronesia Fiscal Year 2012 Economic Review.* http://www.pitiviti.org/news/wp-content/uploads/downloads/2014/02/FSM_EconReview_FY12.pdf

**Figure 14: Probability Distribution of Federated States of Micronesia's Compact Trust Fund Size, FY2023**




FY = fiscal year.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

**Figure 15: Size of the Federated States of Micronesia's Compact Trust Fund**




Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

One insight from Figure 15 is that, since drawdowns have a fixed target in terms of real dollars, there is a bifurcation of outcomes. That is, if the value of FSM's CTF is past a certain threshold point by the time drawdowns start, then its real value is more likely to grow, or at least be maintained. If the CTF value is below the threshold, then its real value is more likely to diminish. Given that the line showing the 79th percentile is roughly flat after 2023, this seems to broadly represent the threshold level.

## Typical Patterns of Allowable Drawdowns

Before examining summary information of drawdowns across all simulations, it is worth inspecting individual simulations to understand how the size and drawdowns of FSM's CTF could progress over time. Figure 16 presents a stylized representation of this. It is a handpicked simulation generated by the model, chosen as showing a "typical" drawdown pattern. It should therefore be considered only as a stylized illustration, rather than as being objectively representative of all simulations generated by the model.

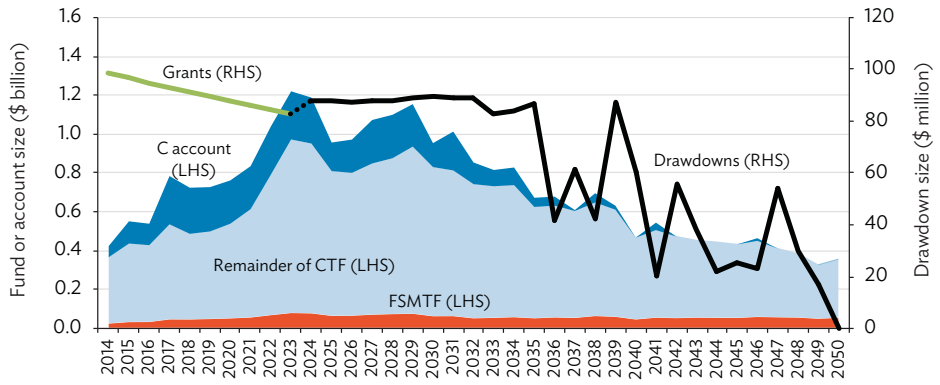
A key point from this stylized diagram is that, under FSM's CTF account structure and associated rules, the drawdown schedule can typically be expected to be highly unpredictable. In Figure 16, after an initial period from 2024 to 2035, during which the C account is run down to a low level, the drawdowns vary significantly from year to year, in one instance reducing from one year to the next by $45 million or 9% of projected GDP. This includes the revenue contribution of the FSMTF. This magnitude of variation in government revenue could cause significant problems for FSM's economy, especially when fiscal multiplier effects are considered.

Figure 16 also illustrates that the account structure and rules currently in place often lead to imprudently high levels of drawdowns in the first few years after 2023.

## Drawdowns–Summary Statistics

Figure 16 gives an idea of what might be experienced in a typical scenario, but does not represent a comprehensive consideration of possible outcomes, as it does not consider the full set of simulations generated. The results and discussion below broaden the study by moving away from individual representative simulations to a more general characterization of drawdowns and their volatility, as well as overall CTF sustainability.

**Figure 16: Federated States of Micronesia's Compact Trust Fund–Stylized Fund and Drawdown Pattern, Current Rules** (in 2023 dollars)




CTF = Compact Trust Fund, LHS = left-hand side, RHS = right-hand side.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

The main measures used are the following:

- Analyzing drawdowns, including:
  i. **Average yearly drawdown**, i.e., the average drawdown per year from 2024 to 2050, inclusive. Higher is better.
  ii. **Drawdown volatility**, i.e., the number of years in 20 where drawdowns fall by more than 3%, 5%, or 10% of GDP. This shows the expected frequency of funding shocks of these magnitudes. Lower is better. Additional modeling results illustrating the volatility of drawdowns are in Appendix 6.

- Measuring **CTF sustainability**, through estimating the chance that the CTF maintains its real 2023 value up to 2050, i.e., the probability that the CTF is at least as large in 2050 as it is in 2023 in real terms. Higher is better.
- Measuring the severity of any **fiscal adjustment** in 2024, through estimating the average reduction in funding from 2023 to 2024, i.e., the difference between the 2023 dollar value of grants in 2023 and the trust fund drawdown in 2024, if the latter is less than the former. Lower is better.

Table 10: Modeling of the Federated States of Micronesia's Compact Trust Fund's Current Drawdown Rules

| | Average yearly drawdown over the projection period[a] | | Drawdown Volatility - number of years in 20 where drawdowns fall by more than: | | | CTF Sustainability - Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment - Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| Item | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| Current structure | 60.5 | 12.5 | 3.7 | 2.6 | 0.3 | 22 | N | |

CTF = Compact Trust Fund, GDP = gross domestic product, N = none (reduction may occur later).

Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

It is clear from the information in Table 10 that the current structure with a drawdown target of $83 million in 2023 dollars is not sustainable. There is only a 22% chance that under the current regime FSM's CTF will maintain whatever value it attains by 2023. This roughly corresponds to the 79th percentile figure in Figure 15.

The volatility of drawdowns under this regime, depicted previously in the graph of a "typical" drawdown schedule, is also apparent in Table 10. Specifically, these results indicate that drawdown reductions of 5% of GDP are quite common, and reductions of more than 10% of GDP are to be expected, most likely in the scenarios of poorer investment returns.

Drawing down too much too early is the cause of many of these problems. As depicted in Figure 17 (also evident in Figure 16), if FSM's CTF follows the existing rules allowing the drawdown of the full $83 million without regard to the fund size, this will, on average, lead to a deterioration in the amounts available for drawdown. Note that the line in Figure 17 is only smooth because it shows an average across 10,000 simulations, and thus is not representative of likely volatility of drawdowns. Figure 16 better captures the drawdown volatility that the FSM is likely to experience.

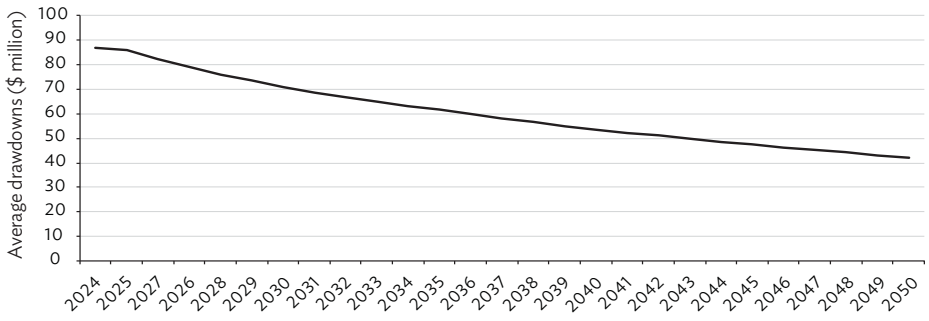
## Alternative Drawdown Rules

Given that there are problems caused by the account structure and associated drawdown rules, some alternative drawdown rules have been examined according to the same metrics. The first two alternatives to be examined are:

- **Alternative 1.** This alternative assumes that the existing A, B, and C account structure and set of rules are used, but with the target yearly drawdown amount (currently expected to be $83 million in 2023 dollars) reduced by
  i. 15%, i.e., a target of $70 million;
  ii. 30%, i.e., a target of $58 million; and
  iii. 50%, i.e., a target of $40 million.

- **Alternative 2.** To serve as a baseline comparator for the account structure and drawdown rules currently in place, Alternative 2 consists of an exceedingly simple rule of drawing down a fixed percentage of FSM's CTF every year. Since the long-term real annualized after-expenses return of the CTF is modeled to be approximately 4.5% per year, the following fixed-percentage drawdown rates have been modeled:
  i. 3.5%,
  ii. 4.0%, and
  iii. 4.5%.
  The results for Alternatives 1 and 2 are set out in Table 11.

**Figure 17: Average Drawdowns on the Federated State of Micronesia's Compact Trust Fund Over Time, Current Drawdown Rules** (in 2023 dollars)




Note: Due to the drawdowns from the FSM Trust Fund (FSMTF), the total expected drawdowns under the current structure in the first year exceed the $83 million Compact Trust Fund (CTF) target. To model the FSMTF consistently between different alternatives, drawdowns from the FSMTF are modeled as independent of CTF drawdowns.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Table 11: Modeling of the Federated States of Micronesia's Compact Trust Fund Drawdown Rules, Alternatives 1 and 2

| Item | Average yearly drawdown over the projection period[a] | | Drawdown Volatility - number of years in 20 where drawdowns fall by more than: | | | CTF Sustainability - Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment - Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| ***Current structure:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of $83m* | | | | | | | | |
| $83 million | 60.5 | 12.5 | 3.7 | 2.6 | 0.3 | 22 | N | |
| ***Alternative I:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of:* | | | | | | | | |
| $41 million | 41.8 | 8.5 | 0.6 | 0.0 | 0.0 | 54 | 36.3 | 8.0 |
| $58 million | 51.8 | 10.6 | 1.7 | 0.9 | 0.0 | 38 | 20.0 | 4.4 |
| $70 million | 56.9 | 11.7 | 2.7 | 1.7 | 0.1 | 29 | 7.8 | 1.7 |
| ***Alternative II:*** *Simplified structure, fixed % of CTF drawn down each year* | | | | | | | | |
| 3.5% | 59.0 | 12.0 | 1.1 | 0.4 | 0.1 | 63 | 36.3 | 8.0 |
| 4.0% | 62.4 | 12.7 | 1.3 | 0.4 | 0.1 | 57 | 30.5 | 6.7 |
| 4.5% | 65.1 | 13.2 | 1.4 | 0.5 | 0.1 | 50 | 24.7 | 5.4 |

CTF = Compact Trust Fund, GDP = gross domestic product, N = none (reduction may occur later).

Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

From Table 11, it is evident that reducing the real drawdown target, as per Alternative 1, has the expected effects. These effects include less significant drawdown volatility and shocks, higher likelihood of CTF sustainability, but also lower overall expected drawdowns. Regarding sustainability, only the $41 million drawdown strategy is expected to produce more than an even chance of the FSM's CTF growing rather than shrinking. However, this strategy only achieves this at the cost of significantly lower drawdowns, both initially and on average. In addition, it should be noted that in the absence of any guidance regarding a long-term sustainable level of drawdowns, the Alternative 1 scenarios are potentially optimistic. Specifically, when faced with the choice between a large sudden fiscal adjustment and drawing down the maximum allowable amount, it is quite plausible that significant pressure will exist to do the latter.

In any case, the litmus test of any complex structure such as that of FSM's CTF accounts and associated drawdown rules is whether it offers advantages over an exceedingly simple structure. The above measurements for Alternative 2 suggest that this is most likely not the case. The fixed-rate strategies of Alternative 2 perform better than almost all the drawdown target strategies on both the sustainability and average drawdown measures. They also produce improvements in drawdown volatility when compared with the current structure and the $58 million and $70 million Alternative 1 structures. They may appear to have a disadvantage relative to the current structure because they are likely to result in a reduction in overall Compact funding in 2024. However, this is somewhat deceptive, because the current

structure usually would only delay this reduction in revenue, not avoid it. In the author's view, this is actually an advantage of the Alternative 2 strategies relative to the current structure, as explained under *Potential Fiscal Cliff for the Federated States of Micronesia* later in this chapter..

It is curious that simple rule changes as per the Alternative 2 strategies can lead to such significant improvements. Reasons for this can be understood intuitively by considering the most important unintended consequences of the FSM's CTF account structure:

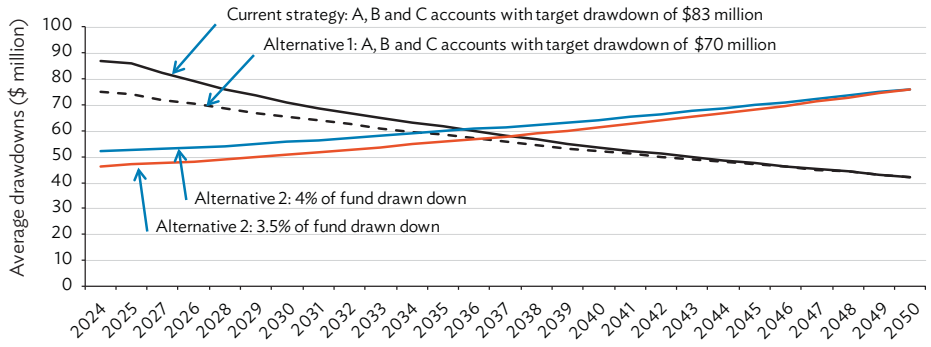
- **Drawdowns are not sensitive to CTF size.** Under the current structure and associated drawdown rules, drawdowns are not sensitive to the overall size of FSM's CTF, but only to recent investment returns. For example, depending on circumstances, the target drawdown of $83 million may become very large relative to the CTF's size, in which case the real value of the CTF would be eroded over time. In a smaller number of scenarios, the $83 million could become very small relative to the CTF size, in which case the CTF would not be providing as much benefit to the FSM as it could.
- **Too much is drawn down too early.** A related point, mentioned earlier but worth reemphasizing, is that the use of the C account to supplement transfers to the budget can lead to imprudently drawing down too much early on. This is relevant for those simulations in which the CTF size cannot support the particular level of fixed-dollar drawdowns adopted. This often results in a reduced CTF size and reduced drawdowns in later projection years (Figure 16).
- **Attempts to protect the A account do not (and cannot) work.** It is important to note that, although the value of the A account is intended to be protected under the existing structure, it is not the case, because the A account is ultimately still exposed to negative investment returns when they occur. That is, even though the A account will not be drawn upon when investment returns are negative, the combination of fluctuating returns and drawdowns over multiple years may easily result in a diminished A account, in both real and nominal terms. More generally, with a growth-oriented investment portfolio strategy it is unreasonable to expect to be able to protect an investment fund against losing value; the nature of investment risk is such that if an investor desires a higher long-term expected return, he/she must accept the possibility of loss. It is not possible to circumvent this fundamental dynamic with a complicated set of drawdown rules.

Although the fixed-percentage strategies offer substantial improvements based on the above measures, they do produce a markedly different pattern of drawdowns. Figure 18 updates Figure 17 by showing the average drawdown over time for the new strategies.

A key issue is whether FSM's CTF drawdowns can replace US Compact grants, which are projected to be approximately $83 million in 2023. Figure 18 shows that, on average, the drawdown rules based on the current A, B, and C account structure can be expected to produce drawdowns that start close to the 2023 Compact grant amount but decrease over time due to the diminishing real value of FSM's CTF under this structure. Conversely, the drawdown rules based on fixed-percentage drawdowns can be expected to produce drawdowns that start at a lower, more sustainable level and increase over time.

Figure 18 reflects the points made above in relation to the reduction in revenue. Although such a reduction is likely to occur in 2024 for the Alternative 2 strategies, the declining black line in Figure 18 reflects the fact that the reduction is still likely to happen under the current structure. In particular, the smoothness of the black line above (which represents an average) belies the unpredictability of drawdowns the FSM may experience,

**Figure 18: Average Drawdowns Over Time on the Federated States of Micronesia's Compact Trust Fund** (in 2023 dollars)




Note: Due to the drawdowns from the FSM Trust Fund (FSMTF), the total expected drawdowns under the current structure in the first year exceed the $83 million Compact Trust Fund (CTF) target. To model the FSMTF consistently between different alternatives, drawdowns from the FSMTF are modeled as independent of CTF drawdowns.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

as per Figure 16. Thus, it is not clear that delaying the reduction by maintaining the current structure is a good choice. This issue is explored in more detail under *Potential Fiscal Cliff for the Federated States of Micronesia* later in this chapter.

Taking a step back, it appears that the A, B, and C account structure has been designed to try to reliably replace Compact grants while protecting the value of the A account. However, the modeling and analysis reveal some unexpected and unintended consequences.

In Table 12, the same modeling results are provided for two additional types of drawdown strategies, to discover a set of rules that further improve the contribution of FSM's CTF to the budgetary objectives of the FSM. The drawdown strategies are as follows:

- **Alternative 3.** The fixed-percentage drawdowns of Alternative 2 achieve greater sustainability by making drawdowns sensitive to the size of FSM's CTF. However, there is still scope for reducing the volatility of drawdowns. Alternative 3 attempts to realize such improvements. It is the same as Alternative 2 except that, instead of drawdowns being calculated as a fixed percentage of the current CTF size, they are calculated as a fixed percentage of the average size over the last 3 years. This is designed to lead to a smoother drawdown progression, since the averaging allows some of the volatility of the size of FSM's CTF to cancel itself out.
- **Alternative 4.** Alternatives 2 and 3 discard the A, B, and C account structure. Alternative 4 keeps the existing structure but builds on it by making it more similar to Alternative 3. Specifically,
  i. the drawdown target is changed from being a fixed real dollar amount to being a fixed percentage of the average of FSM's CTF value over the last 3 years; and
  ii. the maximum size of account C is capped at three times the target drawdown amount, instead of being capped at three times the 2023 US Compact grant amount (the previous target drawdown amount).

Table 12: Modeling of the Federated States of Micronesia's Compact Trust Fund Drawdown Rules, Alternatives 3 and 4

| Item | Average yearly drawdown over the projection period[a] | | Drawdown Volatility - number of years in 20 where drawdowns fall by more than: | | | CTF Sustainability - Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment - Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| ***Alternative III:*** *Drawdown defined as % of average CTF size over the last 3 years* | | | | | | | | |
| 3.5% | 57.7 | 11.7 | 0.3 | 0.1 | 0.0 | 64 | 40.8 | 9.0 |
| 4.0% | 61.4 | 12.4 | 0.3 | 0.1 | 0.0 | 58 | 35.6 | 7.8 |
| 4.5% | 64.3 | 13.1 | 0.4 | 0.1 | 0.0 | 52 | 30.4 | 6.7 |
| ***Alternative IV:*** *Same as current structure but with target drawdown defined as % of average CTF size over the last 3 years* | | | | | | | | |
| 3.5% | 57.2 | 11.6 | 0.7 | 0.4 | 0.1 | 66 | 40.9 | 9.0 |
| 4.0% | 60.8 | 12.3 | 0.9 | 0.4 | 0.1 | 60 | 35.7 | 7.8 |
| 4.5% | 63.8 | 12.9 | 1.0 | 0.5 | 0.1 | 54 | 30.5 | 6.7 |
| Previous results, for comparison: | | | | | | | | |
| ***Current structure:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of $83m* | | | | | | | | |
| $83 million | 60.5 | 12.5 | 3.7 | 2.6 | 0.3 | 22 | N | |
| ***Alternative I:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of:* | | | | | | | | |
| $41 million | 41.8 | 8.5 | 0.6 | 0.0 | 0.0 | 54 | 36.3 | 8.0 |
| $58 million | 51.8 | 10.6 | 1.7 | 0.9 | 0.0 | 38 | 20.0 | 4.4 |
| $70 million | 56.9 | 11.7 | 2.6 | 1.7 | 0.1 | 29 | 7.8 | 1.7 |
| ***Alternative II:*** *Simplified structure, fixed % of CTF drawn down each year* | | | | | | | | |
| 3.5% | 59.0 | 12.0 | 1.1 | 0.4 | 0.1 | 63 | 36.3 | 8.0 |
| 4.0% | 62.4 | 12.7 | 1.3 | 0.4 | 0.1 | 57 | 30.5 | 6.7 |
| 4.5% | 65.1 | 13.2 | 1.4 | 0.5 | 0.1 | 50 | 24.7 | 5.4 |

CTF = Compact Trust Fund, GDP = gross domestic product, N = none (reduction may occur later).

Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

The modeling results for Alternatives 3 and 4 are presented in Table 12. The enhancement of Alternative 2 embodied in Alternative 3, i.e., using a 3-year average CTF size instead of only the current size, has the intended effect of reducing drawdown volatility. For example, for a 4% target drawdown, a year-on-year reduction in drawdown amount of more than 3% of GDP would only be expected to occur once every 60 years, rather than once every 16 years. More severe shocks are also much less likely. Alternative 3 also leads to marginally higher sustainability and marginally lower average drawdowns than Alternative 2, as well as increasing the expected size of the fiscal adjustment.

The similarity between Alternatives 3 and 4 based on these measures is quite strong, as they are both based on drawing down a fixed percentage of the 3-year average size of FSM's CTF. The differences arise because of those years in which, under Alternative 4, account C becomes low or depleted and investment returns are insufficient to provide for the targeted drawdown, resulting in a cut in drawdowns. At the aggregate level, these cuts lead to slightly improved sustainability, slightly reduced average drawdowns, and a material increase in drawdown volatility. Alternative 4 relinquishes part of the gains made by moving to Alternative 3. In particular, while Alternative 3 exhibited very low volatility of drawdowns, Alternative 4 by comparison still has about half the volatility of drawdowns of the current structure, based on the measurements shown in Table 12. In any case, reduced drawdowns due to low levels of account C occur much less frequently under Alternative 4 than under the current structure.

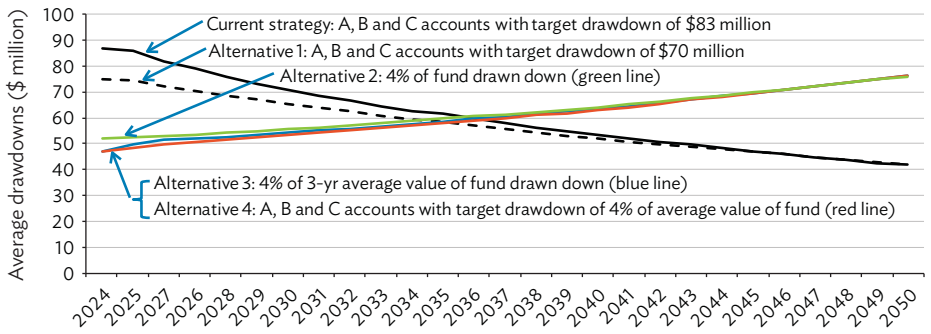
The progression of the average drawdowns over time under Alternatives 3 and 4 are similar to that under Alternative 2, which as noted previously is quite different to the progression under Alternative 1 and the current structure. This is depicted in Figure 19, which updates Figure 18 with extra lines depicting Alternatives 3 and 4. It shows that, under these two new strategies, drawdowns increase over time, similarly to the simplified fixed-percentage strategy previously analyzed. Thus, the discussion under *Potential Fiscal Cliff for the Federated States of Micronesia* later in this section regarding the timing of the fiscal cliff faced by the FSM is also relevant to these two strategies.

## Choosing a Fixed Drawdown Percentage

The fixed drawdown percentages for which modeling results are shown above were devised with reference to the expected long-run annualized real return of FSM's CTF portfolio, of 4.5% net of fees as set out in Table 5. It makes sense that, to achieve sustainability, the percentage drawdown should not exceed this return figure. Appendix 4 contains some notes relating to how this figure is determined.

Choosing an appropriate drawdown percentage involves considering the trade-off between the amount of the drawdowns and the sustainability of the CTF. For example, although the 4.5% drawdown provides higher expected drawdowns over the next few decades, its likelihood of sustainability under Alternative 4 is only 54%, as compared with the more comfortable 60% figure when drawing only 4% of FSM's CTF each year. Thus, in choosing a drawdown percentage, the FSM will face a trade-off between additional income in the medium term and increased likelihood of sustainability.

**Figure 19: Average Drawdowns Over Time on the Federated States of Micronesia's Compact Trust Fund** (in 2023 dollars)



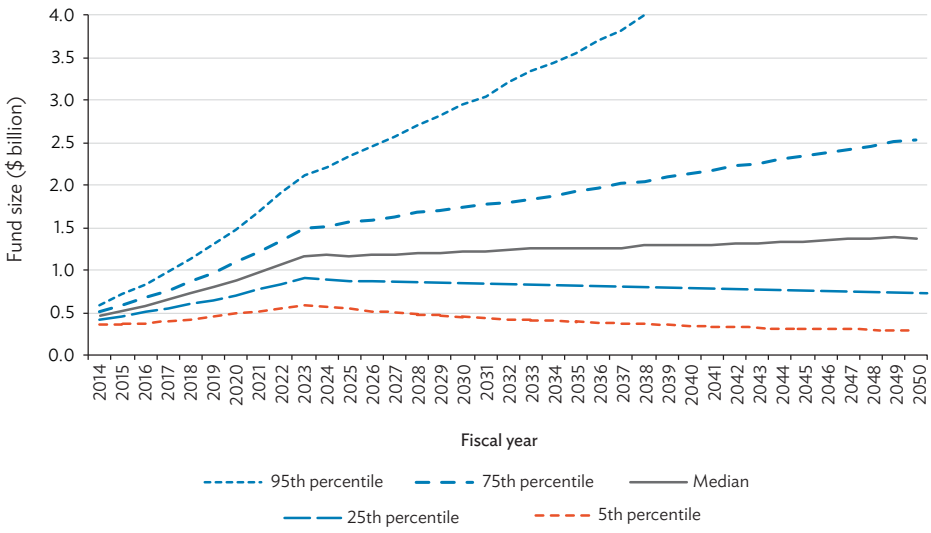

Note: Due to the drawdowns from the FSM Trust Fund (FSMTF), the total expected drawdowns under the current structure in the first year exceed the $83 million Compact Trust Fund (CTF) target. To model the FSMTF consistently between different alternatives, drawdowns from the FSMTF are modeled as independent of CTF drawdowns.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

## Conclusions

The modeling results in Table 12 show that under Alternative 4 a 4% drawdown may strike an appropriate balance for FSM's CTF. This would produce the CTF size progression in Figure 20, and the "typical" drawdown progression in Figure 21, which uses the same investment returns as in Figure 16. The increased sustainability of FSM's CTF is evident in Figure 20, which shows an increasing median CTF size over time. Similarly, the increased predictability

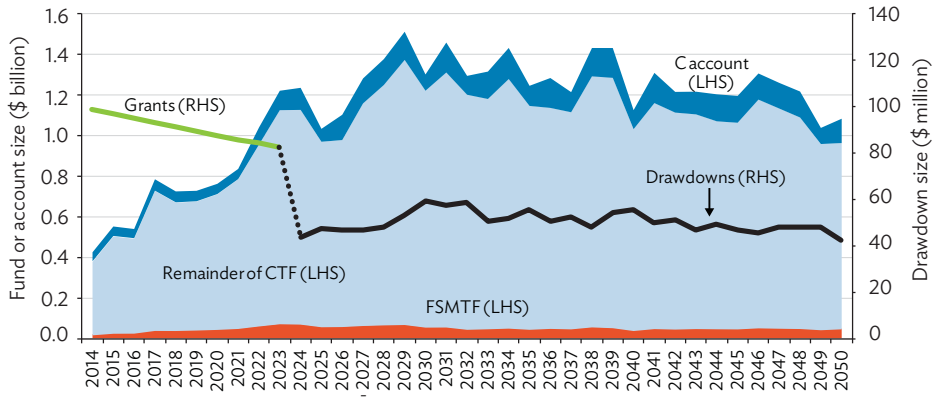
**Figure 20: Federated States of Micronesia's Compact Trust Fund Size, Alternative 4** (in 2023 prices)




Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

of drawdowns is evident in Figure 21. In addition, under the current structure, the amount of the drawdown in a particular year is often strongly influenced by the investment return during the previous year, meaning that there may often be only a few months' warning of any changes to the drawdown amount. By contrast, under the fixed-percentage strategies, the drawdown amounts will be approximately known years in advance, since they are based on the fund size rather than recent investment returns.

**Figure 21: Federated States of Micronesia's Compact Trust Fund–Stylized Fund and Drawdown Pattern, Alternative 4*** (in 2023 dollars)

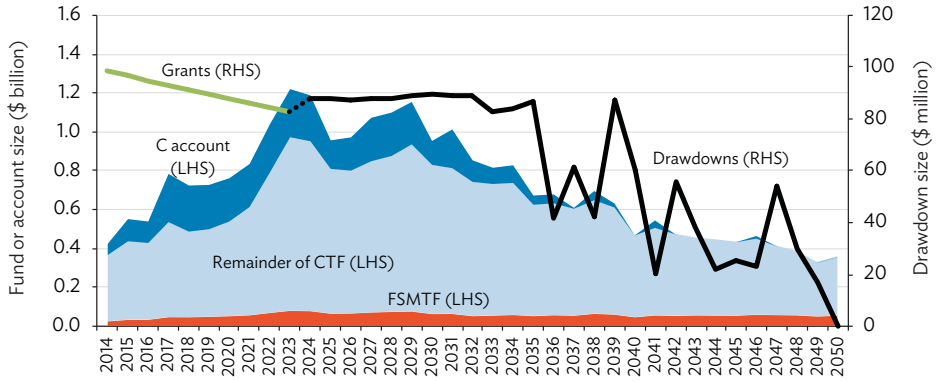



CTF = Compact Trust Fund, LHS = left-hand side, RHS = right-hand side.

* Strategy of drawing down 4% of 3-yr average value of Compact Trust Fund each year.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

**Figure 16 (repeated for comparison purposes): Federated States of Micronesia Compact Trust Fund–Stylized Fund and Drawdown Pattern, Current Rules** (in 2023 dollars)




CTF = Compact Trust Fund, LHS = left-hand side, RHS = right-hand side.

Note: Figures 21 and 16 depict the outcomes from an individual simulation, and thus should be considered only as stylized illustrations, rather than as representative of all simulations generated by the model.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

## Potential Fiscal Cliff for the Federated States of Micronesia

Given the significant size of the grants relative to FSM's GDP, a key issue for the FSM is the potential for the overall amount of Compact funding to change as a result of the switch from Compact grants in 2023 to CTF drawdowns in 2024.

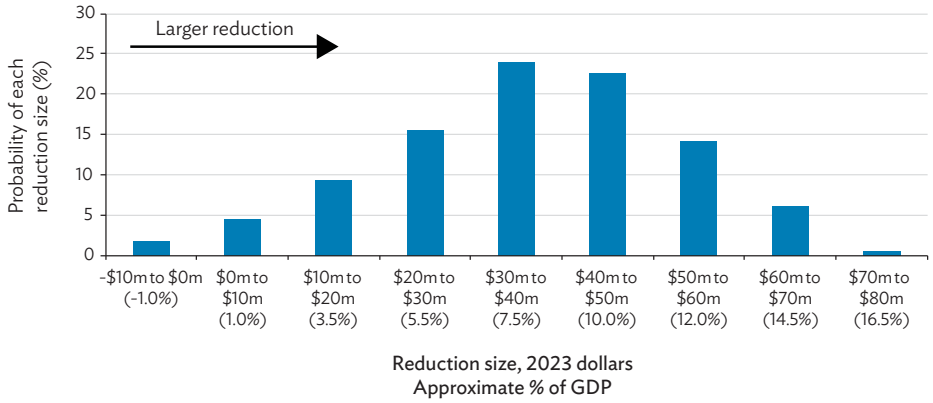
As previously shown in Figures 18 and 19, Alternatives 2, 3, and 4 entail on average some reduction in funding between 2023 and 2024. This is also set out in Table 12. However, the amount of the reduction is highly uncertain at this stage. Figure 22 sets out the possible range of the inflation-adjusted difference between the CTF drawdown in 2024 and the 2023 Compact grant, based on the model.

Although the average reduction in Compact funding from 2023 to 2024 under Alternative 4 is 10% of GDP (Table 12), there is significant variation of this amount between simulations as shown in Figure 22. In the extreme, the reduction could be as much as 10%–15% of GDP. However, it should be noted that this uncertainty exists because the CTF investment returns between 2014 and 2023 are unknown at this stage. As 2024 approaches, the amount of the first drawdown from the CTF under the fixed-percentage structures will become clearer.

Based on Figure 22, the FSM is likely to experience quite a significant negative fiscal shock in 2024 under the alternative structures. By comparison, under the current structure, there will be no reduction in funding from 2023 to 2024. However, in the likely event that the CTF is too small to comfortably support the $83 million drawdowns after 2023 under the current structure, this would be expected to reduce the real size of the CTF and C account, eventually forcing drawdowns to be reduced. This is when, under the current structure, the FSM would experience a fiscal cliff, and in the stylized example in Figure 16, this occurs from 2036. Further, as explained in the previous section of this chapter, under the current structure there may only be a few months' warning of this event, which could add to difficulties in expenditure planning.

Therefore, in contrast to the alternative fixed-percentage strategies, any fiscal cliff under the current structure, while delayed, would be expected to be (i) uncertain in timing and amount, and (ii) associated with an unsustainable drawdown pattern that results in a diminished real CTF size. In other words, the FSM can delay its fiscal cliff, but it will do so by borrowing against its future, and with no way of knowing when its CTF funding will suddenly dry up. This uncertainty is important as it might cause difficulties in planning public expenditure.

Figure 22: Federated States of Micronesia–Prior Uncertainty of 2024 Reduction in Overall Compact Funding[a]




CTF = Compact Trust Fund, LHS = left-hand side, RHS = right-hand side.

[a] Strategy of drawing down 4% of 3-yr average value of Compact Trust Fund each year. (Alternative 4)

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

# VI. Summary of Conclusions

## General Comments

In the context of the Compact Trust Funds (CTFs) of the Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM), the benefits of stochastic Monte Carlo modeling arise due to the fact that it is not feasible to qualitatively consider every possible path that investment returns may take, and the implications of each path for drawdowns under the current structure. Using a simulation model thus enables a more comprehensive and objective analysis.

Thus, the design of the A, B, and C account structures and associated rules has consequences for the sustainability of the CTFs of the RMI and the FSM. In particular, drawdowns are not sensitive to CTF size under this structure, which could cause the RMI or the FSM to draw down too much too early. This would effectively lead to the RMI and the FSM borrowing against the livelihoods of their future generations.

However, in addition to sustainability, volatility of drawdowns is also a concern under the current structure. There are insufficient measures taken within the current A, B, and C account structures to ensure the stability of drawdown amounts. Specifically, in the event where the C account becomes low or depleted, drawdowns can suddenly drop substantially, with little warning. This volatility of drawdowns is reflected by the summary measures presented in Table 9 for the RMI and Table 12 for the FSM.

The modeling results suggest simple changes to the CTF account structures of the RMI and the FSM and the associated drawdown rules, which would go a long way toward mitigating these risks. These changes can be summarized as follows:

- To achieve a better likelihood of sustainability, define the annual drawdown limit as a fixed percentage of the CTF size, rather than as a fixed (real) dollar amount. This change would also need to flow through to the C account cap.
- To mitigate drawdown volatility, apply this percentage to a 3-year moving average of the CTF size, instead of only the current CTF size.

By far the most important aspect of the above changes is that drawdowns are defined as a percentage of the fund size (or a proxy thereof), rather than as a fixed dollar amount, thus achieving acute sensitivity of drawdowns to the fund size. This is the key to gaining transparent control over CTF sustainability.

It is noteworthy that discarding the A, B, and C account structure completely, and simply applying the above two principles directly to the full balance of the CTF each year, would help to mitigate drawdown volatility further.

Changes to the CTFs' drawdown policy along the lines discussed would require changes to their TFAs.

## Conclusions for the Marshall Islands' Compact Trust Fund

In light of the alternative structures presented, the RMI faces a strong impetus to change the drawdown rules of its CTF. Not only is the current likelihood of sustainability low at 49% (Table 13), but there are gains in drawdown volatility that can be achieved by moving to an alternative structure along the lines of the principles discussed under "General Comments" in this chapter. Further, these benefits can be realized while simultaneously increasing the average drawdown amount during 2023–2050. These changes will on average result in smaller drawdowns in the initial few years post 2023, but this should be reasonably manageable. For further discussion of this point, see *Dealing with a Fiscal Cliff* later in this section.

One possibility would be for the RMI's CTF to adopt Alternative 4 with a 3.5% target drawdown, given the current investment portfolio strategy of RMI's CTF. However, if the RMI's CTF's governing body has enough flexibility, Alternative 3 could be adopted, which would lead to additional improvements to drawdown volatility as explained in Chapter 4, *Additional Alternative Strategies*. The choice of drawdown percentage is a subjective judgment, based on considering the trade-off between the expected size of drawdowns and the sustainability of RMI's CTF, as set out in Table 9 and discussed in Chapter 4, *Choosing a Fixed Drawdown Percentage*. It should be noted that the appropriate drawdown percentage is assumption-sensitive, as per Appendix 3. Appendix 4 discusses how the choice of drawdown percentage could be refined by using a more sophisticated set of investment return assumptions, for example with the assistance of RMI's CTF investment consultant.

## Conclusions for the Federated States of Micronesia's Compact Trust Fund

FSM's CTF is unlikely to be able to maintain its real size under the current set of drawdown rules. Based on the modeling results presented in this report, there is only a 22% likelihood of sustainability. Furthermore, given the potential extent of volatility of drawdowns under the current structure, the FSM faces the risk of large fiscal shocks in the likely event of the C account running low or becoming depleted. For example, at some point before 2050, there is a material chance under the current structure that drawdowns from FSM's CTF will decrease by more than 10% of gross domestic product (GDP) in the space of a year, and with little warning.

The FSM's CTF can bring its expected sustainability and drawdown volatility to reasonable levels by adopting an alternative structure along the lines of the principles discussed under "General Comments" in this chapter. However, regardless of the rules adopted, the FSM will most likely face a fiscal cliff because the size of its CTF is likely to be insufficient to replace US Compact grants. In this scenario, if the principles outlined in *General Comments* are adopted, the FSM will face this sharp drop in funding in 2024. However, if in this scenario the FSM follows the existing CTF drawdown rules, it will face the drop in funding at some unknown point after 2024, by which time the size of its CTF will be substantially diminished. The fact that, under the current structure, the timing of the fiscal

cliff is uncertain and its occurrence will only be predictable a few months in advance, adds to its potential damage.

One possibility would be for the FSM's CTF to adopt Alternative 4 with a 4% (target) drawdown, given the current investment portfolio strategy of FSM's CTF. However, if the FSM's CTF's governing body has enough flexibility, Alternative 3 could be adopted, which would lead to additional improvements to drawdown volatility as explained in Chapter 5, *Additional Alternative Strategies*. The choice to use 4% as the drawdown percentage is a subjective judgment, based on considering the trade-off between the expected size of drawdowns and the sustainability of the FSM's CTF set out in Table 12; and discussed in Chapter 5, *Choosing a Fixed Drawdown Percentage*. It should be noted that the appropriate drawdown percentage is assumption-sensitive, as per Appendix 3. Appendix 4 discusses how the choice of drawdown percentage could be refined by using a more sophisticated set of investment return assumptions, for example with the assistance of FSM's CTF investment consultant.

## Dealing with a Possible Fiscal Cliff

The alternative, percentage-based strategies for both the RMI and the FSM entail a reduction in overall Compact funding when these countries move from grants in 2023 to CTF drawdowns in 2024. On the surface, this may appear to be a disadvantage of the alternative structures compared with the current structure. However, under the current structure, in the event that either CTF is too small to comfortably support the fixed-dollar target drawdowns after 2023, this will further reduce the real size of the CTF in question, eventually leading to the depletion of the C account. After this point, drawdowns will become volatile and may reduce to zero in some years.

Therefore, in contrast to the alternative fixed-percentage strategies, any fiscal cliff under the current strategy, while delayed, is also (i) uncertain in timing and amount, and (ii) associated with an unsustainable drawdown pattern that results in a diminished real CTF size.

In RMI's case, the fiscal adjustment likely to be required under the alternative structure is quite manageable in terms of size. Therefore, the benefits of changing to an alternative structure, in terms of safeguarding the interests of future generations and government funding predictability, are quite significant compared with the fiscal adjustment that may be brought forward.

In FSM's case, the fiscal adjustment under the alternative percentage-based structures considered is likely to be larger than for the RMI, and thus the flow-on effects within the FSM economy are likely to be more severe. As explained above, this scenario is still better than that which is likely to be experienced under the current structure. However, due to the likely negative shock to the economy in 2024, the FSM will need to prepare for this, e.g., by cutting expenditure, rather than simply hoping for favorable investment returns. If fiscal reform is to be enacted, a smoother adjustment could be achieved by commencing these adjustments well in advance of 2024.

Another adaptation strategy for the FSM, which also applies to the RMI to an extent, would be to seek additional contributions to the CTF. However, these contributions are unlikely to be large enough to remove the possibility of a fiscal cliff. For example, under Alternative 4, to reduce FSM's expected fiscal adjustment figure (Table 13) from $35.7 million to $0 through a single one-off contribution, the contribution would need to

Table 13: Modeling Results for the Current and Alternative Drawdown Strategies

| Item | Average Yearly Drawdown over the Projection Period[a] | | Drawdown volatility - number of years in 20 where drawdowns fall by more than: | | | CTF sustainability Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment – Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| *Current structure* | | | | | | | | |
| RMI | 26.1 | 7.8 | 1.2 | 0.2 | 0.0 | 49 | N | |
| FSM | 60.5 | 12.5 | 3.7 | 2.6 | 0.3 | 22 | N | |
| ***Alternative structure** (Alternative IV with drawdown percentage of 3.5% for RMI and 4% for FSM)* | | | | | | | | |
| RMI | 31.7 | 9.2 | 0.5 | 0.2 | 0.0 | 62 | 3.6 | 1.3 |
| FSM | 60.8 | 12.3 | 0.9 | 0.4 | 0.1 | 60 | 35.7 | 7.8 |

CTF = Compact Trust Fund, FSM = Federated States of Micronesia, GDP = gross domestic product, N = none (reduction may occur later), RMI = Republic of the Marshall Islands.

Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.
[b] Alternative 4 involves modifying the current structure by defining the drawdown target as a fixed percentage of the average of the CTF size over the last 3 years. It also involves redefining the account C cap to be three times the target drawdown, rather than three times the 2023 US Compact grant.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

be approximately $0.4 billion at the start of 2014 or $0.9 billion at the end of 2023.[11] In fact, the modeling results in this paper already assume that the FSM manages to save $3 million each year into the FSM Trust Fund (FSMTF), through achieving a budget surplus, and that income from the FSMTF is used to supplement CTF drawdowns after 2023.

Additional contributions are likely to improve both the sustainability and volatility of drawdowns. However, even with additional contributions, further improvements would still be achievable by changing the drawdown rules as discussed. Improvements to the drawdown rules may in fact help to source additional contributions.

[11] In RMI's case, the one-off contribution needed to reduce the Alternative 4 expected fiscal adjustment figure (in Table 13) from $3.6 million to $0 would be approximately $50 million at the start of 2014 or $100 million at the end of 2023. Modeling results in this paper assume contributions of $1 million annually until 2023 into RMI's account D, and that income from account D is used to supplement CTF drawdowns after 2023.

# Appendix 1
# Modeling Assumptions

## Investment Return Modeling Assumptions

Table A1.1: Asset Class Assumptions – Expected Return and Standard Deviation of Returns (%)

| Item | Expected Return* | Standard Deviation* |
|---|---|---|
| World equities | 10.3 | 18.3 |
| US fixed income | 6.0 | 8.6 |
| US private equity | 13.7 | 27.1 |
| Emerging market debt | 7.1 | 10.3 |
| US convertible bonds | 7.1 | 10.3 |
| US private real estate | 7.1 | 9.7 |
| Global hedge funds | 7.1 | 9.3 |
| FSM inflation (GDP deflator) | 2.6 | 1.8 |
| RMI inflation (GDP deflator) | 3.0 | 2.0 |

FSM= Federated States of Micronesia, GDP = gross domestic product, RMI = Republic of the Marshall Islands, US = United States.

* Per year.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Table A1.2: Asset Class Assumptions–Correlation of Returns Across All Projection Years

| Item | World Equities | US Fixed Income | US Private Equity | Emerging Market Debt | US Convertible Bonds | US Private Real Estate | Global Hedge Funds |
|---|---|---|---|---|---|---|---|
| World equities | 1.00 | 0.14 | 1.00 | 0.80 | 0.80 | 0.98 | 0.99 |
| US fixed income | 0.14 | 1.00 | 0.13 | 0.61 | 0.61 | 0.21 | 0.16 |
| US private equity | 1.00 | 0.13 | 1.00 | 0.80 | 0.80 | 0.98 | 0.98 |
| Emerging market debt | 0.80 | 0.61 | 0.80 | 1.00 | 1.00 | 0.86 | 0.81 |
| US convertible bonds | 0.80 | 0.61 | 0.80 | 1.00 | 1.00 | 0.86 | 0.81 |
| US private real estate | 0.98 | 0.21 | 0.98 | 0.86 | 0.86 | 1.00 | 0.99 |
| Global hedge funds | 0.99 | 0.16 | 0.98 | 0.81 | 0.81 | 0.99 | 1.00 |

US = United States.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Assumptions for traditional asset classes with longer histories (equities, bonds, and cash), as well as inflation, were set primarily based on past data, and sourced from Global Financial Data, Datastream, US Federal Reserve, World Bank Databank, MSCI, and JP Morgan. Alternative asset classes' assumptions are based mainly on combinations of these more traditional asset classes. Thus, the assumptions in Tables A.1 and A.2 represent a pragmatic combination of long-term historic data and economic and financial theory. A more detailed description of the modeling methodology used is provided below.

- **World equities:** t-distribution with 4 degrees of freedom fitted to the mean and standard deviation of historical annual returns going back to 1926.
- **United States (US) cash yield:** Changes modeled as an autoregressive process with lag 1, calibrated using historic data going back to 1926. Imposed minimum cash yield of 0% to prevent negative yields, imposed maximum cash yield of 8% to achieve symmetry, without which the distribution would become positively skew over time and the average return would increase in later projection years.
- **US Treasury term spread:** Modeled as an autoregressive process with lag 1, based on historic data for 3-month, 5-year, and 7-year US Treasuries going back to 1982.
- **Credit overlay:** Modeled based on historic credit spreads, default rates for investment-grade credit, and an assumed Sharpe ratio of 0.2 for investing in credit risk. Imposed correlation with World equities of 0.75.
- **US fixed income:** US Treasuries returns are calculated by a first-order Taylor approximation of the return of a 6-year bond based on the change in its yield, assuming that the coupon rate is the same as the yield in the previous year. The yield is calculated in each year by adding the modeled cash yield and the term spread. Fifty percent of the Credit overlay series is then added to the return on US Treasuries, reflecting an assumption that roughly 50% of this portfolio's benchmark is allocated to corporate investment–grade bonds.

- **US private equity:** Modeled as having a beta of 1.5 to World equities, designed to achieve an expected return of approximately 3% above World equities as per the Federated States of Micronesia's (FSM) Compact Trust Fund (CTF) benchmark for this asset class.
- **Emerging market debt and US convertible bonds:** Modeled collectively as 20% World equities (to help reflect credit default risk), 40% US cash, 40% US Treasuries (6-year duration), and with the Credit overlay return series added.
- **US private real estate:** Modeled as having a beta of 0.45 to World equities, along with a 25% exposure to the Credit overlay return series.
- **Global hedge funds:** Modeled as having a beta of 0.5 to World equities.
- **Republic of the Marshall Islands (RMI), Federated States of Micronesia (FSM) inflation:** Modeled as normal distributions with means and standard deviations calibrated based on historic data for the respective gross domestic product (GDP) deflators going back to 1982 for the RMI and 1987 for the FSM.
- **Correlations:** The correlations between World equities, US cash, US Treasuries, and inflation in the RMI and FSM were calibrated based on historic annual data going back 25 years and implemented using a Cholesky decomposition. The remaining asset class correlations were determined as an output of the model resulting from the above methodologies.
- **Incorporation of current market conditions:** The model for the US cash yield and term spread use recent market data to determine their starting values.

## Compact Trust Fund Modeling Assumptions Generic between the Federated States of Micronesia and the Marshall Islands

- Buy/sell spreads, as applicable to contributions and drawdowns, are ignored.
- Target asset class allocation strategies of the FSM and the RMI, set out in Parts C and D of this Appendix, are not changed over the projection period.
- At the start of each year, the CTF rebalances exactly (and costlessly) to its target asset class allocations. No other rebalancing activity is undertaken.
- Account structure is as described in Chapter 2, *Details of Account Structure and Drawdown Rules,* on page 4. All funds are invested until they are transferred to the budget.
- Any drawdowns from or contributions into the CTF in a given year are assumed to be made on 1 October.
- The rules associated with the A, B and C account structure are strictly followed.
- Within this, drawdowns are reduced when Account C, the buffer account, runs low. Specifically, it is assumed that if the C account is below half of its maximum cap level when it is needed to supplement drawdowns, then it can only be used to provide for half of the required supplement. So, under this approach, if the target drawdown this year is $83 million, investment earnings for the year are $50 million and the C account balance is $100 million (with a C account cap of $249 million), then since the C account is below half of its cap it can only be used to provide for half of the $33 million gap. So the assumed drawdown for the year will be $66.5 million.
- For "current structure" scenarios where lower maximum drawdowns are targeted, the C account cap is unaltered. More generally, these scenarios only model changes to CTF governing body behaviour, not to the rules governing drawdowns.

Table A1.3: Target Asset Class Allocation Strategy of the Marshall Islands' Compact Trust Fund (%)

| Item | Allocation |
|---|---|
| World equities | 60 |
| US fixed income | 20 |
| US private equity | 0 |
| Emerging market debt | 0 |
| US convertible bonds | 0 |
| US private real estate | 5 |
| Global hedge funds | 15 |
| Total | 100 |

US = United States.

Source: Office of Insular Affairs. 2013. *Trust Fund for the People of the Republic of the Marshall Islands. Fiscal Year 2012 Annual Report*. Washington, DC: US Department of the Interior.

## Modeling Assumptions Specific to the Marshall Islands

Information and assumptions regarding the contributions to RMI's CTF:

- US contributions are programmed to increase by $0.5 million each year, with an inflation adjustment of two-thirds the rate of increase of the US GDP deflator or 5%, whichever is smaller, and will cease in 2024.
- Contributions by Taipei,China are programmed to be $2.4 million each year.
- Thus, contributions are assumed to progress according to the following schedule, which is based on the RMI FY2012 Compact Trust Fund Annual Report and the US Congressional Budget Office projections of changes in the US GDP deflator. Table A1.4 also includes historic contributions. Contributions by the US are made on 1 October of the relevant fiscal year.

Table A1.4: Marshall Islands' Compact Trust Fund Contribution Schedule
($ million)

| FY | RMI | Taipei,China | US |
|---|---|---|---|
| 2004 | 25.00 | | 7.00 |
| 2005 | 2.50 | 1.75 | 7.59 |
| 2006 | | 0.75 | 8.22 |
| 2007 | | 0.75 | 8.95 |
| 2008 | | 0.75 | 9.71 |
| 2009 | | 2.40 | 10.78 |
| 2010 | | 2.40 | 11.13 |
| 2011 | | 2.40 | 11.80 |
| 2012 | | 2.40 | 12.47 |
| 2013 | 0.12 | 2.40 | 13.31 |
| Projections: | | | |
| 2014 | | 2.40 | 14.06 |
| 2015 | | 2.40 | 14.85 |
| 2016 | | 2.40 | 15.66 |
| 2017 | | 2.40 | 16.49 |
| 2018 | | 2.40 | 17.34 |
| 2019 | | 2.40 | 18.20 |
| 2020 | | 2.40 | 19.08 |
| 2021 | | 2.40 | 19.98 |
| 2022 | | 2.40 | 20.90 |
| 2023 | | 2.40 | 21.84 |

FY = fiscal year, RMI = Republic of the Marshall Islands, US = United States.

Source: Office of Insular Affairs. 2012. *Trust Fund for the People of the Republic of the Marshall Islands. Fiscal Year 2011 Annual Report*. Washington, DC: US Department of Interior; US Congressional Budget Office; Author calculation.

Other assumptions specific to the model for the RMI's CTF are as follows:

- Investment management fees and expenses are 0.61% per year.
- Target drawdown under the current structure will be $27 million.[12]
- Real GDP growth rate of 1.5% is assumed.
- Except where otherwise specified, all modeling results include consideration of the impact of account D of RMI's CTF, as described on page 6. Assumptions regarding RMI's CTF account D:
  - » Account D is an investment account separate from the rest of the CTF.
  - » Withdrawals are allowed once the account reaches $10 million (the value as of 30 September 2013 was $11 million).
  - » Account D will be used to assist in government funding post 2023. Thus, drawdowns from account D will be nil until 2024.
  - » Yearly contributions to account D will be $1 million and will continue up to and including 2023.

[12] Graduate School USA. 2014. Republic of the Marshall Islands Fiscal Year 2013 Economic Review Preliminary Report. Honolulu. http://www.pitiviti.org/news/wp-content/uploads/downloads/2014/08/RMI_EconPrelim_FY13.pdf

» Account D will be invested according to the same target portfolio allocations as accounts A and C.
» A fixed percentage of account D is drawn down each year. If the CTF employs a fixed-percentage drawdown rule, this same percentage is adopted for account D. If not, 3.5% is adopted. Although in reality account D drawdowns could be used to smooth volatility in drawdowns from the rest of the CTF, for ease of comparison of different drawdown rules, a consistent approach between CTF drawdown rules was taken.

## Modeling Assumptions Specific to the Federated States of Micronesia

Table A1.5: Target Asset Class Allocation Strategy of the Federated States of Micronesia's Compact Trust Fund (%)

| Item | Allocation |
|---|---|
| World equities | 51.0 |
| US fixed income | 2.5 |
| US private equity | 9.5 |
| Emerging market debt | 10.0 |
| US convertible bonds | 6.5 |
| US private real estate | 10.0 |
| Global hedge funds | 10.5 |
| Total | 100.0 |

US = United States.
Source: Office of Insular Affairs. 2013. *Trust Fund for the People of the Republic of the Marshall Islands. Fiscal Year 2012 Annual Report*. Washington, DC: US Department of the Interior.

Information and assumptions regarding the contributions to FSM's CTF:

- US contributions are programmed to increase by $0.8 million each year, with an inflation adjustment of two-thirds the rate of increase of the US GDP deflator or 5%, whichever is smaller, and will cease in 2024.
- Contributions are thus assumed to progress according to the following schedule, which is based on the FSM FY2012 Compact Trust Fund Annual Report and the US Congressional Budget Office projections of changes in the US GDP deflator. This table also includes historic contributions. Contributions by the US are made on 1 October of the relevant fiscal year. However, the exact value of the FY2014 contribution was not available at the time of preparing this paper.

Table A1.6: Federated States of Micronesia's Compact Trust Fund Contribution Schedule
($ million)

| FY | FSM | US |
|---|---|---|
| 2005 | 30.3 | 32.19 |
| 2006 | | 16.44 |
| 2007 | | 17.69 |
| 2008 | | 19.00 |
| 2009 | | 20.91 |
| 2010 | | 21.52 |
| 2011 | | 22.39 |
| 2012 | | 23.59 |
| 2013 | | 24.99 |
| Projections: | | |
| 2014 | | 26.24 |
| 2015 | | 27.56 |
| 2016 | | 28.91 |
| 2017 | | 30.29 |
| 2018 | | 31.71 |
| 2019 | | 33.14 |
| 2020 | | 34.59 |
| 2021 | | 36.09 |
| 2022 | | 37.61 |
| 2023 | | 39.17 |

FSM = Federated States of Micronesia, FY = fiscal year, US = United States.

Source: Office of Insular Affairs. 2013. *Trust Fund for the People of the Republic of the Marshall Islands. Fiscal Year 2012 Annual Report*. Washington, DC: US Department of Interior; US Congressional Budget Office; Author calculation.

Other assumptions specific to the model for FSM's CTF:

- Investment management fees and expenses are 0.8% per year.
- Target drawdown under the current structure will be $83 million.[13]
- Real GDP growth rate of 0.6% is assumed.
- Except where otherwise specified, all modeling results include consideration of the impact of the FSM National Trust Fund (FSMTF), as described on page 6. Assumptions regarding the FSMTF:
  - » Contributions to the FSMTF are intended to be provided by FSM's budget surplus, which is assumed to be $3 million per year. Contributions are assumed to cease after 2023.
  - » Drawdowns are assumed to be $0 before 2023, after which it is assumed that the maximum drawdown is made each year, with the maximum amount to be determined by FSMTF rules. Although in reality FSMTF drawdowns could be used to smooth volatility in CTF drawdowns, for ease of comparison of different drawdown rules, a consistent approach between alternatives was taken.

[13] Graduate School USA. 2014. Federated States of Micronesia Fiscal Year 2013 Economic Review Preliminary Report. Honolulu. http://www.pitiviti.org/news/wp-content/uploads/downloads/2014/08/FSM_EconPrelim_FY13.pdf

# Appendix 2
## Sensitivity Testing - Possible Continued Grants from Development Partners After 2023

Given the possibility of continued post-2023 grants being negotiated in response to the potential fiscal problems after 2023, this Appendix presents modeling results that include such grants. Please note that the purpose of this Appendix is not to provide any kind of comment on the appropriateness of such grants. Its purpose is rather to check whether such an arrangement might compromise the conclusions drawn in this paper.

Rather than reexamining the full range of alternative drawdown rules, this Appendix focuses on the current structure and the key alternative structure discussed (specifically Alternative 4) for both the Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM). In the case of the alternative structure, the grants are simply added on to drawdowns from the Compact Trust Fund (CTF), without changing the functioning of the CTF. However, in the case of the current structure, drawdowns are already arguably quite high immediately after 2023. Therefore, instead of assuming that the grants simply provide extra income, the grants are assumed to be used to offset target drawdowns. Taking the FSM as an example, an overall annual funding target for Compact funding sources (grants and the CTF) of $83 million in 2023 dollars is used. If continued post-2023 grants were assumed to be $50 million, then the maximum amount that could be drawn from the CTF would be $33 million.

The continued grant amounts assumed in this Appendix are the "fiscal adjustment" amounts in Table 13 (page 47): $3.6 million for the RMI and $35.7 million for the FSM, in 2023 dollars. These amounts are assumed to be paid yearly from 2024 and are indexed to inflation, which means that the post-2023 grant amounts are used to reduce the average fiscal adjustment to 0. However, it should be noted that this does not remove the risk of a fiscal cliff. Although on average under this scenario there will be no reduction in funding from 2023 to 2024, there is still significant possible variation around this average, as per Figures 13 and 22.

The results, which focus on the overall Compact income including drawdowns from the CTFs and continued post-2023 grants, are presented in Table A2, and in Figures A2.1 and A2.2.

Table A2: Modeling of the Marshall Islands' and the Federated States of Micronesia's Compact Trust Funds: Current versus Alternative Drawdown Rules with Continued Grants Post-2023

| Item | Average Yearly Income over the Projection Period[a] | | Income Volatility–number of years in 20 where income falls by more than: | | | CTF Sustainability–Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment – Average reduction in income from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| ***RMI, current structure***<br>*Existing A, B, and C account structure, real drawdown target in 2023 dollars of $27 million* | | | | | | | | |
| No continued grants | 26.1 | 7.8 | 1.2 | 0.2 | 0.0 | 49 | N | |
| Continued grants, $3.6 million per year, real | 27.2 | 8.1 | 0.7 | 0.1 | 0.0 | 56 | N | |
| **RMI, alternative structure**<br>*Alternative IV, same as current structure but with target drawdown defined as 3.5% of average CTF size over the last 3 years* | | | | | | | | |
| No continued grants | 31.7 | 9.2 | 0.5 | 0.2 | 0.0 | 62 | 3.6 | 1.3 |
| Continued grants, $3.6 million per year, real | 35.3 | 10.3 | 0.5 | 0.2 | 0.0 | 62 | 0.0 | 0.0 |
| ***FSM, current structure***<br>*Existing A, B, and C account structure, real drawdown target in 2023 dollars of $83 million* | | | | | | | | |
| No continued grants | 60.5 | 12.5 | 3.7 | 2.6 | 0.3 | 22 | N | |
| Continued grants, $35.7 million per year, real | 81.3 | 16.6 | 0.9 | 0.2 | 0.0 | 49 | N | |
| **FSM, alternative structure**<br>*Alternative IV, same as current structure but with target drawdown defined as 4% of average CTF size over the last 3 years* | | | | | | | | |
| No continued grants | 60.8 | 12.3 | 0.9 | 0.4 | 0.1 | 60 | 35.7 | 7.8 |
| Continued grants, $35.7 million per year, real | 96.5 | 19.6 | 0.9 | 0.4 | 0.1 | 60 | 0.0 | 0.0 |

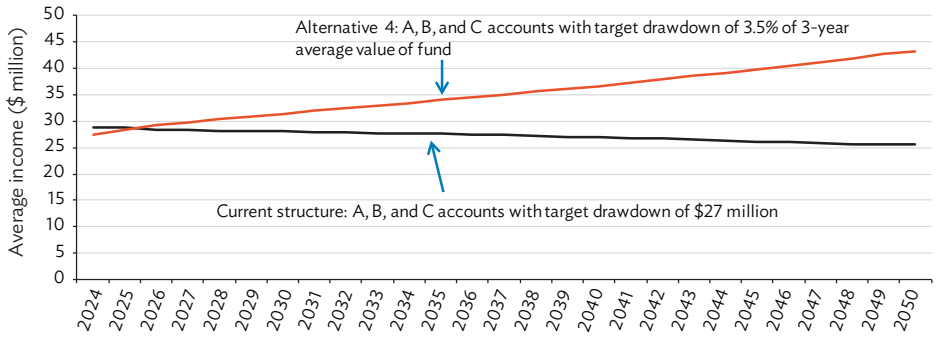
CTF = Compact Trust Fund, FSM = Federated States of Micronesia, GDP = gross domestic product, N = none (reduction may occur later), RMI = Republic of the Marshall Islands.

Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.

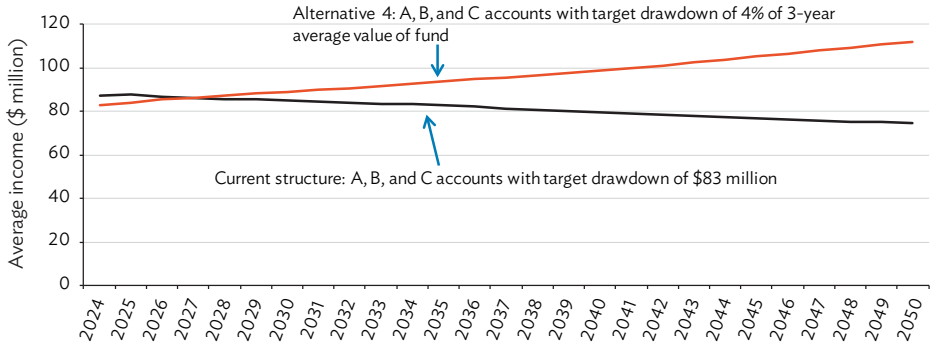
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Figure A2.1: Marshall Islands: Average Income Over Time including Continued Post-2023 Grants (in 2023 dollars)




Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Figure A2.2: Federated States of Micronesia: Average Income Over Time Including Continued Post-2023 Grants (in 2023 dollars)




Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

The benefits to RMI and FSM of such continued grants funding as assumed are substantial.

In the case of the alternative structure (Alternative 4), the additional post-2023 grants go only toward increasing the average income and reducing the average reduction in funding from 2023 to 2024. They do not affect drawdown volatility or the sustainability of either CTF, as they are provided separately to the workings of the CTF and the FSM Trust Fund (FSMTF) in the case of the FSM, or account D in the case of the RMI.

In the case of the current structure, since the additional grants offset target drawdowns, the grants result in improvements across the sustainability, drawdown volatility and average drawdown statistics. Among other benefits, the grants result in less chance of imprudently drawing down too much early on under this modification, as the drawdowns from the CTF are (for example in FSM's case) $35.7 million lower than they would have been otherwise.

Nevertheless, the Alternative 4 structure still provides better sustainability than the current structure in the presence of continued post-2023 grants. This is because the impacts of the aforementioned adverse consequences of the current structure, while reduced, remain. This means that Alternative 4 also leads to higher average drawdowns over the full projection period. Interestingly, in the presence of continued post-2023 grants, the modeled changes to drawdown volatility from moving to the alternative structure are inconclusive. Alternative 3 may need to be adopted in order to realise improvements in these measures of drawdown volatility, in the presence of such grants.

Therefore, although continued post-2023 grants would clearly be very positive for FSM's and RMI's fiscal situation, from the viewpoint of the choice of drawdown rules, they have little impact. Alternative 4 is still a clear improvement on the current structure, for both the RMI and the FSM, regardless of whether such grants are forthcoming.

# Appendix 3:
# Sensitivity Testing–World Equity Return Assumption

This Appendix seeks to answer the question of whether the conclusions of this report may be affected by different model parameterization. To address this, modeling results are provided below, which investigate the effects of a 2% lower expected annual return for world equities. This parameter is the one in which there exists the least confidence, due to the high level of equity return volatility and the amount of available data. The world equities return assumption also affects the expected returns from many of the alternative asset classes modeled, as explained in Appendix 1.

This sensitivity test does not seek to ask "what would happen if the equity return experienced were lower?" This question is adequately answered by the variations in overall equity returns between the 10,000 simulations generated by the Monte Carlo model and presented in the body of this paper. Rather, this Appendix addresses the sensitivity of this paper's conclusions to one of the model's parameters: the assumption for the expected equity return.

It should be noted that, although the specific results (e.g., the probability of sustainability) will definitely change in response to this changed parameter, the more interesting question is whether these changed results would lead to different conclusions; that is, whether the paper's conclusions are robust to model specification.

The effects of a lower expected equity return on the Republic of the Marshall Islands' (RMI) and the Federated States of Micronesia's (FSM) Compact Trust Fund portfolio characteristics as per the model are in Table A3.1.

Table A3.1: Expected Risk and Return Characteristics of the Marshall Islands' and the Federated States of Micronesia's Compact Trust Fund Portfolios
(with 2% lower expected annual equity return)

| Item[a] | RMI | | FSM | |
|---|---|---|---|---|
| | Previous assumptions | Reduced expected equity return | Previous assumptions | Reduced expected equity return |
| Average annual long-term real return (%) | 4.0 | 2.6 | 4.5 | 2.9 |
| Standard deviation of annual returns (%) | 13.0 | 13.0 | 15.2 | 15.2 |
| Expected frequency of negative annual returns (number of years in 20) | 4.7 | 5.4 | 5.1 | 5.9 |
| 5th percentile annual real return (%) | (15.6) | (17.0) | (18.3) | (19.8) |

( ) = negative, FSM = Federated States of Micronesia, RMI = Republic of the Marshall Islands.

Results in the above table summarise model outcomes across both time and simulations.

[a] Net of fees, excluding investment manager outperformance.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

The 2% reduction in the expected equity return does not lead to a full 2% reduction in expected return at the overall portfolio level for either country's Compact Trust Fund (CTF), since the CTFs also invest in some other assets not heavily exposed to equity returns. However, it does reduce their expected return significantly, by 1.4% per year in the case of the RMI and by 1.6% per year in the case of the FSM. Further, it negatively impacts the expected frequency of negative annual returns and the 5th percentile annual real return from both of these portfolios.

Table A3.2 sets out the changes in modeling results for the current and alternative (Alternative 4) strategies caused by the modified equity return assumption.

Table A3.2: Modeling for the Compact Trust Funds of the Marshall Islands and the Federated States of Micronesia: Current versus Alternative Drawdown Rules
(with 2% annual lower expected equity return)

| Item | Average Yearly Drawdown over the Projection Period[a] | | Drawdown volatility – number of years in 20 where drawdowns fall by more than: | | | CTF sustainability Chance that the CTF maintains its real 2023 value to 2050 | Fiscal adjustment Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| ***RMI, current structure***<br>*Existing A, B, and C account structure, real drawdown target in 2023 dollars of $27 million* | | | | | | | | |
| Previous results | 26.1 | 7.8 | 1.2 | 0.2 | 0.0 | 49 | N | |
| Reduced expected equity return | 23.5 | 7.1 | 1.7 | 0.3 | 0.0 | 29 | N | |
| ***RMI, alternative structure***<br>*Alternative IV, same as current structure but with target drawdown defined as 3.5% of average CTF size over the last 3 years* | | | | | | | | |
| Previous results | 31.7 | 9.2 | 0.5 | 0.2 | 0.0 | 62 | 3.6 | 1.3 |
| Reduced expected equity return | 23.9 | 7.0 | 0.5 | 0.1 | 0.0 | 43 | 5.8 | 2.1 |
| ***FSM, current structure***<br>*Existing A, B, and C account structure, real drawdown target in 2023 dollars of $83 million* | | | | | | | | |
| Previous results | 60.5 | 12.5 | 3.7 | 2.6 | 0.3 | 22 | N | |
| Reduced expected equity return | 49.8 | 10.3 | 4.5 | 3.1 | 0.4 | 9 | N | |
| ***FSM, alternative structure***<br>*Alternative IV, same as current structure but with target drawdown defined as 4% of average CTF size over the last 3 years* | | | | | | | | |
| Previous results | 60.8 | 12.3 | 0.9 | 0.4 | 0.1 | 60 | 35.7 | 7.8 |
| Reduced expected equity return | 44.4 | 9.0 | 0.8 | 0.4 | 0.1 | 41 | 40.7 | 9.0 |

CTF = Compact Trust Fund, FSM = Federated States of Micronesia, GDP = gross domestic product, N = none (reduction may occur later), RMI = Republic of the Marshall Islands.

Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

These results show that the lower equity return assumption does negatively impact upon most drawdown and sustainability measures, for both the current drawdown rules and Alternative 4. This indicates that the specific results for the statistics presented in this paper are, as expected, sensitive to the model's assumptions.

However, upon comparing the reduced equity return results for Alternative 4 with those for the current structure, it is evident that moving to the alternative structure is still expected to produce similar benefits for both the RMI and the FSM under a reduced equity return assumption. Sustainability is greatly enhanced, and drawdown volatility is considerably reduced. The main difference in the benefits of the alternative structure is that it would now lead to slightly lower average drawdowns over the projection period in FSM's case instead of slightly higher average drawdowns. However, this metric is influenced by several factors such as the sustainability under each scenario as well as the length of the projection period. If we extended the projection period, the average drawdowns of more sustainable strategies would increase more (or decrease less) than those of less sustainable structures.

Therefore, although the specific measurements are sensitive to the model's assumptions, the broad conclusions in this paper with regard to the current versus alternative structures are robust to the model's assumptions. Thus, the broad conclusions of this report stand despite the possibility of a lower expected equity return.

However, the appropriate drawdown percentages are assumption-sensitive. Referring back to Table A3.1, the expected returns for these portfolios each become about 1.5% lower under the reduced equity return scenario. If the alternative strategies for the FSM and the RMI are modified by reducing the drawdown percentage similarly by 1.5%, the results in Table A3.3 are obtained.

Table A3.3: Modeling of the Marshall Islands' and the Federated States of Micronesia's Compact Trust Funds' Alternative Drawdown Rules
(with 2% annual lower expected equity return and 1.5% annual lower drawdown percentage)

| Item | Average Yearly Drawdown over the Projection Period[a] | | Drawdown volatility - number of years in 20 where drawdowns fall by more than: | | | CTF sustainability Chance that the CTF maintains its real 2023 value to 2050 | Fiscal adjustment Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| ***RMI, alternative structure with 2% lower annual equity return***<br>*Alternative IV, same as current structure but with target drawdown defined as % of average CTF size over the last 3 years* | | | | | | | | |
| Drawdown percentage of 3.5% | 23.9 | 7.0 | 0.5 | 0.1 | 0.0 | 43 | 5.8 | 2.1 |
| Drawdown percentage of 2% | 16.6 | 4.8 | 0.1 | 0.0 | 0.0 | 63 | 15.1 | 5.4 |
| ***FSM, alternative structure with 2% lower annual equity return***<br>*Alternative IV, same as current structure but with target drawdown defined as % of average CTF size over the last 3 years* | | | | | | | | |
| Drawdown percentage of 4% | 44.4 | 9.0 | 0.8 | 0.4 | 0.1 | 41 | 40.7 | 9.0 |
| Drawdown percentage of 2.5% | 34.4 | 7.0 | 0.5 | 0.2 | 0.0 | 60 | 54.7 | 12.0 |

CTF = Compact Trust Fund, FSM = Federated States of Micronesia, GDP = gross domestic product, RMI = Republic of the Marshall Islands.

Results in the above table summarise model outcomes across both time and simulations.

[a] In 2023 dollars.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

The above results are all for the reduced expected equity return scenario. They show that reducing the annual drawdown percentage by 1.5% restores CTF sustainability to the previous (reasonable) level in each case, and reduces drawdown volatility. The cost of restoring sustainability is a reduction in the yearly drawdown over the projection period, both initially and on average. This is commensurate with the lower expected equity return; if one earns less, one has to spend less.

Since the drawdown percentage, a component of the alternative structures discussed is assumption-sensitive, despite the care taken in formulating the investment return model used in this paper, the RMI and the FSM may prefer to further investigate the level of expected return that should be assumed in regard to their portfolios. Once such a return assumption is established, a drawdown percentage can then be calculated in reference to these modeling results. Notes regarding the derivation of the appropriate drawdown percentages to use are in Appendix 4.

# Appendix 4
# Notes on the Calculation of the Expected Long-Term Return, for the Purpose of Setting the Drawdown Percentage

## Calculation of Expected Long-Term Return

The appropriate return figure to use, as a reference for the drawdown percentage, is the compound annualized real return after investment management expenses. It is important to realize that it is necessary for this purpose to measure not the arithmetic average return, but the geometric average return (i.e., the compound annualized return). This is because investment market volatility causes these two measures to diverge somewhat, and it is the compound return that the investor actually receives. The figures in Table A5 for the Compact Trust Funds (CTFs) of the Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM) are the arithmetic average, across simulations, of the geometric average (compound annualized) return realized over the 37 projection years, i.e., from 2014 to 2050, inclusive. The simple arithmetic average of real returns across time and simulations is higher by 0.9% for RMI and 1.2% for FSM, according to the model.

In adjusting the expected return for investment management expenses, all expenses should be considered, including for example the extra layer of fees in fund-of-funds structures, i.e., paid by the fund-of-funds manager to the underlying fund managers.

## Potential Refinements to the Drawdown Percentages Identified

Although care has been taken in formulating the investment return model used in this paper, given the assumption-sensitive nature of the choice of drawdown percentage (Appendix 3) it may be worth investigating further the expected long-term annualized returns of FSM's and RMI's CTF portfolios to better inform this decision, if a drawdown percentage is to be adopted. In this regard, the investment consultants to each CTF would be in a good position to assist, given their detailed knowledge of the investment portfolios of RMI's and FSM's CTFs, as well as of investment markets.

Once the expected return figure is calculated, then the same differential between the expected return figure in this paper and the drawdown percentage identified in this paper can be adopted to provide similar sustainability and drawdown volatility results. For example, in FSM's case, the expected long-term compounded annualized real return is 4.5% according to the model, and the drawdown percentage identified is 4% (lower by 0.5%). Thus, if further detailed investigation produced an expected return of 4% for the portfolio, then a drawdown percentage of 3.5% (lower by 0.5%) could be adopted.

It is also noteworthy that the expected return depends upon each CTF's investment portfolio allocations, so if these were materially changed in the future, then the target drawdown percentage may also need to be revised.

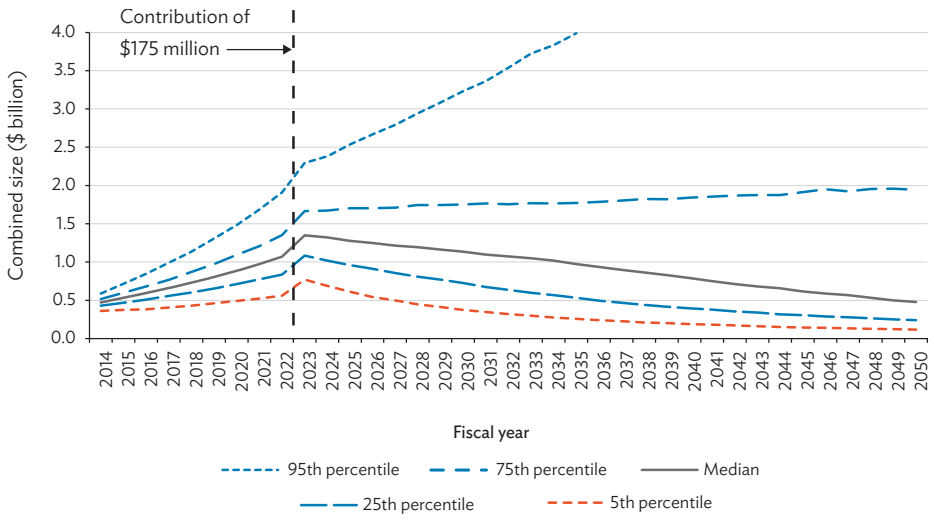
# Appendix 5
# Contribution of Unspent Compact Grants to the Federated States of Micronesia's Compact Trust Fund in 2023

In the Federated States of Micronesia (FSM), not all United States Compact grant money provided to date has been spent. Assuming that unspent Compact grants continue to build up at the same rate as that experienced to date, the total is naïvely projected to be approximately $175 million by the time Compact grants expire at the end of 2023. Since this amount may be rolled into the Compact Trust Fund (CTF) at that date, the purpose of this Appendix is to examine if that scenario will affect the key modeling results in this paper. Please note that the purpose of this Appendix is not to provide any kind of comment on the appropriateness of the contribution of any unspent grants to the FSM CTF. Its purpose is rather to check whether such an arrangement might compromise the conclusions drawn in this paper.

There are also some unspent Compact funds in the Republic of the Marshall Islands (RMI), but the amount is extremely small. Hence, assuming this continues to be the case in RMI until 2023, there is no benefit of modeling this scenario for the case of the RMI, as the modeling results would not be noticeably affected.

The progression of the combined size of the FSM's CTF and FSM Trust Fund under this scenario according to the model is in Figure A5, and Table A5 shows the key results for the current and alternative strategies under this scenario.

**Figure A5: Size of the Compact Trust Fund of the Federated States of Micronesia with Contribution of Unspent Compact Grants** (in 2023 dollars)




Note: This assumes that the unspent Compact grants (projected to be $175 million in 2023) are contributed to the CTF at the end of 2023.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Table A5: Modeling of the Federated States of Micronesia's Compact Trust Fund: Current versus Alternative Drawdown Rules, with Contribution of Unspent Compact Grants[a]

| Item | Average Yearly Drawdown over the Projection Period[a] | | Drawdown Volatility – number of years in 20 where drawdowns fall by more than: | | | CTF Sustainability Chance that the CTF maintains its real 2023 value to 2050 | Fiscal Adjustment Average reduction in funding from 2023 to 2024[a] | |
|---|---|---|---|---|---|---|---|---|
| | $ million | % of GDP | 3% of GDP | 5% of GDP | 10% of GDP | % | $ million | % of GDP |
| ***Current Structure:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of $83 million* | | | | | | | | |
| Previous results | 60.5 | 12.5 | 3.7 | 2.6 | 0.3 | 22 | N | |
| Extra $175 million | 66.5 | 13.7 | 3.3 | 2.4 | 0.3 | 29 | N | |
| ***Alternative Structure:*** *Alternative IV, same as current structure but with target drawdown defined as 4% of average CTF size over the last 3 years* | | | | | | | | |
| Previous results | 60.8 | 12.3 | 0.9 | 0.4 | 0.1 | 60 | 35.7 | 7.8 |
| Extra $175 million | 69.3 | 14.0 | 1.0 | 0.5 | 0.1 | 60 | 33.3 | 7.3 |

CTF = Compact Trust Fund, GDP = gross domestic product, N = none (reduction may occur later).

Results in the above table summarise model outcomes across both time and simulations.

[a] This assumes that the unspent Compact grants (projected to be $175 million in 2023) are contributed to the CTF at the end of 2023.
[b] In 2023 dollars.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

For the current structure, the injection of $175 million produces improvements to all modeling results, including average drawdowns, drawdown volatility, and sustainability. Under the alternative structure, the change has no effect on sustainability, since drawdowns simply increase in proportion to the increase in fund size. Nevertheless, the average drawdown amount increases, and the average 2024 reduction in funding decreases. Drawdown volatility, however, actually increases slightly under the alternative structure, because the drawdown amounts are larger relative to projected gross domestic product.

The injection of the $175 million thus has a more positive effect under the current structure than under the alternative structure. However, the benefits of moving to the alternative structure are just as clear as under the original scenario; that is, the modeling results do not change enough to compromise the overall conclusions regarding the relative merits of the current vs. alternative structures.

# Appendix 6
# Additional Modeling Results

This Appendix provides additional measures of the volatility of projected drawdowns for the various structures and scenarios considered in this paper.

The following measures are used:

- **Expected largest year-on-year change in drawdowns** (lower is better)—the average across simulations of the maximum change, up or down, in real drawdown amount from year to year
- **Expected standard deviation of year-on-year change in drawdowns** (lower is better)—the average standard deviation of changes in real drawdowns from year to year across all simulations.
- **Average number of years in 10 in which CTF drawdowns are less than target** (lower is better)—the number of years in 10 in which CTF drawdowns are expected to be less than the maximum amount that can be drawn down.

Table A6.1: Marshall Islands' Extra Drawdown Risk Measures for Current and Alternative Structures

| Item | Expected largest year-on-year change in drawdowns | | Expected standard deviation of year-on-year change in drawdowns | | Average no. of years in 10 in which CTF drawdowns are less than target |
|---|---|---|---|---|---|
| | $ million, 2023 dollars | % of GDP | $ million, 2023 dollars | % of GDP | |
| ***Current structure:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of $27 million* | | | | | |
| $27 million | 13.8 | 3.9 | 4.7 | 1.8 | 1.9 |
| ***Alternative I:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of:* | | | | | |
| $19 million | 9.3 | 2.6 | 3.1 | 1.4 | 1.4 |
| $23 million | 5.4 | 1.5 | 1.9 | 1.0 | 0.8 |

*continued on next page*

*Table A6.1 continued*

| Item | Expected largest year-on-year change in drawdowns | | Expected standard deviation of year-on-year change in drawdowns | | Average no. of years in 10 in which CTF drawdowns are less than target |
|---|---|---|---|---|---|
| | $ million, 2023 dollars | % of GDP | $ million, 2023 dollars | % of GDP | |
| ***Alternative II:*** *Simplified structure, fixed % of CTF drawn down each year* | | | | | |
| 3.0% | 11.5 | 3.3 | 9.1 | 2.3 | N/A |
| 3.5% | 12.3 | 3.6 | 9.3 | 2.5 | N/A |
| 4.0% | 13.0 | 3.8 | 9.5 | 2.7 | N/A |
| ***Alternative III:*** *Drawdown defined as % of average CTF size over the last 3 years* | | | | | |
| 3.0% | 5.7 | 1.6 | 8.8 | 2.2 | N/A |
| 3.5% | 6.1 | 1.7 | 9.1 | 2.4 | N/A |
| 4.0% | 6.5 | 1.9 | 9.3 | 2.6 | N/A |
| ***Alternative IV:*** *Same as current structure but with target drawdown defined as % of average CTF size over the last 3 years* | | | | | |
| 3.0% | 11.0 | 3.2 | 9.2 | 2.3 | 0.4 |
| 3.5% | 12.3 | 3.6 | 9.6 | 2.5 | 0.5 |
| 4.0% | 13.6 | 4.0 | 9.8 | 2.7 | 0.6 |

CTF = Compact Trust Fund, GDP = gross domestic product, NA = not applicable (no target).
Results in the above table summarise model outcomes across both time and simulations.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

### Table A6.2: Marshall Islands' Extra Drawdown Risk Measures for Extra Scenarios, Current and Alternative Drawdown Strategies

| Item | Expected largest year-on-year change in drawdowns | | Expected standard deviation of year-on-year change in drawdowns | | Average no. of years in 10 in which CTF drawdowns are less than target |
|---|---|---|---|---|---|
| | $ million, 2023 dollars | % of GDP | $ million, 2023 dollars | % of GDP | |
| ***Current structure:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of $27 million* | | | | | |
| Continued post-2023 grants ($3.6 million per year from 2023) | 9.8 | 2.8 | 3.3 | 1.5 | 1.4 |
| 2% lower expected annual equity return | 16.9 | 4.8 | 6.4 | 2.3 | 3.2 |
| ***Alternative IV:*** *Same as current structure but with target drawdown defined as 3.5% of average CTF size over the last 3 years* | | | | | |
| Continued post-2023 grants ($3.6 million per year from 2023) | 10.7 | 3.2 | 6.8 | 2.0 | 0.7 |
| 2% lower expected annual equity return | 10.7 | 3.2 | 6.8 | 2.0 | 0.7 |
| 2% lower expected annual equity return, 2% drawdown | 6.7 | 2.0 | 5.1 | 1.3 | 0.5 |

CTF = Compact Trust Fund, GDP = gross domestic product.
Results in the above table summarise model outcomes across both time and simulations.
Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Table A6.3: Federated State of Micronesia's Extra Drawdown Risk Measures for Current and Alternative Drawdown Strategies

| Item | Expected largest year-on-year change in drawdowns | | Expected standard deviation of year-on-year change in drawdowns | | Average no. of years in 10 in which CTF drawdowns are less than target |
|---|---|---|---|---|---|
| | $ million, 2023 dollars | % of GDP | $ million, 2023 dollars | % of GDP | |
| ***Current structure:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of $83 million* | | | | | |
| $83 million | 51.0 | 10.2 | 23.2 | 5.0 | 4.7 |
| ***Alternative I:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of:* | | | | | |
| $41 million | 14.5 | 2.9 | 6.5 | 1.5 | 1.5 |
| $58 million | 25.9 | 5.2 | 11.9 | 2.7 | 2.9 |
| $70 million | 37.7 | 7.5 | 17.4 | 3.8 | 3.9 |
| ***Alternative II:*** *Simplified structure, fixed % of CTF drawn down each year* | | | | | |
| 3.5% | 30.0 | 6.0 | 20.5 | 4.0 | N/A |
| 4.0% | 31.2 | 6.3 | 20.8 | 4.1 | N/A |
| 4.5% | 32.1 | 6.5 | 21.0 | 4.2 | N/A |
| ***Alternative III:*** *Drawdown defined as % of average CTF size over the last 3 years* | | | | | |
| 3.5% | 16.4 | 3.3 | 19.5 | 3.7 | N/A |
| 4.0% | 16.9 | 3.4 | 19.8 | 3.8 | N/A |
| 4.5% | 17.2 | 3.5 | 20.1 | 3.9 | N/A |
| ***Alternative IV:*** *Same as current structure but with target drawdown defined as % of average CTF size over the last 3 years* | | | | | |
| 3.5% | 27.5 | 5.6 | 20.4 | 3.9 | 0.6 |
| 4.0% | 29.7 | 6.0 | 20.9 | 4.1 | 0.6 |
| 4.5% | 31.6 | 6.4 | 21.4 | 4.2 | 0.7 |

CTF = Compact Trust Fund, GDP = gross domestic product, NA = not applicable (no target).

Results in the above table summarise model outcomes across both time and simulations.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

Table A6.4: Federated States of Micronesia's Extra Drawdown Risk Measures for Extra Scenarios, Current and Alternative Drawdown Strategies

| Item | Expected largest year-on-year change in drawdowns | | Expected standard deviation of year-on-year change in drawdowns | | Average no. of years in 10 in which CTF drawdowns are less than target |
|---|---|---|---|---|---|
| | $ million, 2023 dollars | % of GDP | $ million, 2023 dollars | % of GDP | |
| ***Current structure:*** *Existing A, B, and C account structure, real drawdown target in 2023 dollars of $83 million* | | | | | |
| Continued post-2023 grants ($35.7 million per year from 2023) | 17.8 | 3.6 | 8.1 | 2.1 | 1.9 |
| 2% lower expected annual equity return | 54.2 | 11.0 | 26.6 | 5.7 | 6.2 |
| Inclusion of unspent Compact grants of $175 million | 50.5 | 10.1 | 21.3 | 4.6 | 3.9 |
| ***Alternative IV:*** *Same as current structure but with target drawdown defined as 3.5% of average CTF size over the last 3 years* | | | | | |
| Continued post-2023 grants ($35.7 million per year from 2023) | 29.7 | 6.0 | 20.9 | 4.1 | 0.6 |
| 2% lower expected annual equity return | 24.8 | 5.1 | 14.9 | 3.0 | 0.9 |
| 2% lower expected annual equity return, 2% drawdown | 18.8 | 3.8 | 12.2 | 2.4 | 0.6 |
| Inclusion of unspent Compact grants of $175 million | 34.0 | 6.9 | 24.1 | 4.7 | 0.7 |

CTF = Compact Trust Fund, GDP = gross domestic product.

Results in the above table summarise model outcomes across both time and simulations.

Source: Author modeling and calculation. Modeling assumptions are set out in Appendix 1.

## Trust Funds and Fiscal Risks in the North Pacific

*Analysis of Trust Fund Rules and Sustainability in the Marshall Islands and the Federated States of Micronesia*

This publication analyzes the trust funds established by the United States with the Republic of Marshall Islands and the Federated States of Micronesia, intended to provide budget support upon expiration of these countries' Compacts of Free Association with the United States. Analysis shows future revenues from the funds will likely be volatile and unsustainable, but examines simple rule changes designed to reduce fund volatility and improve the sustainability of fund balances.

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