Disaster Risk Finance Analytics

Richard Poulter
Remember

Four Core Principles of DRF

To make sound financial decisions you need to have the right information.
MODULE 1
Fundamentals of DRF analytics

Basic concepts, DRF decisions and 5 step analytics workflow

Define the question

Collect Risk Data

Assess the Fiscal Impact

Inform DRF Decision-Making

Monitor & Evaluate
How do I estimate my fiscal exposure in the event of a disaster?

Should we set aside funds in a reserve fund, and how large should this reserve fund be?

Should we seek to establish a line of credit, which can immediately be drawn upon if a disaster were to occur?

How can we evaluate proposals for risk transfer products such as disaster insurance or catastrophe bonds?

What is the financial cost of scaling up an existing social protection program?
What is DRF Analytics?

- Combines disaster risk information with financial methodologies and assumptions to support informed decision making.
- Standardized approach of proven statistical and economic methodologies to conduct financial analyses to support governments in fiscal decisions related to disaster risk.
- Bridges the gap between disaster risk data and risk-informed decision making.
DRF Analytics empowers stakeholders to take risk-informed financial protection decisions, based on sound financial and economic analyses.

**Why is DRF Analytics important to financial decision makers?**

- Interpret data & understand fiscal exposure
- Appraise, evaluate & monitor DRF decisions
- Transparent & open decision-making process
- Communication tool to gain common understanding amongst different stakeholders
5-Step DRF Analytics Workflow

01 Define the question
02 Collect Risk Data
03 Assess the Fiscal Impact
04 Inform DRF Decision-Making
05 Monitor & Evaluate

Stakeholder Engagement
MODULE 2
Data Requirements

Reliable data required to produce quality quantitative information
I. What Type of Data Do You Need?

- Risk / Loss Data
- Macro-economic Data
- Fiscal / Financial Data

**BIG DATA SETS DOES NOT ALWAYS EQUATE TO USABLE INFORMATION**
II. Where Can You Find the Data?

- Government Agencies
- Public Sources
- Humanitarian Organizations
- Risk Model Firms
- Insurance Companies
Analytics translates data into useful information

**Data**
- Risk/Loss
- Macro-economic
- Fiscal/Financial

**Analytics**
- Financial capacity building tools
- Financial impact analysis
- Economic, fiscal evaluation

**Information**
- For decision making
- For monitoring & evaluation
- For capacity building
Module 3
Fiscal Impact Assessment

Estimating the fiscal impact using probabilistic risk assessments
Exercise One:
Estimating Potential Costs
As the Minister of Finance, you are developing a DRF strategy to manage the cost of future disasters. You want to understand the potential disaster-related costs the government could face. The primary financial driver of disaster response is supporting people who are affected. Historical records on the number of people impacted by disasters from 2002 to 2016 are available. This historical information has been used by a technical colleague to complete an analysis (‘probabilistic risk assessment’) of the financial cost of the impact of disasters.

You have been presented with a simple quantitative tool to evaluate the potential costs based on the historical number of people affected by disasters.

**Exercise One**

- Estimated disasters of different magnitude
- Estimated average annual cost of disasters
- Actual cost of the 2016 disaster (for reference)
Introduction to DRF Analytics

What do the actuaries do?

- Technical statistical analysis using limited historical data
- Estimating 10,000 potential future events (or less/more) from a limited number of historical events
- Statistical measurements (such as average annual loss) quantified based on the estimated potential future events
TAKE OUT YOUR LAPTOP
(one between three is fine)

Tool link:

https://www.financialprotectionforum.org/online-learning-exercises-using-data-and-analytics

Password: passwd1
The relief cost per person is a Government input that could be estimated using expenditure information from the most recent 2016 event and other available information.
Introduction to DRF Analytics

DRF Analytics Exercise

Vary the relief cost per person using the slider to determine the:

- Estimated average annual cost of disasters; and
- Estimated cost of a 1 in 10-year disaster event.

A. Assuming relief costs of US$50 per person?
B. Assuming relief costs of US$200 per person?

Take 10 minutes to vary the inputs and evaluate the results.
Exercise One: Solution A

Assuming relief costs of US$50

- Estimated average annual cost is $15 million
Exercise One: Solution B

Assuming relief costs of US$200

- Estimated average annual cost is $62 million
Accounting for Uncertainty (lack of data)

Quantity and quality of data is critical to reduce the levels of uncertainty in the fitted distributions. More data reduces confidence bands, and therefore increases confidence in estimates.
Module 3 Recap

Evaluating a probabilistic risk assessment

Using risk assessment information to support decisions
MODULE 4
Informing Fiscal Decisions

DRF Instruments and managing the disaster related funding gap

- Define the question
- Collect Risk Data
- Assess the Fiscal Impact
- Inform DRF Decision-Making
- Monitor & Evaluate
• How much funding will be required post disaster [Module 3]

• When will funds be required, Where will the funds come from and What is the funding gap [Module 4]

Overview

Should we set aside funds in a reserve fund, and how large should this reserve fund be?

Should we seek to establish a line of credit, which can immediately be drawn upon if a disaster were to occur?

How can we evaluate proposals for risk transfer products such as disaster insurance or catastrophe bonds?
Exercise Two:
Assessing Funding Gap
You are now developing a DRF strategy to better manage your estimated disaster costs. A technical colleague has prepared a quantitative tool to support you in evaluating the funding gap and to assess the impact of different financial instruments available to you.

The options available include the following:

**Exercise Two**

- **Utilising $200m for the reserve fund**
- **Having a reserve fund of $100m, and contingent credit up to US$300 million**
- **Additional purchase of an insurance policy**

[You have access to two insurance options of equal cost: option a) provides cover for moderate and extreme events; and option b) provides higher cover for extreme events only.]
Exercise Two

Remember the estimated 1 in 10-year cost of US$315 million from exercise one (with relief costs of US$400 per person)
DRF Analytics
Exercise Two

Evaluate the following options:

A. Increase in reserve fund to US$200 million;
B. Reduce the reserve fund to US$100 million and take out a contingent line of credit for US$300 million;
C. A reserve fund of US$100 million and take out a contingent line of credit for US$300 million and take out an insurance policy for extreme events.

Note: It is assumed that the contingent credit will only be drawn down once the reserve fund is fully used.

Take 15 minutes

What is the impact of this strategy on the funding gap during the: average year, 1 in 10 year, 1 in 50 year?

Would this strategy have provided enough funding for the event in 2016?

How do the outcomes compare across the three strategies?
Exercise Two: Solution A

1. Select level of reserve fund in place
   - $200

2. Select level of contingent credit in place
   - $0

Funding gap reduces
Is this an efficient allocation of limited government resources?
Exercise Two: Solution B

1. SELECT LEVEL OF RESERVE FUND IN PLACE

![Graph showing funding levels and gaps](image)

- $100

2. SELECT LEVEL OF CONTINGENT CREDIT IN PLACE

- $300

Funding gap reduces further. However, for extreme events there are still significant unfunded costs that will need to be covered using ex-post resources that can be both slow to arrange and costly.
Exercise Two: Solution C

1. SELECT LEVEL OF RESERVE FUND IN PLACE  
   $100

2. SELECT LEVEL OF CONTINGENT CREDIT IN PLACE  
   $300

3. SELECT INSURANCE COVER IN PLACE  
   Option B: Extreme Cover Only

Note: The cost of insurance Options A and B are equal.
Exercise Two: Group Discussion

This exercise included two alternative insurance options; both of which have an equal cost.

What is the difference between Insurance Option A and Insurance Option B for the Government? What do you notice with the funding gap?

Take 10mins to discuss
Evaluating the Cost of Sovereign DRF Strategies

Framework to evaluate sovereign DRF strategies

1. Define the Contingent Liability
2. Define Finance Strategies and Layers
3. Set Base Assumptions
4. Calculate Results under Base Assumptions
5. Consider Relevant Sensitivities and Re-Calculate Results
6. Conclude on Risk Finance Implications

Stakeholder Dialogue
Exercise Three:
Evaluating Optimal Funding Mix
You are developing a DRF strategy to be better prepared financially to manage future relief costs in the event of a disaster. You are trying to understand the optimal DRF strategy to finance future disasters.

A technical colleague has prepared a quantitative tool to support you in evaluating the total cost of alternative DRF strategies based on required finance from the 2016 event of US$488 million.

The financial instruments available include:

**Exercise Three**

- **A line of contingent credit for up to US$488 million**
- **Purchase of an insurance policy to cover some or all of the risk**
Introduction to DRF Analytics

PRE-ARRANGED TOTAL FINANCE $488 million

1. SELECT THE COST OF INSURANCE
   High (hard market) ▼

2. SELECT THE CONCESSIONAL RATE SPREAD
   Low (1% spread) ▼

3. SELECT THE EVENT OCCURRENCE
   No Disaster Occurs ▼

ACTUAL COST OF EVENT $0 million

TOTAL COST OF DISASTER EVENT BASED ON PRE-ARRANGED FINANCE

- 100% Contingent Credit 0% Insurance: 5
- 50% Contingent Credit 50% Insurance: 44
- 25% Contingent Credit 75% Insurance: 92
- 0% Contingent Credit 100% Insurance: 213

$ Million
DRF Analytics
Exercise Three

Use the quantitative tool to evaluate the following scenarios:

A. The insurance cost is high (hard market) and the cost of borrowing is high (concessional rate spread offered is low)
   • No disaster occurs
   • 2016 disaster occurs

B. The insurance cost is low (soft market) and the cost of borrowing is high (concessional rate spread offered is low)
   • No disaster occurs
   • 2016 disaster occurs
DRF Analytics
Exercise Three

Take 15 minutes to vary the inputs and evaluate the results
Exercise
Three: Solution A

No disaster

2016 disaster
Exercise Three: Solution B

No disaster

2016 disaster
Challenging DRF Analytics Information

1. **What is the purpose and significance** of the analytics information; including the consequences and implications of the its use in decision-making?

2. **How sensitive** is the analytics information to changes in assumptions?

3. **Who has prepared** the analytics information and have they any incentive to mislead?

4. Has the analytics information been **peer reviewed** by a technical expert?
## Commissioning DRF Analytics

<table>
<thead>
<tr>
<th>Provider</th>
<th>How can a Government Contract with Provider</th>
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<tbody>
<tr>
<td>Multilateral Development Banks</td>
<td>• Technical assistance provided through development loans or through trust funds</td>
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<tr>
<td></td>
<td>• These could be bank executed or recipient executed</td>
</tr>
<tr>
<td>Donors</td>
<td>• Technical assistance provided through donor projects</td>
</tr>
<tr>
<td></td>
<td>• Services often provided to Governments at no cost through donor funded projects</td>
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<tr>
<td>Insurance Companies</td>
<td>• Analytics information provided to support design and selection of an insurance contract</td>
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<tr>
<td></td>
<td>• Fees are often paid for through insurance premiums</td>
</tr>
<tr>
<td>Financial Intermediary</td>
<td>• Analytics information provided to support design, selection and execution of a financial instrument</td>
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<tr>
<td></td>
<td>• Fees are often paid for through commission</td>
</tr>
<tr>
<td>Brokers</td>
<td>• Analytics information provided to support selection and execution of a financial instrument</td>
</tr>
<tr>
<td></td>
<td>• Fees are often paid for through commission</td>
</tr>
<tr>
<td>Consultants</td>
<td>• Technical support provided under an individual or firm contract</td>
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<td></td>
<td>• Fees could be time based or fixed fee and negotiated between the individual/firm and the Government.</td>
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</table>
After a DRF instrument, strategy or program has been implemented stakeholders should monitor the decision. Monitoring can take place at different stages such as:

- After a disaster event
- When fiscal conditions change
- At instrument renewal
- When market conditions change
Module 4 Recap

Tools to assess funding gaps and the costs of DRF strategies

Framework to evaluate sovereign DRF strategies

Challenging and commission DRF analytics