

# FINANCING EXPLICIT CONTINGENT LIABILITIES THROUGH IDA

DISCUSSION PAPER



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The Centre for Disaster Protection works with developing countries to find better ways to manage the risks of disasters and to deliver earlier, more cost-effective support for people when disasters occur. One element of the Centre's work is influencing global policy on financing responses to disasters. This series of papers was commissioned to provide analysis, ideas and recommendations for the upcoming nineteenth replenishment of the International Development Association. The series comprises Discussion Papers and Policy Briefs, all available at [www.disasterprotection.org](http://www.disasterprotection.org).

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Discussion papers represent 'work in progress' documents that are intended to inspire discussion and debate. They reflect the views of their authors and not necessarily the views of the Centre for Disaster Protection. For more information email [info@disasterprotection.org](mailto:info@disasterprotection.org).

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## ● EXECUTIVE SUMMARY

In the context of natural disasters, it's useful for governments to pre-agree to some expenditures that would automatically be necessary if a particular kind of disaster occurs or has a particular impact. For example, a government can pre-agree that if rains fail, it will scale-up a cash transfer programme as a means of preventing vulnerable rural households from falling into a poverty trap.

An advance commitment to fund such expenditures creates **an explicit contingent liability** to a government—an agreed future payment, or set of payments, made if a particular event or disaster occurs. This entails the government agreeing in advance how much funding it will provide from public funds if a particular event occurs, and how those funds will be used. There are different ways that such explicit contingent liabilities can be financed. Advanced public financial management systems typically include ways for the public sector to take explicit contingent liabilities onto their balance sheets in a cost-effective way.

This paper focuses on the World Bank's International Development Association (IDA) approach to contingency financing, and **sets out an innovative approach to explicit contingency finance that should deliver improved impact and efficiency.**

There are a number of mechanisms for financing disaster losses within the IDA envelope, but limited ways to take on explicit contingent liabilities with objective 'hard triggers'. **The existing financial and budgetary instruments used by IDA for financing losses from disasters are:**

- Discretionary budget reallocation—reallocations within the IDA country envelope or from additional sources such as the Immediate Response Mechanism or the Crisis Response Window (CRW).
- Pre-funded project components—for example, a catastrophe drawdown option (Cat DDO), which is a policy development loan and does not finance explicit contingent liabilities.
- Risk transfer arrangements, such as commercial insurance—IDA has recently started to support insurance arrangements on a small scale, for example with the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI).

**There is an alternative option proposed to fill the gap in the IDA instrument set.** This instrument uses funds from a country's IDA envelope to purchase a contingent loan with hard triggers, on concessionary IDA terms. The payout is used to buy down the cost of a commercial loan (such as IDA's Scale-Up Facility) to concessionary IDA terms. This mechanism allows the country to access lending on IDA terms over and above their IDA envelope, but incurs the additional cost associated with the loan.

The authors are not proposing that a completely new instrument be created, but rather **a more efficient and effective use of existing contingent finance**, in order to test if additional instruments should be considered as a means of improving the economic efficiency of funding contingent liabilities.

This paper presents a simplified cost-benefit analysis, in order to **assess and compare the economic efficiency of these instruments with each other to fund contingent liabilities for different types of risk.** The results also illustrate the impact of changing some of the key assumptions on economic efficiency. The cost-benefit analysis showed:

- The insurance-based instruments provide far more coverage of the liability amount per US\$1 allocated by IDA (the extent of which depends on the insurance cost) than budget reallocation or pre-funded projects. This difference is more pronounced for less-likely contingent liabilities.
- Under the baseline assumptions, most of the instruments provide a positive net social benefit for at least some types of contingent liabilities—i.e. there is more social benefit to fund the instrument than to fund other IDA expenditure. This depends heavily on the extent to which the social benefit of spending on post-disaster losses (i.e. the contingent liability falling due) is higher than that for other IDA expenditure. The central assumption for the benefit of spending on post-disaster losses is that it is four times the World Bank's expected average benefit from other spending.
- Under some circumstances, including baseline assumptions, the proposed alternative instrument is more economically efficient than existing instruments, for all but the most likely contingent liabilities. This advantage is reduced or eliminated if insurance costs are higher, and reduced or eliminated if a country's cost of borrowing rises, as this cost is paid by the instrument.

## KEY FINDING:

**The proposed alternative instrument could finance contingent liabilities more cost effectively than existing IDA instruments, once the full opportunity cost of undisbursed IDA is taken into account.** We also demonstrate how this instrument could be constructed by combining instruments already available to IDA countries, and suggest how analysis could be extended to examine additional instrument types, or combinations of instruments.

# ● INTRODUCTION

## BACKGROUND AND OBJECTIVES

The Government Actuary's Department (GAD) has prepared this paper as a contribution to global analysis; the conclusions of this paper should not be interpreted as policy advice.

A number of commentators have stated that, after a disaster, spending the World Bank's International Development Association (IDA) funds on financing disaster losses, rather than normal IDA projects, would be more financially efficient.<sup>1,2</sup>

Contingent liabilities are financial risks that are uncertain in timing and amount, but where there is a future commitment to meet the losses if specific conditions are met, or certain events happen.<sup>3</sup> Advanced public financial management systems typically include ways for the public sector to take explicit contingent liabilities on to their balance sheets in a cost-effective way.

### Explicit Contingent Liabilities

In this report we refer to 'Explicit Contingent Liabilities'. We define this term as an agreed future payment, or set of payments, made if a particular event or disaster occurs. The agreement sets out how the funds will be used and includes mechanisms to ensure this will happen (known as 'hard triggers').

IDA includes a number of mechanisms for discretionary reallocations within the IDA envelope to respond to disasters, but it has limited ways to commit to future losses from contingent liabilities. Here we illustrate gaps in the IDA instrument set, by proposing an example of **an alternative instrument**, which uses the payout from an insurance policy to buy down the cost of a commercial loan to concessionary IDA terms. This paper tests whether extending the range of IDA instruments could increase economic efficiency for financing explicit contingent liabilities of different characteristics.

We have not commented on the practicalities of implementation of this alternative instrument, and this would need to be assessed before any implementation. This paper is inspired by the contingent liabilities from natural disasters, but the principles could carry over to other types of contingent liability.

## THE COST-BENEFIT ANALYSIS

This paper presents a simplified cost-benefit analysis, comparing the economic efficiency of existing and potential IDA instruments, for a range of risks of different likelihoods. For example, we present the results for regularly occurring risks with lower-value losses, as well as more remote risks with catastrophic losses.

<sup>1</sup> Clarke D and Dercon S (2019). Beyond Banking: Crisis risk finance and development insurance in IDA19, Centre for Disaster Protection. Clarke D and Dercon S (2016) Dull Disasters, Oxford University Press.

<sup>2</sup> <https://www.cgdev.org/publication/payouts-for-perils-how-insurance-can-radically-improve-emergency-aid-report>

<sup>3</sup> <https://www.gov.uk/government/publications/contingent-liability-approval-framework>

## PARAMETERS

The analysis only considers the financing of explicit contingent liabilities where funding is non-discretionary and there is a strict future commitment to meet any losses that materialise. This means the instruments considered are such that contingent finance is agreed in advance, before any potential disaster, and is triggered based on objective rules to fund pre-agreed contingency plans.

The economic cost and opportunity of each instrument relies heavily on the assumptions we have used. The appropriate assumptions for instruments used by specific IDA-eligible countries will depend on the context, and there may be additional factors to consider. We present the baseline results for a set of best-estimate assumptions, as well as some alternative scenarios in which we explore the impacts of adjusting the material assumptions.

This paper complements the work done previously, including work carried out by the World Bank and GAD, in evaluating the opportunity cost of risk-financing instruments. In comparison to the framework presented by the World Bank in “Evaluating Sovereign Disaster Risk Finance Strategies: A Framework”, which demonstrated a way to derive an optimal combination of instruments for a country to meet a defined contingent liability, this paper compares the economic effectiveness of each instrument, in order to help understand how the contingent liability characteristics impact on this.

## THE STRUCTURE OF THE PAPER

This paper first sets out a summary of the instruments we have analysed, and the theoretical basis for our calculations. The analysis is then presented in a set of graphs using our chosen baseline assumptions, followed by alternative assumptions to show the sensitivity of the results to these. Further detail on our model and the associated assumptions used is provided in a Technical Appendix.

# 1

## SECTION 1: BASIS FOR ANALYSIS

### 1.1 FINANCIAL AND BUDGETARY REQUIREMENTS

The analysis in this paper compares the economic efficiency of existing and potential IDA instruments in meeting explicit contingent liabilities for a range of risk types. We have taken IDA’s broad instrument set (Instruments 1 to 3, below) and considered the efficiency of using such instruments to finance explicit contingent liabilities (where funding is non-discretionary). In addition to the existing instruments, we have included a potential new instrument (Instrument 4), not currently offered by IDA, but that may be appropriate for managing the costs of some types of risk.

#### Proposed Alternative Instrument

##### *How the instrument works:*

Funds from a country’s IDA envelope are used to purchase a contingent loan on concessionary IDA terms.

##### *How the instrument is constructed:*

The instrument is constructed by purchasing an insurance policy using funds from a country’s IDA envelope, such that a payout is made following a pre-defined risk event or disaster.

The payout is used to buy down the cost of a commercial loan (such as IDA’s Scale Up Facility) to concessionary IDA terms. This mechanism allows the country to access lending on IDA terms over and above their IDA envelope, but incurs the additional cost associated with the loan.

For each instrument, the ability to finance explicit contingent liabilities depends on the explicit agreements—‘hard triggers’—and mechanisms in place,

to ensure the funds are made available at the time of the event and have to be spent on the specific liability. The instruments included in the analysis are:

#### Instrument 1: Unfunded Project Component

Ex-post reallocations are made from within the IDA country envelope, from the Crisis Response Window (CRW), or from alternative funding sources. There are currently a number of examples of discretionary reallocations, but no examples of such an instrument being used to meet explicit contingent liabilities, which we are analysing here.

This instrument often requires the reallocation of programmed funds, which can have a detrimental impact on development objectives. (It is noted, however, that there may be circumstances where this reallocation may be helpful to policymakers if, for example, they need to meet spending targets. We have not allowed for this in our analysis.)

#### Instrument 2: Pre-Funded Contingent Project—with Undisbursed Balance Reallocated

Funding from within the country’s IDA envelope is ring-fenced, and only accessed in the case of the contingent liability materialising (e.g. the occurrence of the specified disaster). Any undisbursed balance from the project is reallocated to other IDA expenditure.

One example of this type of instrument is IDA’s approach to financing contingent expenditures under the Third Northern Uganda Social Action Fund (NUSAF III), in Uganda. In this case, an amount of IDA is ring-fenced to fund up to the maximum possible expenditure, and any unspent balances are reallocated to scaling-up the safety net programme, to cover more individuals in the final year of the project.

### Instrument 3: Insurance Policy— Payout Directly for Losses

An insurance policy purchased using funds from a country’s IDA envelope, such that a payout is made following a pre-defined risk event or disaster. Insurers charge a premium to take on the risk, and the value of this instrument depends on this cost. The payout is used to meet the disaster losses.

### Instrument 4: Insurance Policy—Contingent Loan on Concessionary IDA Terms

Funds from a country’s IDA envelope are used to purchase a contingent loan, on concessionary IDA terms. We have constructed this by purchasing an insurance policy using funds from a country’s IDA envelope, such that a payout is made following a pre-defined risk event or disaster. The payout is used to buy down the cost of a commercial loan to concessionary IDA terms. This

mechanism allows the country to access lending on IDA terms, over and above their IDA envelope, but incurs the additional cost associated with the loan.

Instruments 3 and 4 are exposed to credit risk, which is the risk that the insurance policy does not payout due to insurer insolvency. This risk can be mitigated by transferring the risk to an insurer with a strong credit rating. A higher credit rating will come at a cost. Therefore, one can consider the impact of higher or lower credit risk on our analysis by changing our assumption about the price of insurance. Increasing the cost will correspond to testing an instrument with lower credit risk. Instruments 1 and 2 sit on IDA’s balance sheet, and therefore there is limited credit risk.

A summary of the features of these instruments is presented in Table 1, below.

**Table 1: Instrument features**

INSTRUMENT	FUNDS REALLOCATED ON RISK EVENT	FUNDS REALLOCATED IF NO RISK EVENT	FUNDS AVAILABLE IF NO RISK EVENT	INSURANCE BASED	INCREASES DEBT (ON RISK EVENT)	FUNDS EXPLICIT CONTINGENT LIABILITY
1. Unfunded project component	X		X			
2. Pre-funded contingent project—with undisbursed balance reallocated		X	X			[X]
1. Unfunded project component				X		[X]
2. Pre-funded contingent project—with undisbursed balance reallocated				X	X	[X]

(X) = Potential for funding explicit contingent liability if there is explicit agreement with hard triggers.

## 1.2 THEORETICAL FRAMEWORK

The basis for our analysis is that the total social benefit from US\$1 of IDA expenditure on post-disaster losses is greater than the social benefit were this money to be spent on other IDA expenditure. Our baseline assumption set assumes that the total social benefit from US\$1 of IDA expenditure on the post disaster losses is US\$2, compared with US\$1.25 (based on the World Bank’s internal rate of return) on other IDA expenditures. For each instrument above, the analysis

shows the additional benefit created over the alternative of other IDA spent when financing an explicit contingent liability.

We represent the type of risk by the ‘return period’, which describes the severity of risk in terms of how many years may pass between the occurrences of risks of at least that size. This is summarised in Table 2, below.

**Table 2: Return periods with corresponding time frames and probabilities in one year**

RETURN PERIOD	AVERAGE NUMBER OF YEARS BETWEEN RISK OF THIS SIZE OR GREATER OCCURRING	PROBABILITY OF EVENT OCCURRING IN ANY YEAR
1 in 1 year	1 year	100%
1 in 2 year	2 years	50%
1 in 5 year	5 years	20%
1 in 10 year	10 years	10%
1 in 20 year	20 years	5%
1 in 100 year	100 years	1%

As this is a simplified assessment, we have deliberately not allowed for a number of effects, including the timing of costs and benefits, and the advantages and disadvantages of each of the instruments in providing prompt finance after a loss event.

Further detail on our model and its associated assumptions is provided in a Technical Appendix.

# 2

## SECTION 2: ANALYSIS UNDER BASELINE ASSUMPTIONS

The detailed methodology used to generate the analysis below is documented in the Technical Appendix at the end of this note.

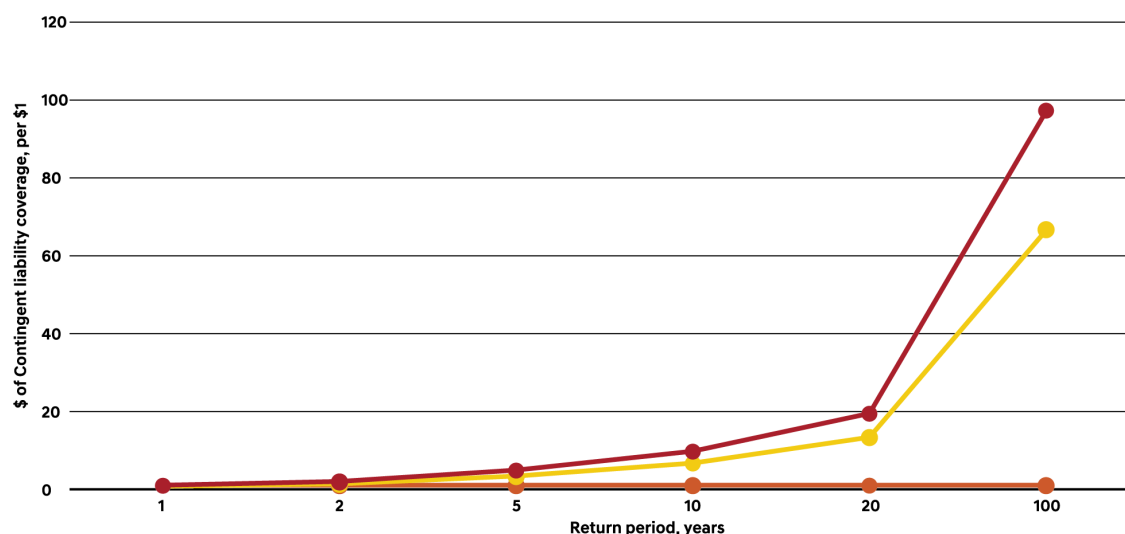
### 2.1 INSTRUMENT COVERAGE

Coverage for an instrument is the amount of liability which is funded by US\$1 of IDA allocated to the instrument. It is more important to use instruments with higher coverage when funding contingent liabilities which have a combination of larger return periods (lower probabilities) and larger amounts. Graph 1 shows the contingent liability coverage per US\$1 of IDA expenditure for losses of increasing return period.

- The non-insurance linked instruments (1 and 2), provide a fixed coverage of US\$1 (the orange line is just above the x-axis). Therefore, for every US\$1 of IDA invested to cover a specified risk, these instruments can only ever cover losses up to US\$1.

- For the insurance-based instruments (3 and 4), the coverage increases with the return period. This is because it is generally cheaper to insure an event that is less likely to happen. This implies that for US\$1 of IDA invested in an insurance-based instrument, the amount of liability covered will increase as the likelihood of the liability becoming due reduces. The coverage is greater for instrument 4 than for 3 (the blue line versus the yellow line), as instrument 4 uses the payout to leverage further lending, which provides more funding to cover losses.

**Graph 1: Contingent liability coverage, per US\$1 of IDA allocated to the contingent liability of different return periods.**



- Unfunded project
- Pre-funded contingent project, with undisbursed balance reallocated
- Insurance policy
- Insurance policy, to buy down a post-disaster loan

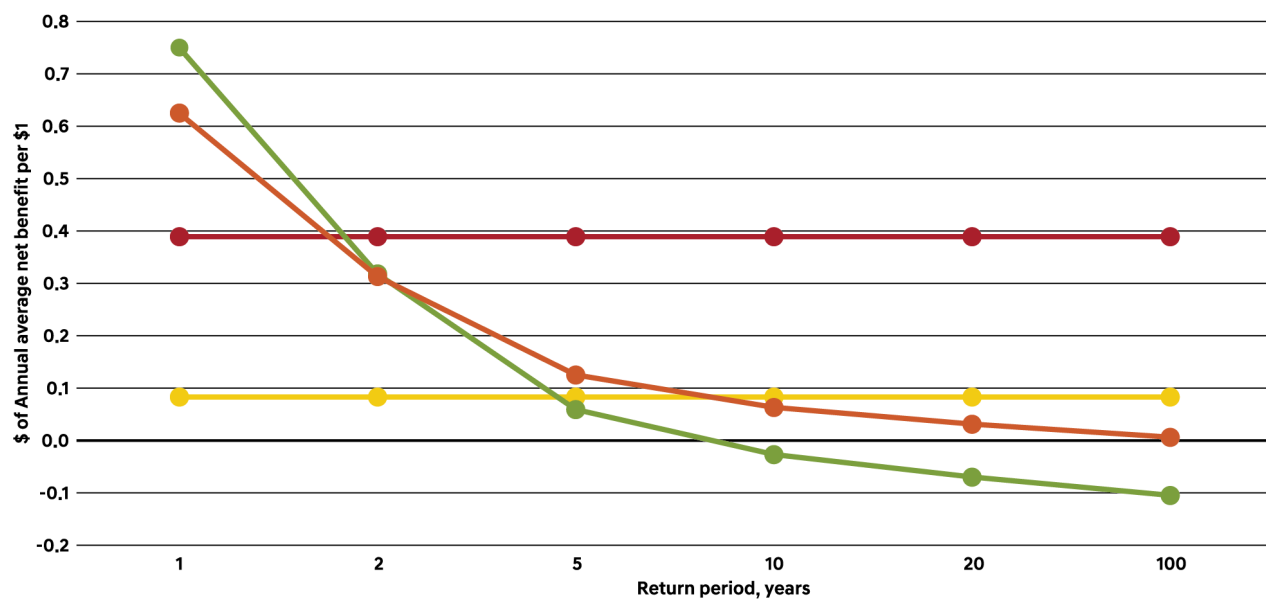
**Analysis conclusion:** Insurance-based instruments provide higher coverage as the event likelihood reduces (the return period increases)

## 2.2 NET BENEFIT OF THE INSTRUMENTS

We have defined the benefit for an instrument as *the social benefit from US\$1 of expenditure*. In order to estimate benefit, we have compared the expected benefit of the instrument net of costs, with the assumed benefit of US\$1 of typical IDA expenditure. This is explained in more detail in the Technical Appendix. Graph 2, below, shows the annual average net benefit per US\$1 of IDA on our chosen baseline assumptions. Higher values indicate more beneficial instruments.

- This analysis demonstrates that the most appropriate instrument to use to finance explicit contingent liabilities will depend on the size and frequency of these risks, with no single instrument performing the best for all risks.
- This demonstrates that, under our assumptions, instrument 4 (which is not currently available with IDA), is more beneficial than any other instruments analysed above a return period of two years.

**Graph 2: Annual average net benefit (relative to normal IDA investments), per US\$1 of IDA allocated to the contingent liability of different return periods.**



- Unfunded project
- Pre-funded contingent project, with undisbursed balance reallocated
- Insurance policy
- Insurance policy, to buy down a post-disaster loan

**Analysis conclusion:** Insurance-based instruments provide expected net benefit that doesn't change with disaster event likelihood (return period). In contrast, the

net benefit of the other instruments reduces as the chance of a disaster event reduces.

# 3

## SECTION 3: ALTERNATIVE SCENARIOS

The most beneficial instrument for any particular event will depend on the context, not just the type of risk. Below, we demonstrate how the results of the analysis depend on the chosen input assumptions.

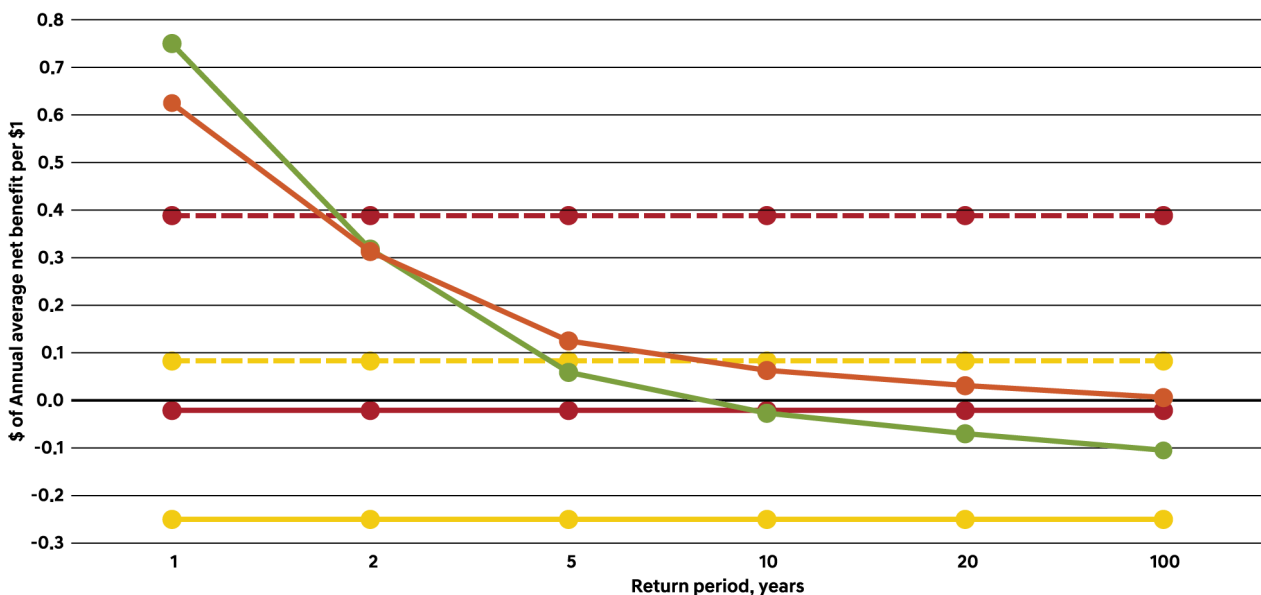
### 3.1 SCENARIO 1 – INSURANCE IS MORE EXPENSIVE

If the cost of insurance is increased—for example, if insurers aim to increase their return on providing policies—then the net benefit of the insurance-based instrument decreases.

Graph 3, below, summarises the impact on the instruments modelled; the net benefit under the baseline

assumptions is denoted by the dotted line. In this scenario, the insurance multiple has been increased from 1.5 to 2. Instruments 3 and 4 are less beneficial at all return periods, although the net benefit is still greater than some other instruments for high-severity, low-probability risks.

**Graph 3: Annual average net benefit, per US\$1 of IDA allocated to the contingent liability of different return periods, with the cost of insurance increased.**

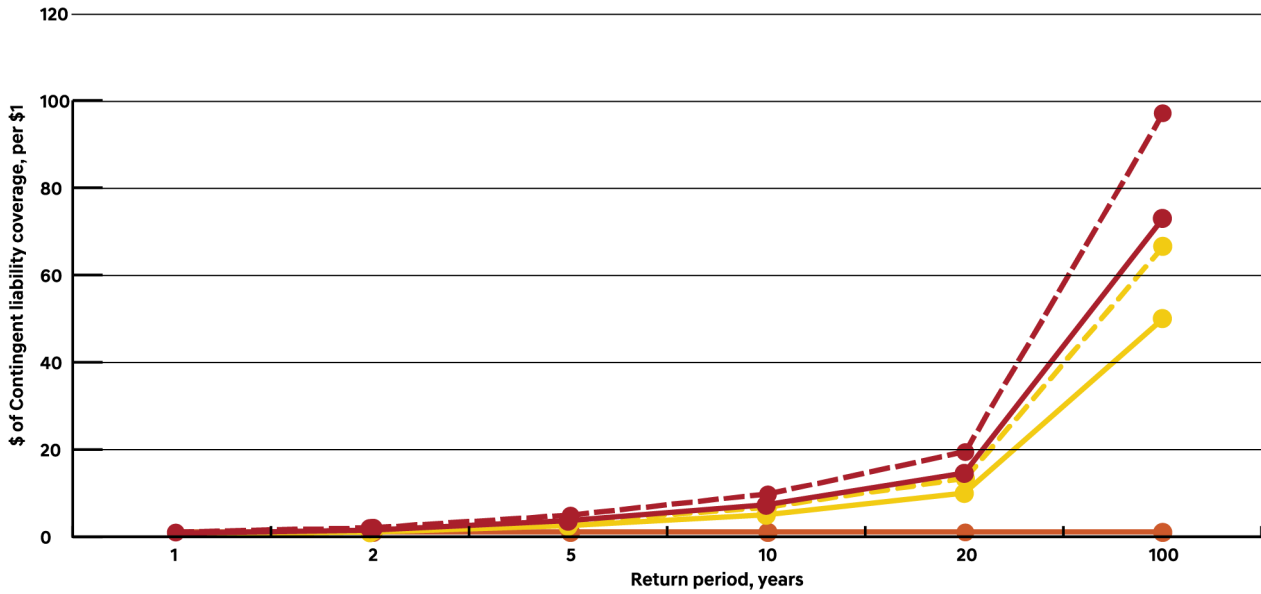


- Unfunded project
- Pre-funded contingent project, with undisbursed balance reallocated
- Insurance policy
- Insurance policy - Baseline assumptions
- Insurance policy, to buy down a post-disaster loan
- Insurance policy, to buy down a post-disaster loan - Baseline assumptions

Increasing the insurance multiple reduces the coverage provided by the insurance-based instruments. Graph 4, below, summarises this effect. As in Graph 3, the

coverage under the baseline assumptions are denoted by dotted lines.

**Graph 4: Coverage, per US\$1 of IDA allocated to the contingent liability of different return periods, with the cost of insurance increased.**



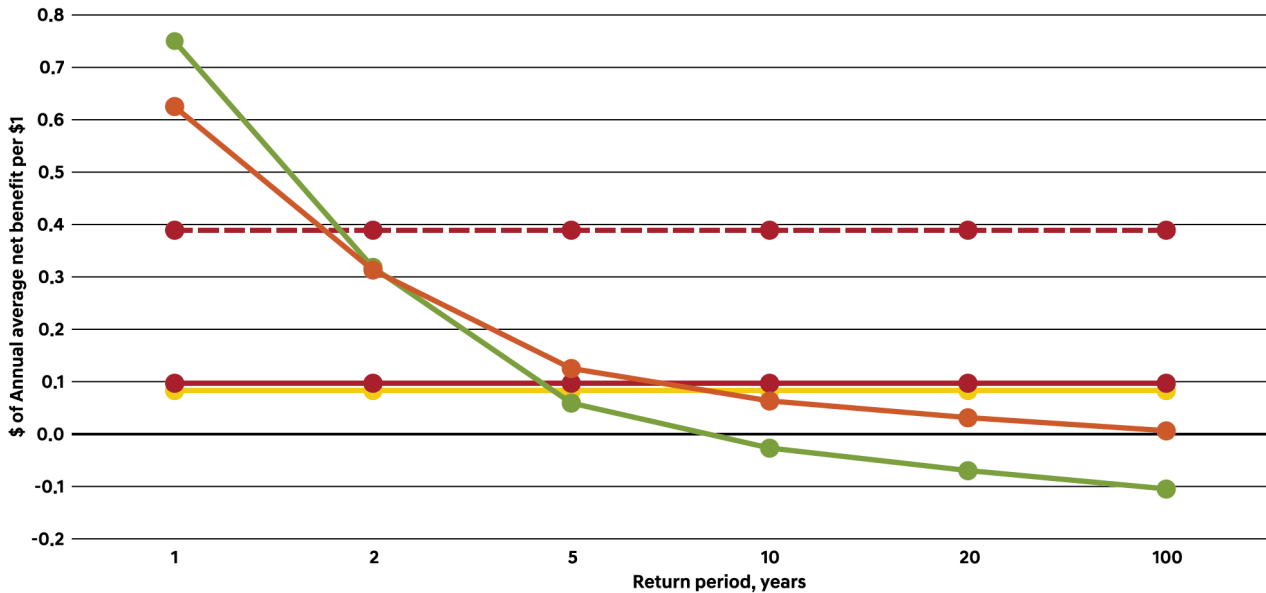
- Unfunded project
- Pre-funded contingent project, with undisbursed balance reallocated
- Insurance policy
- Insurance policy - Baseline assumptions
- Insurance policy, to buy down a post-disaster loan
- Insurance policy, to buy down a post-disaster loan - Baseline assumptions

### 3.2 SCENARIO 2 – COMMERCIAL LENDING IS MORE EXPENSIVE

Countries may take different approaches to setting their discount rate, and the rates at which they can borrow will also vary. As the cost of commercial lending increases above the discount rate, the benefit of Instrument 4 is

expected to decrease. Graph 5 shows the impact of doubling the cost of lending. The benefit of Instrument 4 over Instrument 3 has been reduced to effectively nil, as the cost of the commercial loan has increased.

**Graph 5: Annual average net benefit, per US\$1 of IDA allocated to the contingent liability of different return periods, with the commercial interest rate higher than the discount rate.**



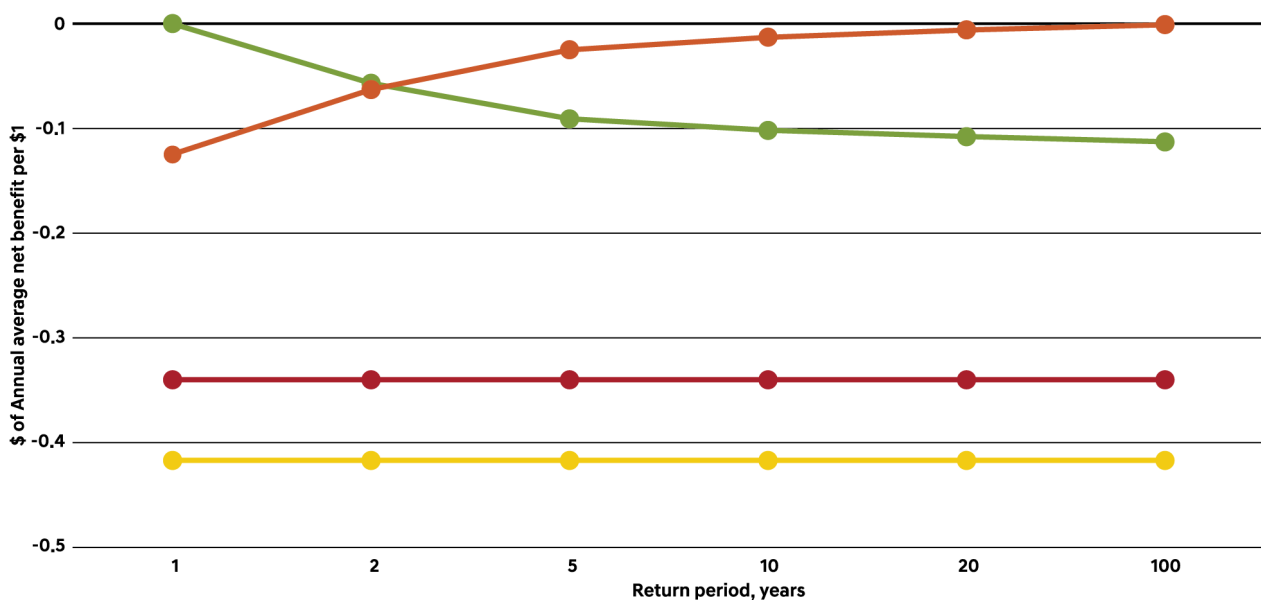
- Unfunded project
- Pre-funded contingent project, with undisbursed balance reallocated
- Insurance policy
- Insurance policy - Baseline assumptions
- Insurance policy, to buy down a post-disaster loan
- - - - Insurance policy, to buy down a post-disaster loan - Baseline assumptions

### 3.3 SCENARIO 3 – IDA EXPENDITURE BENEFITS POST-DISASTER ARE NO GREATER THAN OTHER IDA EXPENDITURE

In this scenario, we assume that the benefit of expenditure on contingent liabilities is no greater than other IDA expenditure – i.e. the total social benefit from US\$1 of IDA expenditure on the post-disaster losses and on other expenditure is US\$1.25.

In this case, all instruments have negative annual average net benefits, at each risk level. This is because the expense associated with reallocating funds is not compensated with greater returns on expenditure to fund disaster-contingent liability. This is shown in Graph 6, below.

Graph 6: Annual average net benefit, per US\$1 of IDA allocated to the contingent liability of different return periods, with contingent liability expenditure of no greater benefit than typical expenditure.



- Unfunded project
- Pre-funded contingent project, with undisbursed balance reallocated
- Insurance policy, to buy down a post-disaster loan
- Insurance policy

# 4

## SECTION 4: NEXT STEPS: FUTURE ANALYSIS AND INSTRUMENTS

We have developed a simple cost-benefit analysis, to test how a range of financial and budgetary instruments provide financial protection against different types of risk. We also propose an alternative instrument, highlighting a potential gap in the IDA instrument set.

This simple analysis can be developed further, to incorporate additional instrument types, or combinations of the above instrument types. The analysis could also be developed to allow for more sophisticated approaches and assumptions. For example, analysis could consider:

- An instrument which is a combination of contingent credit and insurance, where contingent credit is taken for expenditures up to some level, and IDA provides insurance for expenditures above that. Insurance would be fully hedged, using fully collateralised capital market instruments.
- IDA itself acts as an insurer (intermediary), using part of a country's IDA envelope to offer contingent funding to countries, and fully hedging its exposure using fully collateralised capital market instruments.
- IDA itself acts as an insurer (intermediary), using part of a country's IDA envelope to offer contingent funding to countries, retaining some risk using a new capital base separate to IDA's, and hedging its exposure above some level using fully collateralised capital market instruments.

## ● TECHNICAL APPENDIX

### APPROACH TO COST-BENEFIT ANALYSIS

**A.1** We have developed a simple economic model to perform a cost-benefit analysis of the four chosen instrument types. This model is assessed under a set of clearly defined baseline assumptions.

**A.2** The model is heavily reliant on the following two assumptions:

- The total social benefit measured in US\$ from US\$1 of typical IDA expenditure in a normal year ( $B_1$ ). For example, this is the benefit of IDA expenditure on other IDA projects, pre-disaster.
- The total social benefit from US\$1 of post-disaster expenditure to finance the losses from an explicit contingent liability ( $B_2$ ). For example, this is the benefit from a payout from either of the four instruments, used to meet losses from a natural disaster.

**A.3** We assume that if the US\$1 of IDA were not spent on financing the chosen specific contingent liability, it would otherwise be spent on normal IDA activities. We therefore present the net benefit of each instrument relative to the benefit of typical IDA expenditure.

**A.4** To keep the model simple, we have ignored the additional benefits from managing risk well (i.e. setting aside finance pre-disaster). Given this, the model is likely to be underestimating the benefits from these instruments, relative to typical IDA expenditure.

**A.5** At a high level, the annual net benefit (relative to other IDA expenditure) is calculated as follows.

CL coverage from \$1 of IDA allocation ×  
Benefit of this spend ( $B_2$ ) × Probability  
*plus* Residual benefit of undisbursed IDA  
allocation ( $B_1$ ) × (1 - Probability)  
*less* Any additional cost of this coverage ×  
Probability  
*less* Benefit if IDA was spent on regular  
expenditure ( $B_1$ )

This is then represented mathematically in  
Table 4, below.

**A.6** In this case, 'Probability' is defined as the likelihood of the contingent liability crystallising, so, for example, if we want to cover the contingent liability from an event with a return period of 5 years, the probability would be 20% (see Table 3).

## PARAMETERS

A.7 Table 3, below, sets out the parameters and the values attributed in our baseline.

**Table 3: Model parameters and baseline assumptions set**

PARAMETER	DESCRIPTION	BASELINE ASSUMPTION
$B_1$	<b>Benefit from normal IDA expenditure:</b> the total social benefit from US\$1 of typical IDA expenditure.	This parameter is set to <b>1.25</b> . This is based on the latest available estimate of the internal rate of return on World Bank projects of 25%. <sup>4</sup>
$B_2$	<b>Benefit from IDA expenditure on post-disaster-contingent liability:</b> the total social benefit from US\$1 of IDA expenditure on a contingent liability.	This parameter is set to <b>2</b> . After a disaster there will typically be a whole range of potential investments, some with very high internal rates of return (i.e. key transportation/energy infrastructure) and some with 'normal' internal rates of return (i.e. similar to the value proposed for $B_1$ ). The range might therefore be somewhere above 1.25. We have used a central estimate of 2, but have included an alternative scenario in section 5 to show the impact of reducing this assumption to 1.25.
$R$	<b>Return period:</b> this defines the expected magnitude of a loss. A loss with return period 100 indicates that there is a 1 in 100 chance of a loss of at least that size. Alternatively, an event of this size can be described by a probability of $1/R$ , so 1/100.	The model is evaluated at the following return periods: <b>2, 5, 10, 20</b> and <b>100</b> years. We have selected this wide range to show how the instruments performed for a range of risks types.
$N$	<b>Payback period:</b> the term over which any commercial or IDA lending must be paid back.	We assume that $N$ is <b>30 years</b> for both the commercial and IDA loan. This is broadly in line with the terms of current IDA loans. <sup>5</sup>
$c$	<b>IDA lending rate:</b> cost of lending from within a countries IDA envelope.	In our model, US\$1 of IDA is assumed to be US\$1 of IDA credit at interest rate of <b>0%</b> .
$i$	<b>Marginal interest rate on sovereign borrowing:</b> the average commercial borrowing rate on government debt portfolio.	<b>10%</b> . This rate is based on the cost of borrowing for a typical developing country. We have used 10% for illustration, but the rate could be higher or lower and will vary by country. This differs to the cost of IDA lending which is assumed to be fully concessional (i.e. interest rate of 0%).

<sup>4</sup>[http://siteresources.worldbank.org/EXT/TOED/Resources/cba\\_full\\_report.pdf](http://siteresources.worldbank.org/EXT/TOED/Resources/cba_full_report.pdf), note that this is no longer reported

<sup>5</sup>[https://ida.worldbank.org/sites/default/files/pdfs/ida\\_terms\\_effective\\_july\\_27\\_2017\\_updated\\_with\\_change\\_in\\_ibrd\\_fixed\\_spread.pdf](https://ida.worldbank.org/sites/default/files/pdfs/ida_terms_effective_july_27_2017_updated_with_change_in_ibrd_fixed_spread.pdf)

PARAMETER	DESCRIPTION	BASELINE ASSUMPTION
$d$	<b>Annual discount rate:</b> the rate at which money loses its value over time.	<b>10%.</b> For simplicity, we have assumed the discount rate used by government for future cashflows is in line with the marginal interest rate on sovereign borrowing. In practice this could be higher or lower.
$m$	<b>Insurance pricing multiple:</b> the additional margin charged by an insurer when pricing the risk.	We assume a pricing multiple of <b>1.5</b> . This will depend heavily on the capacity for risk in the relevant market. We have included an alternative scenario in Section 5, to show the impact of an increase in the cost of insurance

## FORMULAE

**A.8** In this section, we present the instruments to be considered, how much coverage they would offer per US\$1 of IDA allocation, how much IDA would be disbursed per US\$1 of IDA allocation, and the annual average net benefit to the country from using this instrument, as compared to investing in other IDA projects. The resulting formulae are summarised in Table 4, below.

### Option 1: Unfunded Project Component – Financed by Budget Reallocation

**A.9** In this option, any contingent liability is assumed to be financed by an emergency budget reallocation from existing IDA projects. We assume that emergency budget reallocations are costly, because they disrupt normal development programming. Specifically, we assume that for every US\$1 reallocated from another project on an emergency basis, the social cost of this emergency budget reallocation is  $dB_1$ . When a contingent liability doesn't materialise, the project isn't disrupted and has benefit  $B_1$ . Allowing for the probability of a contingent liability materialising of  $1/R$ , the total expected annual average net benefit to a country of using IDA in this way instead of just investing it in normal IDA projects is (as the formula in A.5 above):

$$1 \times B_2 \times \frac{1}{R} + B_1 \times \left(1 - \frac{1}{R}\right) - dB_1 \times \frac{1}{R} - B_1$$

$$= \frac{B_2 - B_1 \times (1 + d)}{R}$$

### Option 2: Pre-funded Contingent Project Component – with Undisbursed Balance Reallocated to Other IDA Projects

**A.10** In this option, we assume that IDA is set aside for a one-year period. If the contingent liability materialises, it funds that liability, resulting in a benefit of  $B_2$ . If the contingent liability doesn't materialise, it is reallocated at the end of the year to other IDA projects, resulting in a benefit of  $B_1$  at the end of the year, equivalent to a discounted benefit of  $B_1/(1+d)$ . Allowing for the probability of a contingent liability materialising of  $1/R$ , the total expected annual average net benefit to a country of using IDA in this way (instead of just investing it in normal IDA projects) is:

$$B_2 \times \frac{1}{R} + \frac{B_1}{1+d} \times \left(1 - \frac{1}{R}\right) - B_1$$

### Option 3: Insurance Policy – Payout Directly for Losses

**A.11** We assume that US\$1 of IDA is used to purchase insurance coverage. We assume that the premium for insurance is calculated as:

$$\text{Premium} = \text{Coverage} \times \text{Probability} \times \text{multiple}$$

**A.12** Rearranging this and substituting in a premium of US\$1, probability of  $1/R$ , and multiple of  $m$  gives:

$$\text{Coverage} = \frac{R}{m}$$

This can be checked for consistency with our default assumptions, based on a premium of US\$1. If Coverage = \$20,  $R = 30$ , and  $m=1.5$ , the premium is

$$\text{US\$}20 \times \frac{1}{30} \times 1.5 = \text{US\$}1$$

**A.13** So, a premium of US\$1 allows coverage of  $R/m$ . If the contingent liability materialises, the benefit from this is  $B_2 \times R/m$ . If the contingent liability doesn't materialise, the benefit is zero. Allowing for the probability of a contingent liability materialising of  $1/R$ , the total expected annual average net benefit to a country of using IDA in this way (instead of just investing it in normal IDA projects) is:

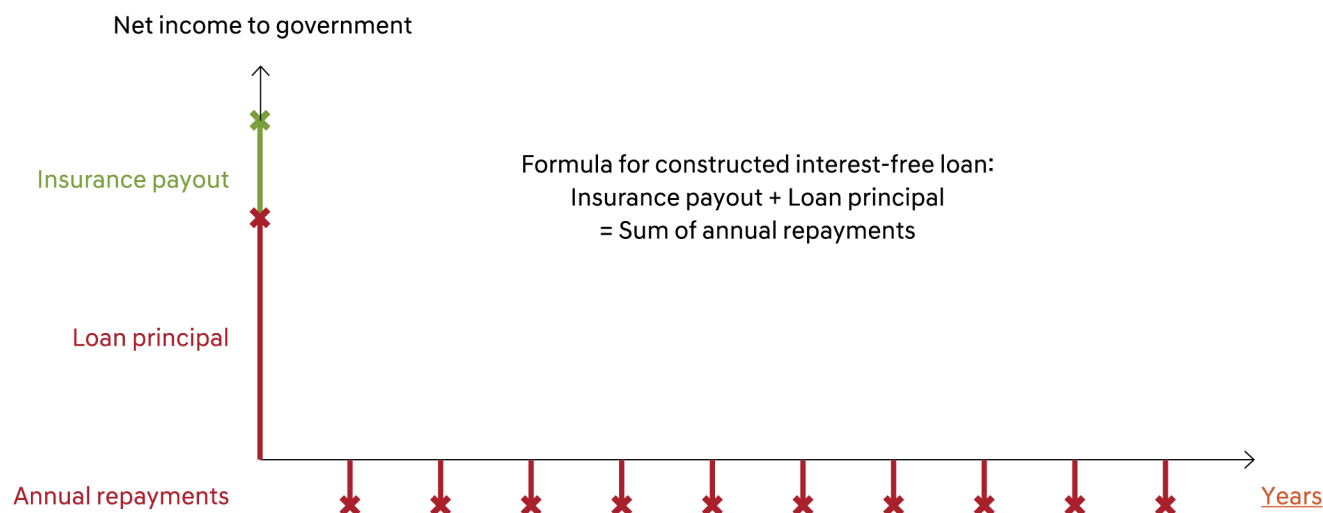
$$B_2 \frac{R}{m} \times \frac{1}{R} - B_1 = \frac{B_2}{m} - B_1$$

**Option 4: Interest-Free Contingent Credit-Financed by IDA, Insurance and the Scale-Up Facility**

**A.14** In this option we assume that US\$1 of IDA is used to purchase insurance coverage. So, the use of IDA allocation is identical to that in Instrument 3.

**A.15** However, we also assume that if the contingent liability materialises, IDA is able to combine a commercial loan (for example, provided through IDA's scale-up facility) with the insurance payout to 'create' an interest-free loan. It does this by adding the insurance payout to a specific amount of commercial loan, so that the insurance payout plus the commercial loan principal together are equal to the total repayments due under the commercial loan (Figure 1). This ensures that the constructed loan is interest free.

**Figure 1: Illustration of how in the event of an insurance payout, insurance plus a commercial loan can combine to create an interest-free loan**



**A.16** If the contingent liability doesn't materialise, there is no insurance payout, and no additional commercial loan.

**A.17** As before, US\$1 of IDA buys insurance with coverage of  $R/m$ . Using actuarial notation

$$a_{\overline{N}|}^i = \frac{1 - (1 + i)^{-N}}{i}$$

we first show that if this payout (or coverage) is combined with a commercial loan of amount

$$\text{Loan amount} = \frac{R}{m} \times \frac{a_{\overline{N}|}^i}{N - a_{\overline{N}|}^i}$$

then the combination of this loan and the insurance payout of  $R/m$  combines to produce an interest-free loan with term  $N$ .

**A.18** For a capital repayment loan of the above loan amount with term  $N$  years and commercial interest rate  $i$ , repayable annually in arrears, the annual repayments are given by:

$$\frac{R}{m} \times \frac{a_{\overline{N}|}^i}{N - a_{\overline{N}|}^i} / a_{\overline{N}|}^i = \frac{R}{m} \times \frac{1}{N - a_{\overline{N}|}^i}$$

**A.19** Since the term of the loan is  $N$  years, the total amount to be repaid under the loan terms is given by:

$$\text{Total cumulative repayments} = N \times \frac{R}{m} \times \frac{1}{N - a_{\overline{N}|}^i}$$

**A.20** If the loan is to be interest-free, the loan amount plus insurance coverage should equal the total cumulative repayments. Adding the loan amount to the insurance coverage gives:

$$\frac{R}{m} \times \frac{a_{\overline{N}|}^i}{N - a_{\overline{N}|}^i} + \frac{R}{m} = \frac{NR}{m(N - a_{\overline{N}|}^i)}$$

which is identical to the formula for the total cumulative repayments shown in A.19 above.

**A.21** So, US\$1 of IDA can be converted for  $\frac{NR}{m(N - a_{\overline{N}|}^i)}$  of coverage of contingent interest-free loan.

**A.22** If the contingent liability materialises, the benefit from this is

$$B_2 \times \frac{NR}{m(N - a_{\overline{N}|}^i)}$$

and in addition to using US\$1 of IDA, the government must repay

$$\frac{R}{m(N - a_{\overline{N}|}^i)}$$

per year for  $N$  years, resulting in an additional discounted cost of

$$\frac{R}{m(N - a_{\overline{N}|}^i)} \times a_{\overline{N}|}^d$$

**A.23** If the contingent liability doesn't materialise, the benefit is zero.

**A.24** Allowing for the probability of a contingent liability materialising of  $1/R$ , the total expected annual average net benefit to a country of using IDA in this way (instead of just investing it in normal IDA projects) is:

$$\frac{1}{R} \times B_2 \times \frac{NR}{m(N - a_{\overline{N}|}^i)} - \frac{1}{R} \times \frac{R}{m(N - a_{\overline{N}|}^i)} \times a_{\overline{N}|}^d - B_1$$

$$= \frac{NB_2 - a_{\overline{N}|}^d}{m(N - a_{\overline{N}|}^i)} - B_1$$

## SUMMARY OF FORMULAE

A.25 We summarise the above formulae in the following Table 4

**Table 4: The simple economic model – we assume costs accrue annually in advance, and benefits accrue annually in arrears.**

INSTRUMENT	CONTINGENT LIABILITY COVERAGE (US\$), PER US\$1 OF IDA ALLOCATED TO CONTINGENT LIABILITY	ANNUAL AVERAGE NET BENEFIT TO COUNTRY (US\$) OF USING IDA IN THIS WAY INSTEAD OF JUST INVESTING IT IN NORMAL IDA PROJECTS.
Unfunded Project Component – financed by budget reallocation	1	$\frac{B_2 - B_1 \times (1 + d)}{R}$
Pre-funded Contingent Project Component – with undisbursed balance reallocated to other IDA projects	1	$B_2 \times \frac{1}{R} + \frac{B_1}{1 + d} \times \left(1 - \frac{1}{R}\right) - B_1$
Insurance policy – payout directly for losses	$\frac{R}{m}$	$\frac{B_2}{m} - B_1$
Interest-free contingent credit – financed by IDA, insurance and the Scale-Up Facility	$\frac{R}{m} \times \frac{N}{N - a_{\overline{N} }^i}$ where $a_{\overline{N} }^i = \frac{1 - (1 + i)^{-N}}{i}$	$\frac{NB_2 - a_{\overline{N} }^d}{m(N - a_{\overline{N} }^i)} - B_1$



**Cover image:** Schoolchildren at a refurbished school near Sukkur, Pakistan.  
Picture: DFID

