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Risk Management of Contingent Liabilities and Public Debt: A New Approach for Commonwealth Member Countries

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Introduction

The subject matter of sovereign contingent liability (CL) risk management has been receiving increasing attention, since it is widely acknowledged that it poses potential hidden fiscal risks.¹ These risks arise as a result of the uncertainty of: (i) whether the CL risk event(s) will materialise; (ii) the precise timing of the occurrence of the event leading to ownership of an obligation; and (iii) the exact amount of this obligation. Notwithstanding this, it is unsurprising that more countries are making use of contingent liabilities. The primary reason for this is that they are balance sheet neutral (from a cash-based accounting perspective), which provides the incentive to use this mechanism over direct lending to achieve policy objectives.

This paper presents a framework within which active risk management of contingent liabilities can be undertaken in a manner that covers the lifespan of the liability and which also incorporates the portfolio effects of other liabilities. This is achieved by providing various frameworks for the calculation of provisions, as well as a general framework for CL risk management.

The motivation for the current work stems from observations as to the relative infancy of contingent liability risk management among less-developed Commonwealth countries. Few of these countries employ quantitative methods to assess the likelihood of occurrence of CL risks or levels of severity of CL costs in a manner that lends itself to rigorous analysis and that is integrated within a framework facilitating continuous/dynamic risk management. This is the novelty of the proposed approach.

What is a contingent liability?

Based on the Government Finance Statistics Manual (GFSM 2014) 'Contingent liabilities are obligations that do not arise unless a particular, discrete event(s) occurs in the future. These contingencies create fiscal risks and may arise from deliberate public policy or unforeseen events'.

Fiscal Risk Matrix

One way of better understanding the relationship between the varied types of fiscal risks is via way of a fiscal risk matrix, as devised by Brixi and Schick (2002) and shown in Table 1.

Table 1 Fiscal risk matrix

Liabilities	Direct	Contingent
Explicit	Foreign or domestic sovereign borrowing	Government guarantees for non-sovereign borrowing, trade and exchange rate guarantees issued by the government, deposit insurance, income from private pension funds, flood insurance
Implicit	Social security schemes, future public pensions and future health care financing if not required by law	Banking failure (support beyond deposit insurance), bailouts following a reversal in private capital flows

Source: Das, Bisen, Nair and Kumar 2002.

Table 1 shows that traditional public debt liabilities (i.e. explicit and direct) arise as a result of legal or contractual obligations, the timing and quantum of which are (generally) known in advance of the payments associated with the debt.

In relation to negotiated (i.e. explicit) contingent liabilities, one notes that:

- there is an explicit agreement in place for the government to make various types of payments;
- the amounts of the payments are (generally) not known in advance;
- the time at which the payments occur are (generally) not known in advance; and
- the amount of any future payments is (generally) independent of the actions of the sovereign.

In relation to implicit liabilities, the key determinant is the extent to which a government is susceptible to moral suasion. The less likely they are to give in to public pressure, the more likely it is that the implicit liabilities will not become liabilities of the government. This said, it is worthwhile mentioning that economic considerations can also play a significant part in shaping a government's response to the occurrence of a contingent risk event. Take, for

example, the 'great recession' that took place during the period 2007–09, in which various governments around the world bailed-out banks – much to the outrage of the public.

In general, implied liabilities can occur in cases where losses/payments go beyond those of expected levels and it is viewed by the government as 'being in its interest' to satisfy these liabilities. One should note, however, that these liabilities are not only difficult to quantify, but can easily dwarf those of their explicit counterparts.

Medium-term Debt Strategy

A medium-term debt strategy (MTDS) is a plan (usually over a three to five-year period) that a government implements in order to achieve a defined mix of debt financing, within acceptable cost and risk tolerances, in order to meet policy/budget objectives forecast over the term.

A question arises, however, as to how should such an MTDS differ for portfolios with and without CLs.

In the case where the value of the CL is not explicitly analytically calculated, there would be no analytical way in which to determine the likelihood of the CL becoming a direct liability of the government.

In some countries where CLs are accounted for (specifically for guarantees), it is assumed that 100 per cent of the guaranteed amount will become payable by the government. Although conservative, this approach corresponds to a worst-case scenario that over-estimates the commitment by the government and also does not account for developments of the market (and other parameters) which reduce the potential liability of the government. The case of a 100 per cent allocation might also lead to the moral hazard of implying that the government would provide a blanket guarantee for certain types of CLs.

In the case where the CL is not accounted for in the MTDS (which is the case for most Commonwealth countries), it simply would not be possible to assess the impact of the pending obligation on either the cost or risk associated with the chosen debt strategy.

Including CLs into the MTDS provides a more reliable estimate of debt financing costs and risks and reduces the impact of fiscal surprises due to the contingent liability being called

Including CLs into the MTDS provides a more reliable estimate of debt financing costs and risks and reduces the impact of fiscal surprises due to the contingent liability being called. Note that by inclusion, it is not necessarily meant to account for 100 per cent of the potential CL exposure, but at least its expected costs. For example, in the case of a minimum revenue guarantee for a public-private partnership (PPP) project, it might be necessary (under the contractual agreement) for a government to make payments every year (depending on the level of demand for the service

offering under the PPP and some threshold level). If the actualised level (i.e. demand) is less than the threshold, then a payment is made – otherwise there is no payment. If these expected payments can be reliably estimated, then they should be included in the MTDS for each year of the analysis.

In some circumstances, the nature of the CL – e.g. a loan guarantee – does not neatly lend itself to allocating potential costs to a specific year for the purpose of an MTDS analysis. In such cases, the issue of timing could be estimated via a measure such as the average (or weighted average) life of a loan (WAL). Such a measure would determine the weighted average of the times of the principal repayments. Having determined the WAL, a rule could then be employed which allocates the expected costs to a loan with maturity equal to that of the WAL. Thus, the principal amount would equal the expected costs; the interest rate would be that of the guaranteed loan, while the payment frequency would be the same as the loan, etc.

Accounting Standards

Under International Public Sector Accounting Standards (IPSAS),² for accrual accounting there is no requirement for CLs to be recognised as liabilities on the balance sheet unless the event leading to the liability is viewed as likely. 'Likely' in this sense is commonly understood to be greater than 50 per cent. Another condition is that a reliable estimate of the amount of the obligation should be determined.

In the eventuality that the two key features of probable occurrence and reliable estimates are not both met, then it is implied by IPSAS that no provision for the CL would be recorded.

Under accrual accounting, it would be required to make some level of disclosure in the notes to the financial statements (unless the payment possibility is remote).

Under cash accounting, there is no requirement to make any such disclosure.

Statistical reporting standards, such as GFSM, require disclosure of contingent liabilities as memorandum items on the balance sheet.

The lack of prescriptive and/or defined rules for dynamically accounting for CLs makes it possible for fiscal arbitrage to take place. The term 'fiscal arbitrage' is used here in the context that the real risk of lending to a country is hidden and a lower one presented by way of its balance sheet and result of its MTDS if CLs are not properly accounted for. As a consequence of these existing disclosure requirements, it might be possible for a country to obtain funding at more favourable levels (i.e. in terms of amount and costs) than they otherwise would obtain if more full disclosure was required for those operating under cash-based accounting.

Although not universally applied, sovereign lenders should also incorporate the use of provisioning mechanisms into their loan risk management framework

Irrespective of the accounting method adopted by a country, disclosure of contingent liabilities and dynamic/frequent updating of the risks associated with CLs would provide increased levels of transparency, which would work to the benefit of potential creditors. This should also work in favour of borrower countries, in as much as it provides a reminder of the current levels of CL risk that, if accompanied by prudent risk management, would seek to better manage fiscal surprises.

Provisioning Framework

The use of provisions to absorb potential loan losses is a well-established method employed by commercial lending institutions worldwide. As a

rule, the provision covers expected loan losses (EL) due to default, but might also include a buffer to account for some level of variability of the EL – which is often termed unexpected loss (UL).

The concept of a loan provision can be explained through an example. Suppose a government lends funds to one of its public sector entities (PSEs) (e.g. \$100) and after a period of time it is assessed that the PSE might default on its obligation to pay back the outstanding amount (let's also say \$100). If the government believes that it will only get back \$65, then it might make a provision for \$35 – representing the amount of the loss it believes will result from the default. There are a number of ways in which this \$35 could have been derived, but in this paper attention is only paid to provisions based on estimates of probabilities of risk occurrences and costs in the eventuality of those occurrences.

Suppose that (based on the above loan example) the provision for \$35 was made in the current year. The question arises as to what the provision level might be made in a subsequent year if the default event had not previously occurred. Suppose now that it is one year since the \$35 provision was made and that it is now felt that the likelihood of default of the PSE has reduced so that the expected amount of loss is now \$25. What should be the provision amount for this year? Given that the risk has decreased to where it is below the original provision amount, in this current year there would not be any additional provision and, in fact, the current level of \$35 would be reduced to \$25. Conversely, if the risk had been assessed as increasing – resulting in an expected loss of \$40 – then the additional amount of provision would be \$5.

Although not universally applied, sovereign lenders should also incorporate the use of provisioning mechanisms into their loan risk management framework, especially in relation to loans/guarantees extended to public sector entities known to be weak.

As it relates to the use of provisions, this document is advocating an approach that is more 'aggressive' than accounting standards such as IPSAS, since it would result in non-zero amounts of provision even when the credit quality and/or economic conditions underlying a loan associated with a beneficiary of a guarantee have not changed. As a consequence, one observes that a provisioning framework for CLs reduces the availability of funds to the government (for discretionary and other spending), while reducing the likelihood of fiscal shocks/surprises due to the occurrence of contingent events leading to losses/expenditure.

In the sections that follow, four (4) provisioning frameworks (in increasing order of sophistication) are detailed. The data requirements for successive frameworks are more involved, in that more data and modelling parameters need to be estimated.

Provisioning framework 1

It is advised that if neither the probabilities and/or the exposure amounts can be estimated with any degree of accuracy, then the probability of occurrence of the exposure should be assumed to be 100 per cent, and the amount should correspond to: 100 per cent of the value outstanding of the contingent liability if a loan guarantee; 100 per cent of the maximum payout amount for a PPP revenue guarantee; or an equivalent measure for other contingent liabilities. For some Commonwealth member countries, this will be 'business as usual' as this is what they currently do, but for others it will represent a significant departure from their current practice. Clearly, providing 100 per cent for all CLs is not practical, as this will limit their ability to use funds for other purposes. On the other hand, not providing any level of provision is not advisable for reasons already discussed in this paper. Obtaining the correct balance between fully providing or not should be a function of the availability of reliable data in relation to the specific CL.

Provisioning framework 2

This approach encourages a more proactive style of risk management of CLs than that implied by the IPSAS standard and is less punitive than framework 1 above:

1. For each year (of a contingent liability, looking at future timepoints) determine the likelihood of the payment event occurring under normal conditions. 'Normal conditions' mean that the underlying risk factors of a CL are not stressed. This could be based on 'most likely', no-arbitrage or other similar methods, or projections from the fiscal section of government. Depending on the type of CL, the contingent event might be considered to occur at a random point in time – such as a default of a public sector entity (PSE) for which the sovereign is guaranteeing its debt – or at prescribed timepoints (i.e. the event can occur at more than one timepoint), such as for a minimum revenue guarantee (MRG) for a public–private partnership (PPP). In the case where the CL event is considered to be a one-off, the correct likelihood (or probability) should correspond to the conditional probability of the event occurring given that it has not occurred prior to that year. In the case where the event can occur at a number of distinct timepoints, the correct probability to use would be the cumulative probability of the event's occurrence over the horizon between the year of analysis and that in the future.
2. For each year, determine the obligation amounts that would fall due in the future periods under normal conditions.
3. For each year, determine the likelihood of the payment event occurring under stressed conditions. 'Stressed conditions' depend on the type of contingent liability, but should reflect circumstances not commonly occurring within either the macroeconomic or operating environment pertinent to the CL. To this extent, the stress conditions (or scenarios)

should consider those incorporated as part of the MTDS, as well as those specific to the operational aspects of the CL.

4. For each year, determine the obligation amounts that would fall due in the periods under stressed conditions.
5. The provision estimates for normal and stressed conditions (at a timepoint t) should be calculated as follows:

$$P_t = \sum_{i=1}^N P_i * A_i * df_i$$
 Here N denotes the total number of future timepoints from the year of analysis; P_i denotes the conditional (e.g. for a loan where CL costs occur at one timepoint) or cumulative (e.g. for a PPP in which CL costs could occur across more than one year) probability of the event's occurrence to time i ; A_i denotes the amount lost or payable under the CL for the event occurring at time i ; and df_i denotes the discount factor for the present value of cash flows from the analysis date to the future timepoint i . The rate used in the discount factor is that of the applicable risk-free rate for the sovereign. Note that P_i and A_i (it is assumed that this loss amount incorporates the effect of any recoveries) are likely to be different, depending on whether the underlying scenarios are considered normal or stressed. It should be noted that the result of steps (1) through (4) (for any year) is to produce a single point estimate of event likelihoods and obligation costs.
6. The provision is given by the maximum of P_t (in (5) above), based on the normal and stressed conditions. Note here that stressed conditions do not imply the use of any form of explicit probability distribution or confidence interval/level. Factors underlying a CL are simply given subjective values that reflect conditions of stress. Such values are either based on history and/or educated guesses.
7. The process of recalculating the provisions in the next year would be based on the yearly budget. Operationally, the provision is

increased if, having applied steps (1) through to (6), for the next year $P_t - P_{t-1} > 0$. In other words, if the provision for this year (t) is greater than that for the previous year ($t-1$) then the positive difference should be added to last year's value; otherwise the provision should decrease by this same amount.

Note that as an alternative to provisioning just based on expected loss (EL) or exposure amounts (i.e. probabilities times the exposure amounts) one could also incorporate the notion of unexpected loss (UL). The UL is used to denote some level of variation around expected levels of losses and captures the fact that future estimates are not known with certainty.

In order to accommodate the concept of variability, it is assumed that the contingent event probabilities are distributed according to a Bernoulli distribution. Thus, if the probability of occurrence is p the variance is given by $p(1-p)$. The unexpected loss (i.e. standard deviation of loss) is then given by $A * \sqrt{p(1-p)}$, where A is the payment amount. Where applicable, the total payments would be $pA + \alpha A \sqrt{p(1-p)}$, where alpha is a positive real-valued number given by $\alpha \in \mathbb{R}^+$. It is this total payment that would be used in place of the $P_i * A_i$ above in (5).

There are a few important points to note about the assumptions underlying the expression involving the unexpected loss. The expression is akin³ to a one-sided confidence level for the loss amount. It is one-sided since it is our intention to now increase the provision by adding a positive multiple of the standard deviation to the expected loss. One should also note that, whereas it has been assumed that the occurrence of the contingent event is random, we have assumed that the loss amount is not random. This latter assumption, while clearly not true in general, is added to simplify the analysis. In a subsequent paper, the analysis will be extended to cover the case where both the risk event and loss amount are random processes that might be correlated or not.

It is important to note that the application of incorporating variability (or unexpected loss) into the calculations where the contingent event probabilities are derived through stressed conditions does not, necessarily, imply that a form of double counting is occurring in the calculations. Probabilities derived on the basis of either normal or stressed conditions simply reflect single-point estimates of likely occurrences. However, in reality there is an, unknown, probability distribution associated with these occurrences and consequently likelihoods will vary. Another way of saying this is that we do not know with certainty what future expected losses might be and, even if we suspect that likelihoods will increase over historical norms (e.g. the stressed scenario), then our estimates will be subject to error based on variability of the stress outcomes. A Bernoulli distribution has been chosen, as it is commonly used in both the fields of actuarial science and finance in quantifying credit and other types of risk and makes fairly minimal assumptions about the structure of the risk events.

In the case where the contingent liability is based on a maximum amount (known at the time of conception of the liability, where we assume that this is net of any recoveries) – e.g. on-lending – then the maximum provision should, more often than not, not exceed this amount.⁴ In the case where alpha is equal to 1, it can be shown that a value of $P = 0.5$ would result in a total loss amount of 100 per cent of the net exposure amount. This coincides with the trigger level for IPSAS provisions. For values of alpha less than 1, the minimum value of the probability at which the exposure equals the fixed amount will be higher than 50 per cent.

The value of alpha can be calibrated from historical losses (if available) by solving for alpha via the following equation:

$$AF = AEL + \alpha * \sigma_L$$

In the above, AF denotes the average of the fixed exposures over a chosen horizon

comprising at least 30⁵ instances at which a contingent loss event took place in the past; AEL denotes the average expected loss across those historical contingent events; and σ_L denotes the volatility (or standard deviation) of the losses.

In the case where there are insufficient details on historical losses but there is data on historical contingent liabilities (for example, there might not have been any events resulting in losses) with known maximum exposures, then a different method can be employed. For each such CL:

- a) Determine the event probabilities and severity based on the conditions known to be prevailing at the time the CL was undertaken. Depending on the level of data, this will be easier for some CLs than others. Where there is missing data, some reasonable assumptions would need to be made.
- b) The average fixed exposures (AF) can be determined as previously.
- c) The average expected losses can be computed by first determining the Bernoulli expected losses for each CL using the exposures and probabilities derived from (a). The value of AEL can then be obtained as the arithmetic average of these expected losses.
- d) The volatility of the losses can be obtained by first calculating the Bernoulli standard deviation of losses for each CL and then σ_L will be derived by determining the arithmetic average of these standard deviations.
- e) The value of alpha is, again, obtained by solving the above equation, but with AEL being replaced by the result of (c) and σ_L being replaced by the result of (d).

Having determined a value for alpha, this value can be used for subsequent calculations of provision levels. It is recommended that the value of alpha is updated at least annually.

In instances where there are no reliable historical data on contingent liabilities, it is suggested that a value of alpha of 1 be used, as this errs on the side of conservatism which

(given the lack of data) is believed to be a prudent approach to risk management.

In instances where a maximum potential loss amount (such as the case for implied CLs) has not been associated with a contingent liability, then it is recommended that such a value be determined (if possible). In many instances, it is likely that subjective expert opinion would form the basis for quantifying such amounts.

Provisioning framework 3

Here it is assumed that a Monte-Carlo simulation approach is used to determine levels of provision:

1. For each year, simulate the probability distribution corresponding to the obligation payable.
2. Determine S_p^t such that $S_p^t = \max(P_i | A_i^t \leq EX_{IPSAS}^t)$ $i=1, \dots, n$, where i corresponds to the i 'th partition of the probability space; t is the period over which the simulation is forecast; n is the number of partitions; A_i^t is the estimated payment obligation corresponding to partition i ; and EX_{IPSAS}^t is the expected obligation based on multiplying the non-simulated (or stressed) obligation amount (for the period) by 0.5.

if $S_p^t > 0.5$ then Provision = $EL + UL$
else

Provision = EL

Even though an estimate for the likelihood and amount might have been projected for a particular period, it is important that these estimates are updated on a frequent basis. It is recommended that calculations are performed at least quarterly but, in theory, could be performed much more frequently, depending on the degree with which the analysis is automated and the amount of volatility of the underlying risk factors. Certain limitations, however, may pose constraints on the frequency with which such updates can be conducted in practice, including (among others) the rate at which factors such as gross domestic product (GDP)/other macroeconomic parameters, sector and/or individual corporate-specific information are updated.

Step (1) above assumes that the simulation will involve making assumptions about the stochastic processes that can be used to evolve (or forecast) the values of the various risk factors. Some of these factors will comprise macroeconomic parameters (e.g. GDP), interest/foreign exchange rates and, depending on the type of CL, might also include credit spreads (of borrowers) or other factors relevant to the structure of the CL.

A Monte-Carlo simulation will typically involve the generation of numerous (e.g. 10,000 or more) scenarios. For the purposes of this paper, one can view a scenario as a combination of simulated values for each risk factor. Thus, if there are six (6) risk factors for a CL, a scenario would correspond to the simulation of six values corresponding to a set of future possible values. Every set of scenarios simulated can be termed 'a simulation run' or simply 'a run', for which, as mentioned above, there could be many thousands.

After each scenario is simulated, the value of the CL cost would be determined. In the case of explicit contingent liabilities, reference would be made to the details of the contractual obligations and, specifically, the values of any triggers resulting in liability costs. In the case of implied contingent liabilities where there are no specific triggers, it is suggested that a structured approach – such as that deriving from Failure Mode Effects and Criticality Analysis (see discussion later in this document) – could be used to provide estimates of triggers.

For step (2) above, the CL costs are first sorted from lowest to largest. Assuming that there were 10,000 simulation runs, then each run has a probability of 1 in 10,000 of occurring (or 0.0001). The probabilities associated with the CL cost of each run are then summed until this sum equals the value one (1). This summation, essentially, produces the cumulative probability distribution associated with the CL costs, as highlighted by Table 2.

Table 2 Cumulative probability distribution associated with CL costs

Cumulative probability	CL cost
0.0001	CL1
0.0002	CL2
.	
.	
.	
1	CL10,000

The maximum cumulative probability P_i (i.e. the value in the left column of Table 2) for which the CL cost A_i^t (i.e. the value in the right column) is less than EX_{IPSAS}^t (i.e. S_p^t) is then compared to the figure of 0.5, which corresponds to the IPSAS trigger probability for recognition of CLs.

As with framework 2, if the estimated provision levels for new years of assessment are lower than the previous one, then the provision for the current year will be the current estimate (or will equivalently reduce the existing levels by the difference in the provision values).

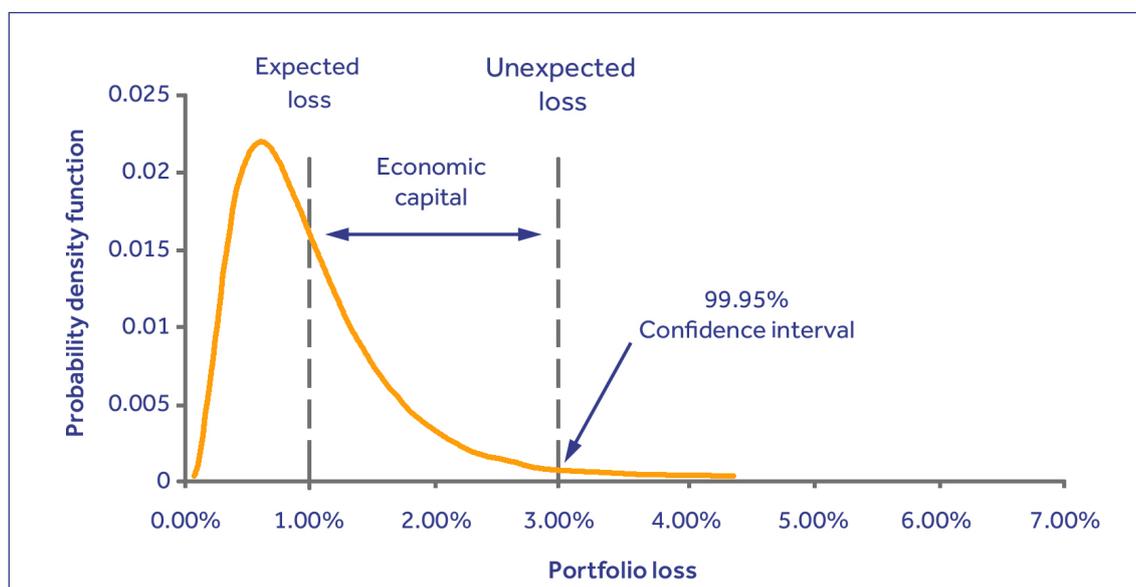
Provisioning framework 4

Here, like framework 3, it is assumed that a Monte-Carlo simulation approach is used to determine levels of provision. The key difference is that condition (2) of framework 3 does not apply and instead the provision is given by the estimated value of the VaR (i.e. a worst case loss given some level of statistical confidence).

For the above Monte-Carlo simulation, as with any similar value at risk (VaR) method, the risk appetite of the government would need to be expressed as a confidence level, e.g. 99.95 per cent. In this case, the confidence level suggests that losses will not amount to more than the VaR more than 1 in 2000, i.e. 0.05% = 100%–99.95%. Once the confidence level is set, the unexpected loss is then given as the difference between the VaR and the expected loss.

Figure 1 provides a pictorial view of the outputs of a Monte-Carlo simulation. The diagram displays the expected loss, unexpected loss and the VaR at a given confidence level. Note that the term 'economic capital' (mainly used in the financial services sector) is also often used to denote unexpected loss.

Figure 1 Outputs of a Monte-Carlo simulation



Source: vander Straeten (2014)

Mathematically, the VaR can be expressed as follows:

$$VaR_{1-\alpha}(X) := \inf_{t \in \mathbb{R}} \{t : \Pr(X \leq t) \geq 1 - \alpha\}.$$

In words, the VaR (at a confidence level $1-\alpha$) is the minimum loss t , such that the probability of CL losses (denoted by X) being less than or equal to t is at least $1-\alpha$. In other words, the probability of losses exceeding the VaR is given by α . In Figure 1, $\alpha = 0.05\%$.

Notes on provision frameworks

It should be noted that with increasing sophistication of a provisioning method, it is likely that the provision amounts would decrease, since more information is accounted for in the calculations and such calculations are based on less conservative assumptions. It is also much more likely that the provision amounts provide a truer picture of the state of risk in the portfolio.

Note that with the use of Monte-Carlo methods, it would be possible to incorporate the structural relationship and co-dependency between risk factors underlying the portfolio of contingent liabilities. As a consequence, rather than assess provisions on a CL-by-CL basis, it would be possible to determine the provision for a portfolio of CLs in a coherent manner, employing methods from VaR theory used to quantify market risk.

Given the increased data requirements of the latter provisioning frameworks, it is likely that only those countries with reliable estimates of historical losses will be in a position to benefit from the use of these frameworks. That said, this paper advocates an approach towards the use of more sophisticated methods, since the thought process involved in their use encourages deeper analysis of the risks that can lead to CL costs and hence provides a better basis for how such risks might be hedged.

One should also note that, in the worst case, i.e. where reliable information does not exist to quantify likelihoods and/or losses, that the proposed framework 1 would lead to less fiscal space – as potentially large amounts would now be allocated for contingent liabilities, as if they were direct exposures of the sovereign. Contrast this with the zero (0) amounts of IPSAS under the same conditions. It is the contention of this paper that it is better to encourage prudent risk management than to employ a binary approach (i.e. record if likelihood greater than 50 per cent or not record otherwise) that could give rise to fiscal risks. Further, the nature of the provisioning framework allows levels to be reduced if year-to-year expected/unexpected losses are reducing. This allows for a more dynamic and fair method of managing CL risk in a portfolio of sovereign debt.

Table 3 Sovereign average 15-year transition rates (1975–2014)

Initial rating	AAA	AA	A	BBB	BB	B	CCC/CC	SD	NR
AAA	70.8%	27.4%	0%	0%	0.6%	1.1%	0%	0%	0%
AA	41.7%	38.7%	9.1%	6.9%	2.5%	0.4%	0.3%	0.3%	0%
A	6.5%	25.9%	44.5%	21.2%	0%	0.2%	0%	1.7%	0%
BBB	0%	11.6%	42.3%	12.7%	15%	3.4%	1.3%	12.4%	1.2%
BB	0%	0%	9.5%	41.2%	20.2%	9%	0.6%	19.5%	0%
B	0%	0%	0.5%	19.2%	23.3%	12.3%	0%	44.7%	0%
CCC/CC	0%	0%	0%	0%	0%	0%	0%	100%	0%

Source: Standard & Poor's Ratings Services (2015)

Table 4 One-year transition matrix

Initial rating	AAA	AA	A	BBB	BB	B	CCC/CC	SD	NR
AAA	96.8%	3.1%	0%	0%	0.1%	1.1%	0%	0%	0%
AA	2.8%	93.7%	2.1%	0.4%	0.4%	0.1%	0%	0%	0.6%
A	0%	4%	90.8%	4.5%	0.5%	0%	0%	0%	0.3%
BBB	0%	0%	5.6%	89.9%	3.6%	0.6%	0.2%	0%	0%
BB	0%	0%	0%	6.3%	87.4%	4.8%	0.7%	0.6%	0.2%
B	0%	0%	0%	0%	6.4%	86.8%	3.1%	2.7%	1%
CCC/CC	0%	0%	0%	0%	0%	35.6%	25.8%	38.6%	0%

That said, it should be pointed out that provisioning is only one of several methods that could be employed as part of a wider risk management framework (e.g. other methods include risk monitoring, reporting, insurance etc.).

The Impact of IPSAS More Than Likely

Table 3 depicts sovereign average 15-year transition rates (1975–2014).

The average rating of a member of the Commonwealth is currently around B+. If one were to apply the above historical default probabilities in determining whether a CL event is likely to occur, this suggests that it would take more than 15 years for the default probability to go beyond 50 per cent for a B+. To see this, note that the transition table shows transition probabilities over a 15-year period for which the default probability is 44.7 per cent, which is less than 50 per cent. Hence, in order to exceed 50 per cent default probability, the horizon of the transition rates would have to exceed 15 years. However, one should note that public sector entities (PSEs) or other beneficiaries (within a country) of loan guarantees would (normally) have a rating lower than that of the sovereign, which implies that their default probability would be higher than 44.7 per cent over the 15 years. Sovereign probabilities are used instead of PSE (or other) specific probabilities since, in the most part, insufficient

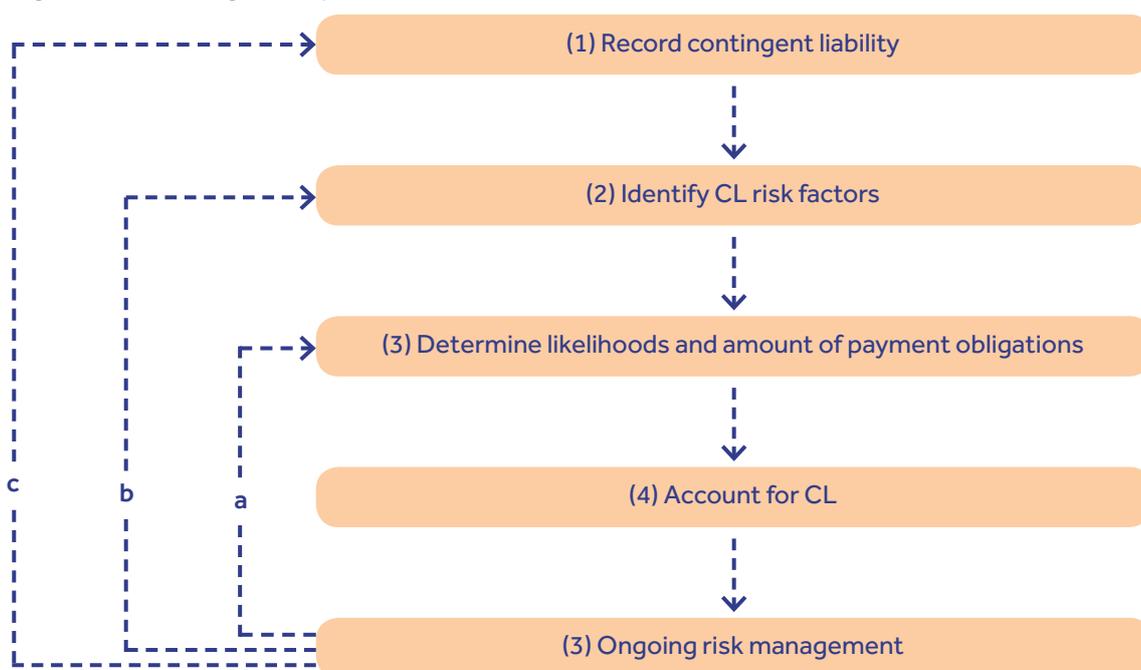
data is available on the default history of these entities to determine reliable estimates.

If one applies the 'more than likely' concept of IPSAS to the occurrence of the event leading to an obligation payout (e.g. for on-lending or a guarantee), then this suggests that no payments would be made prior to year 15 and hence no provisions made for any year up to this point (since default probabilities are, generally, monotonically increasing with time).

One can refer to the above method of recognising provisions as passive in as much as if the default probabilities are less than the 50 per cent threshold, then no provision need be applied (based on IPSAS standard) – although other active risk management techniques could be applied. An active risk management approach (involving the use of provisions) would, in the least, modify the provisions on the basis of the expected loss for each year. For example, consider the one-year transition matrix presented in Table 4.

To determine an expected loss (i.e. one component of the provision), the default probability of 2.7 per cent would be multiplied by the estimated exposure amount in one year's time (assuming 100 per cent loss, given default say). Although a small number, the result would not necessarily be 0, which is what it would be under the IPSAS standard.

Figure 2 Risk management process flow/framework



Source: Haughton, 2016

Framework for Managing Contingent Liability Risk

Figure 2 provides an overview of the risk management process flow/framework for the management of contingent liabilities.

Recording contingent liabilities

The first step in the risk management process is to record the contingent liability. Essentially this requires:

- a) Capturing all the underlying obligation details. For example, for a minimum revenue guarantee of a PPP transaction, details of the revenue levels, timing of the payments etc. would be required. For a loan guarantee or on-lending, the loan terms would also need to be detailed. Note that from these details, cash flows could be generated and also recorded.
- b) Details of the guarantor and borrower.
- c) The percentage amount being guaranteed.
- d) An indication as to whether the contingency is explicit or implicit.

In many instances, even before an entity can record a contingent liability, it needs to identify existing transactions/commitments that might amount to such a liability. That is, it is possible that a government might have given undertakings amounting to a contingent liability without such a commitment having been recorded as such.

Circumstances such as these typically occur for implicit contingent liabilities, where no legal and/or contractual obligation exists, but either past behaviour or moral suasion suggest that the government is quite likely to honour some portion of those obligations.

The Commonwealth Secretariat's debt reporting system, CS-DRMS, is a tool that allows for the recording⁶ of contingent liabilities (as well as general loans and securities) and is the main source used by participating countries to record such debt.

Countries, however, differ in the extent to which they have been able to catalogue their

main implicit contingent liabilities. A big issue here concerns the reliability of the sources of data concerning potential obligations. For example, fairly reliable estimates (e.g. those based on historical data and simulation models) can be obtained on the likelihood of various types of natural disasters and, to a lesser extent, their severity. However, less obvious are likelihoods and severities associated with legal claims and intermediation (beyond insurance levels) following systemic failure of the financial system.

Based on the above, prior to attempting to record contingent liabilities into a system such as CS-DRMS, it is recommended that a review of the potential sources of implied contingent liabilities be undertaken. The purpose of such a review is to categorise the various types of implied contingent liabilities that are prevailing and which the government is likely to have to honour. Such an exercise goes beyond the theoretical classification of CLs and identifies those that could result in additional expenditure for the government, given either prevailing or prospective economic or other conditions.

The approach advocated in this paper is that of failure mode effects and criticality analysis (FMECA)

In the case where a sovereign has explicitly committed to a form of CL, classifying and subsequently recording that CL is less problematic, as the contractual nature of the CL naturally results in a defined classification.

Identify CL risk factors

The identification of contingent liability risk factors is undertaken outside of the CS-DRMS system.

For each contingent liability, it is required to identify the main factors that contribute to the source of risk for the government. For an explicit

CL, this might be a relatively straightforward process since the law/contract would (typically) make reference to the basis on which the government is expected to make payments. However, for some types of implicit CLs the risk factors might not be so obvious, e.g. failure of privatised social services or other activities deemed critical to the wellbeing of the nation. In instances such as these, it is advisable that a holistic approach be adopted to identifying the risk factors.

The approach advocated in this paper (for implicit contingent liabilities such as those referred to above) is that of failure mode effects and criticality analysis (FMECA),⁷ originally developed within the field of reliability analysis. FMECA conjectures: (i) what could go wrong (i.e. failures); (ii) what are the causes of the failures; and (iii) what effects could the failures have (along with associated probabilities and severities).

Attempting to quantify (i), (ii) and (iii), above, generally requires a team of experts (along with debt management risk specialists) within the domain area of concern. The team would establish the ground rules (i.e. data sources, what is in and out of scope, etc.), provide both textual and diagrammatic descriptions of the domain, and would identify existing controls for major facets under consideration. The adequacy of the controls would be assessed (i.e. details provided on the means by which perceived risks were currently been controlled) and ways in which controls might fail, with the effects (i.e. probabilities and severities) estimated.

A list of possible failure modes would come out of an FMECA, along with corresponding likelihoods and severities (which feed process (3) of the risk framework). These latter aspects could be used as part of a model to determine the potential obligations a government might have in relation to future contingent payments.

The likelihoods obtained from an FMECA analysis are derived on the basis of reference to the frequency with which previous events have

Table 5 Legal risk management table

Assessing the likelihood of an adverse outcome	
Likelihood level	Description
Low	For litigation files, when the chance of losing the case is less than 30%. For advisory files, when the likelihood of an adverse outcome arising is less than 30%.
Medium	For litigation files, when the chance of losing the case is between 30-70%. For advisory files, when the likelihood of an adverse outcome arising is between 30-70%.
High	For litigation files, when the chance of losing the case is over 70%. For advisory files, when the likelihood of an adverse outcome arising is over 70%.
Unable to assess	If there is not enough information to permit a proper likelihood of adverse outcome assessment. Once more information is available and, at the very least, if the file involved litigation, before the matter is set for trial, a proper likelihood of an adverse outcome must be selected.
Assessing the impact	
Impact level	Description
Minor	Minimal effect on the client department or government as a whole
Significant	Significant effect on client department's policies or programs or to government as a whole due to actions or third parties or where media coverage is high
Unable to assess	If there is not enough information to permit a proper risk level assessment. Once more information is available, a proper risk level must be selected.

Source: Department of Justice, Canada (2008).

occurred and/or educated guesses based on expert opinion. As an example of the type of output that might be obtained from experts (not necessarily based on historical data or models), consider the legal risk management (LRM) table produced by the Department of Justice in Canada and depicted in Table 5.

Thus, if a legal risk event has been classed as low (based on the Canadian Department of Justice legal risk management [LRM] table), the default probability is not determined with certainty, but has a value anywhere from 0 per cent to (but not including) 30 per cent. A prudent risk management approach would be to assume a value closer to 30 per cent when deciding on provision levels.

Note also classifications regarding the impact of risk events (in relation to the Canadian LRM table). Ultimately, monetary values would be associated with the impact levels above and along with the event likelihoods as the basis for determining provision levels.

It is likely that all countries (irrespective of their level of sophistication with CLs) would be able to make use of the FMECA approach. In the worst case, assessments would result in expert determination (but still judgemental) of likelihoods and severities. The best-case scenario would result in more reliable estimates of these parameters based on historical data.

In relation to assessing contingent liabilities with respect to financial institutions, the subject

matter of systemic risk due to contagion has been extensively studied in the literature,⁸ using network and other models. Such models could be used as the basis for identifying risk factors, as well as determining the severity and potential likelihood of failures in the financial system.

Determine likelihoods and amounts of payment obligations

As can be seen from the discussion of the previous section, determining likelihoods and severities can follow as a result of the method chosen to identify and describe CL risk factors. In general, there are three approaches that can be adopted in determining both likelihoods and obligation amounts:

1. Historical, i.e. based on assuming that previous event occurrences will repeat in the future at the same rate and with same levels of losses. For credit losses, rating transition probabilities are also a possibility.
2. User defined, i.e. based on assuming arbitrary (but perhaps based on some knowledge of the past) levels of the rate of occurrence and amounts.
3. Model-based, i.e. using some form of analytical model for predicting probability and loss levels.

Both (1) and (3) (if properly undertaken) require the storage of data/information pertinent to each main type of contingent liability. This implies that there is a process in place for capturing details related to the occurrence of events, leading to the realisation of payment obligations. In many countries within the Commonwealth (and beyond), this process could be significantly improved.

As it relates to (3), a number of models appear in the literature. Most of these are aimed at determining the guarantee fee or price to be charged by the sovereign for assuming the extant risks of a CL. Without loss of generality, we can call these approaches 'valuation models' – although some (e.g. Monte-Carlo) go beyond just

pricing. Common approaches to valuation are:

- *Contingent claims analysis*.⁹ In this framework, the CL is viewed as an option (as in financial derivatives) where the underlying risk factor (e.g. minimum revenues) follows some stochastic process, such as geometric Brownian motion. Generally, this type of analysis involves the use of a formula (or equivalent analytics) to compute the price of the guarantee.
- *Monte-Carlo simulation*,¹⁰ which involves discretising a stochastic process and simulating a path of values over some horizon. Usually there are numerous simulation runs (e.g. 100,000), which implies that a corresponding number of valuations will be derived. Since the range of valuations can be used to produce a probability distribution, it is possible to derive summary statistics from the distribution – e.g. the mean (or expected) or other percentiles.
- *Market-based/intensity¹¹ default/rating transition¹²* models either attempt to derive default probabilities from credit spreads or model the evolution of ratings transitions over time. Such models are more applicable to on-lending and loan guarantees.

Account for CL

As discussed earlier in this document, accounting for contingent liabilities (from an accounting perspective) involves assessing the likelihood that an obligation will be 'called', as well as a reliable estimate of the payment obligation. Further to this, however, IPSAS also requires that the obligation represent a present obligation based on past events. In other words, the CL arises as a result of some actions/inactions in the past by the sovereign giving rise to potential payouts in the future. However, these future payouts will not arise as a result of any actions of the sovereign going forward.

It is widely accepted that good practice is to

either make provisions for CLs or to include them as memorandum items in financial statements. These practices are not consistently applied across the Commonwealth. Moreover, given that many countries are still following cash-based accounting, there is no real requirement for recognition of any provisions relating to CLs.

The approach advocated in this paper is to follow the provision steps highlighted earlier, which facilitate for a more proactive approach to managing CL risk on an ongoing basis. The basis for this will be the outputs from the previous process.

Ongoing risk management

A wider regime of risk management activities – such as risk monitoring, decision analysis (regarding whether to take on new/additional risk), use of insurance/collateral management etc. – would also form part of the ongoing management of contingent liabilities. In fact, the risk framework facilitates for inclusion of such activities. For example, in deciding to take on additional liabilities, we recommend that a sovereign: identify the type of contingent liability (if any) that is embedded or implied (level 2 of the framework); and perform risk analysis (level 3), as well as determine whether the risk/exposures posed are acceptable (i.e. accept the risk or otherwise reduce it, reject it or hedge it in some manner). If the liability is accepted, then subsequent analysis must determine how it will be accounted for (step 4), which might result in no provision – since there might be sufficient coverage via way of collateral/insurance etc. Once the liability has been recorded (level 1), then ongoing risk management (level 5) will be conducted on the portfolio of contingent liabilities.

In relation to provisioning within the risk management framework, there are three (3) types of risk management activities that should occur:

1. The line referred to as (a) in the process framework diagram focuses on the periodic updating of probabilities and severities caused by changing risk-factor volatilities or other characteristics. There are, potentially, numerous reasons why these factors could change, and it would be useful to log them as and when they occur. The idea is to adjust provision levels (on a period-by-period basis) by recalculating the required amounts and comparing to prior periods. Upwards revision in the provision would occur when the calculated amount at time t is greater than that at time $t-1$, the difference between those levels being added (if the latter time amount is greater) or subtracted (if the latter time amount is smaller) to the prior period figure.
2. The line referred to as (b) focuses on incorporating new risk factors into the analysis of an existing CL. It might be that the nature of the contingent liability has changed since the liability was accounted for, resulting in new and/or additional sources of risk. The effect of these factors on the levels of provision of the CL should be examined.
3. The line referred to as (c) focuses on the inclusion of new contingent liabilities in the analysis. It is at this point that the incremental effect of including the new liability in the portfolio should be assessed. This can be done in a number of ways, but this paper advocates two (2): (i) asset and liability analysis; and (ii) portfolio credit risk analysis. The former relies on balance sheet analysis of assets and liabilities management (ALM), and performing calculations such as gap and/or sensitivity/scenario analysis. The effect of this is to provide information on the adequacy of liquidity within the portfolio. The essence of the ALM approach would be to predict future cash flows emanating from assets on the government's balance sheet (across a number of discrete timepoints), and to assess whether

these flows are sufficient to cover potential liability outflows at the same timepoints. If the difference between the asset flows and that of the liabilities is negative (on any date), then this suggests that the government has a potential shortage of funds to meet its liabilities when due on the dates and hence has potential liquidity risks. In the eventuality that there are shortfalls, then the gap analysis provides a means of determining the amount of additional funding that is required. The latter approach relies on determining some form of dependency structure between and within the various types/classes of contingent liabilities, and either using simulation or other quantitative techniques to evaluate CL premiums or other portfolio statistics.

Conclusions and Next Steps

This paper has introduced a number of approaches to the determination of provisions for contingent liabilities within a wider CL risk management framework. The approaches encourage a more proactive style of risk management than would otherwise be adopted under a cash- or accrual-based accounting system.

The implications for those not currently accounting for provisions for contingent liabilities include a reduction in fiscal space caused by inclusion of the liability as a direct liability. Naturally, this is offset by the certainty of no or significantly less of a fiscal surprise once those liabilities are called.

The framework presented is novel in as much as it applies a more market-based measure to determine the adequacy of provision levels consistent with the inherent risks of the CL in a portfolio. As a consequence, changes in the macro/operating environment would have an immediate effect on the level of the estimated provisions. These changes, however, need not be factored into the provision level any more frequently than quarterly, but could be more

frequent depending on the volatility of the markets. Other more static approaches, such as IPSAS, do not account for market movements (such as changes in interest rates, credit spreads or the macroeconomic parameters of other factors that affect the likelihood of a CL being called) in the manner detailed in this paper, and so the benefits of such movements as well as correlation (if adopting the more sophisticated methods) are not incorporated.

In adopting the more sophisticated approaches to provision management, the data requirements become more onerous and require maintenance of databases of historical information concerning contingent events and prevailing conditions when such events occurred. However, the costs of developing and maintaining such databases are likely to be very small in relation to the potential losses that could be incurred due to inaccurate or poor estimation of contingent liability risks.

A next step in the adoption of the methods detailed in the paper is to design a study, the objective of which would be to classify sources of potential contingent liabilities for Commonwealth member countries and with a view towards assessing the potential likelihood and severity of their occurrence. This empirical data would then be used as a basis for quantifying possible provision and risk levels associated with the liabilities.

Bibliography

- Boyle, P. (1977), 'Options, A Monte Carlo approach', *Journal of Financial Economics*, Vol. 4, No. 3, 323–338.
- Brixi, H, and A Schick (2002), 'Government at Risk: Contingent Liabilities and Fiscal Risks'. World Bank, Washington, D.C.
- Das, T, A Bisen, MR Nair and R Kumar (2002), *Contingent liability Management, A Study on India*. Commonwealth Secretariat, London.
- Department of Justice, Canada (2008), *Legal Risk Management in The Department of Justice Formative Evaluation, Final report*. Available at: http://www.justice.gc.ca/eng/rp-pr/cp-pm/eval/rep-rap/08/lrm-grj/lrm_evaluation_eng.pdf (accessed 9 September 2016).
- Gray, DF, RC Merton, and Z Bodie (2007), 'Contingent Claims Approach to Measuring and Managing Sovereign Credit Risk', *Journal of Investment Management*, Vol.5 No.4, 5–28.
- IPSAS (2002), *Provisions, Contingent Liabilities and Contingent Assets*, available at: <http://www.ifac.org/system/files/publications/files/ipsas-19-provisions-cont-2.pdf> (accessed 3 March 2016).
- Jarrow, R, D Lando, and SM Turnbull (1977), 'A Markov model for the term structure of credit spreads', *Journal of Finance*, Vol. 50.
- Kubelec, C, and F Sa (2010), 'The geographical composition of national external balance sheets: 1980–2005'. Bank of England Working Paper No. 384. Bank of England, 2010.
- Lando, D, (1998), 'On Cox Processes and Credit Risky Securities', *Review of Derivatives Research*, Vol. 2, 99–120.
- Merton, RC (1977), 'On the Pricing of Contingent Claims and the Modigliani-Miller theorem', *Journal of Financial Economics*, Vol. 5, 241–249.
- Standard and Poor's Ratings Services (2015) *Default, Transition and Recovery: 2014 Annual Sovereign Default Study And Rating Transitions*. Available at: https://www.standardandpoors.com/pt_LA/delegate/getPDF?articleId=1664058&type=COMMENTS&subType=REGULATORY.
- vander Straeten, P (2014) 'Unknown Unknowns, Or How Banks Still Get It Wrong on Unexpected Losses' [Blog post]. Available at: <https://www.linkedin.com/pulse/20140902044741-4628733-unknown-unknowns-or-how-banks-still-get-it-wrong-on-unexpected-losses> (accessed 8 September 2016).

Notes

- 1 See Kharas and Mishra (2001).
- 2 See IPSAS (2002).
- 3 That said, there is no intention in this paper to formally construct a confidence interval for the level of losses. What is shown is a convenient simplification of a one-sided confidence level. For more formal background knowledge on confidence intervals, the reader is referred to: Agresti, A, and BA Coull (1988), 'Approximate is better than "exact" for interval estimation of binomial proportions'. *The American Statistician* 52, 119–126.
- 4 It is possible that costs exceed the principal or outstanding amount of a loan, since there might be no hedges in place – like insurance or collateral – and legal/operational or other costs might have been incurred in attempting to restructure the loan. We ignore these costs in the analysis.
- 5 This value has been chosen to be consistent with a commonly applied practice of having at least 30 sample points for applicability of normality assumptions. Although the approach being advocated in the paper does not explicitly use assumptions of normality, via the central limit theorem it can be shown that many distributions can be approximated by a normal distribution; so for consistency we stick with this concept.
- 6 At present, the tool allows for associating a loan with a guarantor and beneficiary (borrower), but assumes that 100 per cent of the loan is guaranteed and makes no distinction between implicit and explicit contingent liabilities.
- 7 See, for example, 'Procedures for performing a failure mode and effect analysis', MIL-STD 1629 or 'Procedures for failure mode and effect analysis', IEC 60812.
- 8 See, for example, Kubelec and Sa (2010).
- 9 See, for example, Merton (1977) or Gray, Merton and Bodie (2007).
- 10 See, for example, Boyle (1977).
- 11 See, for example: Lando (1998).
- 12 See Jarrow, Lando and Turnbull (1977).



The Commonwealth