PROPERTY AND CASUALTY INSURANCE COMPENSATION CORPORATION

RESEARCH PAPER ON TIME HORIZONS AND TERMINAL PROVISIONS

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EXECUTIVE SUMMARY

Purpose and Scope

The Property and Casualty Insurance Compensation Corporation (PACICC), the national guarantee fund for property and casualty (P&C) insurance companies in Canada, is working closely with regulators and other stakeholders through the Minimum Capital Test Advisory Committee (P&C MAC) to develop a new capital framework for Canadian P&C insurers. As part of this process, PACICC engaged KPMG LLP (KPMG) to identify and document possible options for the use of time horizon and terminal provisions for Canadian P&C insurers.

What is Meant by "Time Horizon" and "Terminal Provision"?

Three factors determine the capital requirement of an insurer – the time horizon, the terminal provision, and the selected statistical measurement (or probability). The time horizon refers to the fixed time period used in internal models for the determination of capital requirements and/or the testing of the financial condition of an institution. The terminal provision refers to the valuation basis for the risk that remains at the end of the time horizon. The two statistical measures most often considered when determining time horizon and terminal provisions are VaR, also referred to as percentile or confidence levels, and TVaR, also known as CTE or expected shortfall.

The time horizon, terminal provision, and probability are linked as we need to choose two factors to determine the third. As one interviewee noted, the level of security that one wants relative to a probabilistic view depends on the time horizon. Essentially time horizon is arbitrary and we choose a probability appropriate for that time horizon. There are three equations: money, time horizon, and probability. We need to choose two to determine the third.

Research Methodology

In preparing this paper, we conducted an extensive literature review as well as eleven interviews with experienced practitioners. We include, in Appendix A, a complete list of the relevant literature. In Appendix B, we present the questionnaire that was used in our discussions with professionals from regulatory authorities, P&C and life insurance companies, the banking industry, academia, international insurance industry organizations, and accounting firms. We held discussions with professionals in Canada, the United States, Europe, and Australia.

Findings and Comments

Decisions regarding time horizon and terminal provisions must be considered in the context of the functions of regulatory capital. In *Key Principles for the Future Direction of the Canadian Regulatory Capital Framework for Property & Casualty (P&C) Insurance*[1] (*P&C Key Principles*), the Office of the Superintendent of Financial Institutions Canada (OSFI) cites two key functions of regulatory capital available:

- it allows institutions to absorb losses during ongoing operations
- it protects policyholders and creditors from loss in the event of liquidation

These two functions will influence the MAC's decision-making process. While we present numerous viewpoints and factors for consideration, our research indicates that ultimately there are three primary decisions for OSFI and other stakeholders in determining the requirements and/or standards for time horizon and terminal provisions. First, should a one-year or multi-year time horizon be required in internal modeling? Second, should the terminal provisions be determined based on a going concern basis or from a transfer value perspective? Finally, which statistical measurement, VaR or CTE (also known as tail value at risk or TVaR), and what percentage should be used?

Based on our research, there is not yet consensus, either in Canada or internationally, on these questions. It is important to recognize that KPMG does not reach conclusions on any of these issues nor do we offer recommendations to PACCIC. Instead, we present a summary of current practices – both in Canada and around the world – and present numerous opinions on the important issues for consideration.

Below we summarize some of our findings.

Time Horizon

Frequently cited advantages of a one-year time horizon (based on our literature review and interviews) include: consistency with approaches used in banking, proposed by the International Actuarial Association (IAA), and generally by insurers in European countries; solvency confidence level can be calibrated to bond defaults; less uncertainty in management and policyholder actions over a shorter time horizon; impact of model risk and parameterisation is less significant over a one-year period; and computer processing time as well as hardware and software requirements are less challenging for a one-year than a multi-year time horizon.

Disadvantages of a one-year approach include: one year is not a sufficient period of time to recognize the effects of the multi-year business cycle; one year may also not be a long enough period to identify a problem and allow the supervisor and/or company to react; many events have effects over multiple years; gradual changes/trends or sustained periods of adverse experience in risks would not fully manifest themselves in one year and may not be appropriately captured; obligations after the one-year time horizon are only reflected via the terminal liability, making it critical that all obligations and risks are reflected.

[1] Released by the Office of the Superintendent of Financial Institutions of Canada in January 2010.

Terminal Provisions

There are essentially two alternatives for the consideration of terminal provisions: run-off and transfer value. In a run-off approach, the terminal value represents the cost of settling insurer obligations as they come due. This terminal value depends on the distribution of ultimate settlement values for policy obligation foreseen as run off commences. The run-off approach is also referred to as a going concern approach, in which the objective is to ensure that the insurer has sufficient assets at the end of the time horizon to ensure that all remaining obligations can be met given experience at a conservative confidence level.

In a transfer value approach, the terminal value is determined from a model representing the cost of transferring the unsettled policy obligations to another entity at the end of the time horizon or projection period. This terminal value depends on two distributions. Firstly, it depends on the distribution of the estimates of ultimate settlement values for policy obligations at the end of the projection period. Secondly it depends on the distribution of market risk perception, as measured by changes in cost of capital or other measures.

Statistical Measurements – VaR and CTE

Our research and interviews indicated that there are advantages and disadvantages to using either VaR or CTE.

The CTE is generally considered theoretically superior by some individuals and organizations as it more robustly reflects the “fatness” of the tail. Under heavily skewed distributions (such as property catastrophe coverage, credit insurance, or some types of professional liability coverage), an extreme percentile can be less than the expected value (i.e., mean value). On a percentile basis, the aggregate result of two risks can be higher than the sum of the stand-alone results.

One interviewee noted that the answer as to which is the superior statistical measurement is dependent on what the regulator is trying to manage – the probability of ruin or the depth of ruin. The VaR denotes a single point in the tail of the distribution of possible losses, whereas the CTE is a measure of the expected values of the loss given that the loss falls in the adverse tail of the distribution. Thus, CTE provides information about the depth of ruin and VaR is focused on the probability of ruin.

OSFI is seeking the identification of a statistical measurement that will deliver an appropriate capital requirement. If the selected measurement is able to properly identify the relative levels of financial strength of companies, then it is a viable measure. We believe that both VaR and CTE, properly calibrated, when applied to an appropriately parameterized internal model, can result in a reasonable statistical measurement under most situations.

International Practice

The following summarizes, in tabular format, the current practice with respect to time horizon and statistical measurement by regime.

Jurisdiction/Regime	Time Horizon	Statistical Measurement
Canada – segregated funds	Lifetime	CTE 95
Australia	One year plus run off of certain risks to extinction	VaR 99.5
Bermuda	One year plus run off of liabilities to extinction	CTE 99.0
Netherlands	One year	VaR 99.5
Solvency II	One year	VaR 99.5
Switzerland	One year	CTE 99
United Kingdom	One year or longer at comparable confidence level	VaR 99.5
FTK Model (Dutch)	One year	VaR 99.5
2002 GDV (German) Model	One year	VaR 99.78
Basel	One year equivalent	Credit risk - based on long run average defaults Operational risk - VaR 99.9 Interest rate risk - VaR 99.0

Winding Up of an Insurance Company

There are significant differences between the approach to P&C insurer liquidations and life insurer liquidations and between the course of an insurer in liquidation and a going concern operation.

With a life insurer insolvency, the objective is to maintain the policies in force and to transfer the book of business to a solvent company as soon as possible. On the other hand, with P&C liquidations, the business is generally run off over time, and the policies may or may not be terminated. We observe that the approach to liquidating P&C insurers is more consistent with the calculation of a terminal provision on a run-off basis, while the approach to liquidating life insurers is more consistent with the calculation of a terminal provision on a transfer value basis. However, we also observe that nothing precludes the liabilities of a P&C insurer from being transferred to or reinsured en bloc after the issuance of a winding-up order.

Assets risk is the main risk for life insurers; while insurance risk is the primary risk for P&C insurers. In a liquidation scenario, while insurance risk continues to be significant factor for P&C insurers, asset risk increases. For an insurance company in liquidation, the reinsurance is generally the most significant asset.

Many of the differences between the winding up of an insolvent insurer and a going concern operation arise because of the application of the *Winding-up and Restructuring Act* (WURA). For example, WURA establishes a scheme of priorities, the effect of which is that certain creditors of the insolvent insurer are entitled to payment in advance of other creditors and that within the priority ranking (e.g., policyholders), all creditors must be treated equally.

Other Issues Addressed in the Research Paper

In this paper, we also address the following issues:

- A summary of the current state and international practices regarding time horizons and terminal provisions as well as the theoretical and practical considerations when selecting a time horizon or terminal provisions
- Whether the time horizon or terminal provision should vary by risk factor or be uniform
- Whether the time horizon and terminal provision should be standardized for banks, life insurers, and P&C insurers. If not, the key differences between P&C insurer and other members of the financial sector
- Practical issues related to international financial reporting standards (IFRS) and the implementation of IFRS 4 (Phase II)
- A review of the implications for Standards of Practice of the CIA
- "Good practice in 2012" as quoted from *Actuarial Aspects of Internal Models for Solvency II*[2]

[2] D. Brooks, R.J. Care, M.B. Chaplin, A.M. Kaufman, K.A. Morgan, D.N. Roberts, J.M.E. Skinner, D.J.K. Huntington-Thresher, P.J. Tuley, and D.L. Wong, draft paper presented to the Institute of Actuaries, 23 February 2009.

INTRODUCTION

Purpose and Scope

The Property and Casualty Insurance Compensation Corporation (PACICC), the national guarantee fund for property and casualty (P&C) insurance companies in Canada, is working closely with regulators and other stakeholders through the Minimum Capital Test Advisory Committee (MAC) to develop a new capital framework for Canadian P&C insurers. As part of this process, PACICC engaged KPMG LLP (KPMG) to develop and document modeling practices related to the use of time horizon and terminal provisions for Canadian P&C insurers.

PACICC's request for proposal identified specific requirements for the research paper. Below, we reproduce PACICC's requirements and refer the reader to the specific section addressing each requirement.

- A summary of the current state regarding time horizons and terminal provisions including, but not limited to, a literature review of actuarial and academic papers (Section 5 – Current Practice)

- International practices, including: current practices in the use of time horizons and terminal provisions within models used by the P&C industry; practices in other financial sectors, and Basel II, Solvency II, Swiss Solvency Test, and APRA (Australia) solvency requirements (Section 5 – Current Practice)

- Additional costs imposed by the *Winding Up and Restructuring Act* (Section 9 – Winding Up an Insurance Company*)*

- Practical issues related to international financial reporting standards (IFRS) and the implementation of IFRS 4 (Phase II) (Section 8 – Practical Issues Related to International Financial Reporting Standards)

- The theoretical and practical considerations when selecting a time horizon or terminal provision (Section 2 – Time Horizon and Section 3 – Terminal Provision)

- Whether the time horizon and terminal provision should be standardized for banks, life insurers, and P&C insurers. If not, the key differences between P&C insurer and other members of the financial sector (Section 7 – Should there be a Standardized Approach for Banks, Life Insurers and P&C Insurers?)

- Whether there is a standard/common usage of time horizons and terminal provisions in models currently in use (Section 5 – Current Practice)

- The implications for order of priorities in liquidation under the *Winding Up and Restructuring Act* (Section 9 – Winding Up an Insurance Company*)*

- Whether the time horizon or terminal provision should vary by risk factor or be uniform (Section 6 – Should the Time Horizons or Terminal Provisions Vary by Risk Factor or be Uniform?)

— The practical differences of considerations in the use of time horizons and terminal provisions between Conditional Tail Expectation (CTE) and Value at Risk (VaR) (Section 4 – Statistical Measurements)

— A review of the implications for Standards of Practice of the Canadian Institute of Actuaries (CIA) or other elements of the Canadian solvency regime (Section 10 – Implications for CIA and Other Elements of the Canadian Solvency Regime)

In addition to the specific requirements, we addressed other relevant issues in the research paper as appropriate.

What is Meant by "Time Horizon" and "Terminal Provision"?

The time horizon refers to the fixed time period used in internal models for the determination of capital requirements and/or the testing of the financial condition of an institution. The terminal provision refers to the valuation basis for the risk that remains at the end of the time horizon.

It is the combination of the time horizon, the selected statistical measurement, and the terminal provision that determines the capital requirement of an insurer. Thus, it is challenging to separately report on the issues of time horizon and terminal provisions. Nevertheless, wherever possible we strive to present our findings regarding time horizon separately from our findings about terminal provisions.

Decisions regarding time horizon and terminal provisions must be considered in the context of the functions of regulatory capital. In *Key Principles for the Future Direction of the Canadian Regulatory Capital Framework for Property & Casualty (P&C) Insurance*[3] (*P&C Key Principles*), the Office of the Superintendent of Financial Institutions Canada (OSFI) cites two key functions of regulatory capital available:

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These two functions will influence the MAC's decision-making process. While we present numerous viewpoints and factors for consideration, ultimately there are three primary decisions for OSFI and other stakeholders in determining the requirements and/or standards for time horizon and terminal provisions. First, should a one-year or multi-year time horizon be required in internal modeling? Second, should the terminal provisions be determined based on a going concern basis or from a transfer value perspective? Finally, which statistical measurement, VaR or CTE (also known as tail value at risk or TVaR), and what percentage should be used? Based on our research, there is not yet consensus, either in Canada or internationally, on these questions.

It is important to recognize that KPMG does not reach conclusions on any of these issues nor do we offer recommendations to PACCIC. Instead, we present a summary of current practices – both in Canada and around the world – and present numerous opinions on the important issues for consideration.

[3] Released by the Office of the Superintendent of Financial Institutions of Canada (OSFI) in January 2010.

Research Methodology

In preparing this paper, we conducted an extensive literature review as well as eleven interviews with experienced practitioners. We include, in Appendix A, a complete list of the relevant literature. In Appendix B, we present the questionnaire that was used in our discussions with professionals from regulatory authorities, P&C and life insurance companies, the banking industry, academia, international insurance industry organizations, and accounting firms. We held discussions with professionals in Canada, the United States, Europe, and Australia.

Organization of the Research Paper

We organize this research paper in ten sections. Where appropriate, we summarize the relevant comments received during the interview process in the various sections. Before delving into the specific topics of time horizon and terminal provisions, we believe that it is important to acknowledge the state of current practice with respect to the use of internal models in general. Thus, Section 1 contains a discussion of the current use of internal models.

Next, we examine time horizon and terminal provisions (Sections 2 and 3, respectively). In Section 2, we start with a background description and then address theoretical and practical considerations based on our literature review. We present alternative approaches to time horizon as summarized in a CIA draft discussion paper, dated 4 November 2005, titled *Risk based economic capital time horizon*[4] (*CIA Draft Paper Time Horizon*): one year, multi-year, and run-off with and without periodic solvency testing. We conclude Section 2 with a summary of the responses to our interviews regarding the theoretical and practical considerations to time horizon. In Section 3, we begin with background and then present the key findings in a CIA draft discussion paper, dated 6 October 2006, titled *Economic Capital: Calculation of Terminal Provisions*[5] (*CIA Draft Paper Terminal Provisions*). Similar to Section 2, we conclude Section 3 with a summary of comments received during our interviews.

Section 4 presents the two statistical measurements most often considered in the determination of time horizon and terminal provisions: VaR (also referred to as percentiles or confidence levels) and CTE (also known as TVaR). We begin with feedback from the interviews, continue with a comparison of VaR and CTE, and then present concluding remarks about the two statistical measurements.

In Section 5, we open with a quote from *Actuarial Aspects of Internal Models for Solvency II*[6] regarding current practices. We continue with interview comments on the topic and then present the results of a time horizon survey conducted in 2006 by the General Insurance Research Organizing (GIRO) Committee of the Institute of Actuaries (United Kingdom). We conclude with a table summarizing international practice with respect to time horizon and terminal provisions.

[4] CIA Solvency Framework Committee, draft date 4 November 2005.
[5] CIA Solvency Framework Committee, draft date 6 October 2006.
[6] D. Brooks, R.J. Care, M.B. Chaplin, A.M. Kaufman, K.A. Morgan, D.N. Roberts, J.M.E. Skinner, D.J.K. Huntington-Thresher, P.J. Tuley, and D.L. Wong, draft paper presented to the Institute of Actuaries, 23 February 2009 (Brooks et al, 2009).

The question of whether the time horizon or terminal provisions should vary by risk factor or be uniform is addressed in Section 6. Then in Section 7, we discuss whether there should be a standardized approach to determining time horizon and terminal provisions for banks, life insurers, and P&C insurers. The practical issues related to international financial reporting standards (IFRS) and the implementation of IFRS 4 (Phase II) are discussed in Section 8.

Section 9 addresses the issues requested by PACCIC with respect to the *Winding-up and Restructuring Act* (WURA). We begin with a discussion of the application of WURA to P&C insurer insolvencies and then discuss the differences in the liquidations of P&C insurers and life insurers. We also consider the legislated priorities in a liquidation scenario and the costs of liquidations. Finally, we look at issues arising from cross-border insolvencies and complex group structures.

We conclude with Section 10 which addresses next steps for the CIA.

As noted previously, Appendix A contains a complete list supporting our literature research, and Appendix B contains a copy of the questionnaire we used in all interviews. Appendix C, titled "Good Practice in 2012," is taken in its entirety from *Actuarial Aspects of Internal Models for Solvency II*[7] and presents seven practices which the authors believe represent a state of best practice regarding time horizon and terminal provisions.

[7] Brooks et al, 2009.

SECTION 1 – USE OF INTERNAL MODELS

Before commenting on the current practice for time horizon and terminal provisions within models, it is important to acknowledge the state of current practice with respect to the use of internal models in general. Canadian P&C insurers currently lag European and Australian insurers in the use of internal models. This is in large part due to regulatory developments in the United Kingdom, the European Union, and in Switzerland where there has been a movement from market-wide formula-based to company-specific capital calculations. In the United Kingdom, this new environment is referred to as the individual capital adequacy standards (ICAS) regime.

Currently, the primary uses of internal models in Canada tend to be related to dynamic capital adequacy testing (DCAT) for both P&C and life insurers and capital requirements for the segregated funds of life insurers. There is not widespread use of internal models by Canadian P&C insurance companies for individual capital assessment (ICA). Those P&C insurers that are using internal models for ICA tend to have foreign parents who developed and use the models for European solvency and regulatory purposes.

Internationally, many jurisdictions have approved the use of models for assessing regulatory capital. These include (but are not limited to):

- Germany, Belgium, United Kingdom, Netherlands, and Australia for banking
- Australia for general (i.e., P&C) insurance
- Switzerland for life and non-life (i.e., P&C) insurance
- United Kingdom for life and non-life insurance
- Canada for segregated funds
- Belgium for life insurance

The required use of internal models for determining capital requirements can be quite onerous. For example, a key principle of the Swiss Solvency Test (SST) is that the internal model must be integrated into the core processes of the company.[8] However, meeting such a "use test" can be challenging for companies. In November 2005, Phillip Keller, then of the Federal Office of Private Insurance, delivered a presentation titled *Swiss Solvency Test*. In this presentation, Mr. Keller noted that "even worse than having a bad model is having any kind of model – good or bad – and not understanding it." His comments demonstrate the importance of the use and knowledge requirements underlying the new regulatory capital frameworks. If an insurance company is to rely on an internal model, then they must demonstrate that it is understood and in use by the company. In his presentation, Mr. Keller states:

> There needs to be:
>
> - Deep and detailed knowledge by the persons tasked with the upkeep and improvement of the model

[8] "Solvency II and the Swiss Solvency Test" presentation by János Blum at the Casualty Loss Reserve Seminar, San Diego, 11 September 2007.

- Knowledge on the underlying assumptions, methodology and limitations by the CRO, appointed actuary etc.

- Sufficient knowledge to be able to interpret the results and awareness of the limitations by senior management and the board[9]

In addition to the challenges of the use and knowledge tests, there are challenges associated with the wide range of types of risks to be considered in internal models. The Financial Services Authority (FSA) in the United Kingdom has stipulated what types of risks should be considered. These risks are often referred to as the Prudential Sourcebook risk categories[10] and include: insurance risk, market risk, operational risk, pension schemes, credit risk, group risk, and liquidity risk.[11] In "The time horizon conundrum" Claus and Jackson note that "a common mistake is to assume that these risks are well defined and therefore to focus on quantifying the risks instead. In fact, some of the more fundamental issues yet to be resolved are in relation to risk identification rather than quantification."[12]

During our interviews with insurance professionals from Australia, we discussed the current state of practice regarding internal models. In Australia, insurers can use their own internal model in place of the default parameters established by the regulator. It is our understanding that no P&C insurer doing business in Australia is currently using the internal model approach for the purpose of determining capital requirements. While the four largest insurers have all developed internal models that are likely to be in a form that could be approved by the Australian Prudential Regulatory Authority[13] (APRA), none have yet obtained such formal approval. It is expected that other Australian insurers probably have internal models, but these models may not be in a form that the APRA would likely approve.

[9] November 2005, Phillip Keller, Federal Office of Private Insurance, presentation titled "Swiss Solvency Test"
[10] "The time horizon conundrum", Claus and Jackson, December 2006, www.the-actuary.org.uk.
[11] Financial Services Authority, ISG Expert Groups: Draft ICA Principles and Guidance, (Presented for discussion on 5 June 2006), Draft 1.0.
[12] "The time horizon conundrum", Claus and Jackson, December 2006, www.the-actuary.org.uk.
[13] The APRA is the prudential regulator of the Australian financial services industry and oversees banks, credit unions, building societies, general insurance and reinsurance companies, life insurance, friendly societies, and most members of the superannuation industry.

SECTION 2 – TIME HORIZON

Background

In the presentation "Revision to the Insurer Solvency Framework," delivered at the Appointed Actuaries Townhall meeting held in Toronto in April 2008, OSFI discusses the MAC vision concepts. They note that the future solvency financial requirements should "ensure that insurer assets are sufficient, with high degree of confidence, to withstand adversity emerging over a defined regulatory control *time horizon* [*emphasis added*]."

The time horizon refers to the fixed time period used in internal models for the determination of capital requirements and/or the testing of the financial condition of an institution. In *Actuarial Aspects of Internal Models for Solvency II*, the authors note that the time horizon aspect of an internal model involves several components:

- A period during which new contracts are accepted;
- A full or partial run-off period during which no new contracts are accepted; and
- A terminal provision to provide for obligations that continue beyond the run-off period. [14]

In January 2010, OSFI released a document titled *Guidance for the Development of a Models-Based Solvency Framework for Canadian Life Insurance Companies* (*OSFI Life Guidance*). In this guidance document, OSFI defines time horizon as "the length of the time period over which an initial shock is assumed to occur and capital is to provide protection for the identified risks." In this context, time horizon refers to the period over which a shock is applied to the risk and the period over which that shock will affect the insurer. At the end of the shock period, capital should be sufficient so that assets meet the liabilities which have been recalculated to take into account the shock. The recalculation of the liabilities should allow for the effect of the shock on the liabilities over the full time horizon of the policy obligations.

CIA Draft Paper Time Horizon

According to the *CIA Draft Paper Time Horizon*, there are four general considerations for selecting the time horizon:

- Delays in acting. The time horizon needs to be long enough to reflect delays that will arise between the calculation date and the point at which a company or regulator could take action.

[14] Brooks et al, 2009.

— Solvency confidence level. Longer time horizons require lower confidence levels, but it is not always easy to choose a level of confidence for a longer period consistently with a shorter period.

— Long term risks/trends. As the insurer's obligations may extend significantly beyond the time horizon, the insurer may be exposed to some risks that transpire gradually over time. Therefore, it is important that where the time horizon is shorter than the term of the liabilities, that allowance is made for these future obligations via the terminal liability measure used at the end of the time horizon.

— Model error and other practical considerations. The longer the time horizon, the more significant the impact of model risk becomes. With longer horizons it also becomes much more difficult to predict the impact of changes in management or policyholder behaviour. Using longer time horizons can also increase the complexity and run-time of the cashflow models used in the economic capital projections, particularly when an assessment of the solvency position is required at intermediate points in the time horizon.[15]

Alternative Approaches for Time Horizon

The *CIA Draft Paper Time Horizon* identifies four different approaches for time horizon:

— One year with a terminal provision
— Multi-year with a terminal provision
— Run-off with periodic solvency testing
— Run-off without periodic solvency testing

One Year with a Terminal Provision

In the presentation *Revision to the Insurer Solvency Framework*, OSFI refers to a one-year extreme risk horizon coupled with a terminal provision that reflects a lifetime risk horizon.[16] According to this presentation, OSFI selected a one-year time horizon instead of a lifetime horizon for three reasons. First, the focus is on extreme event risk analysis and management in an actionable time frame. Second, the one-year time horizon eliminates the potential for overweighting very subjective analysis embedded in long term extreme tail risk and the modeling of management actions. Finally, when coupled with an appropriate terminal provision at the end of year one that reflects the full distribution of post-stress risk events, the one-year time horizon does incorporate a long term risk horizon but with less weight than under a lifetime horizon.[17]

[15] CIA Solvency Framework Committee, draft date 4 November 2005
[16] Delivered at the Appointed Actuaries Townhall meeting in Toronto on April 2008.
[17] Office of the Superintendent of Financial Institutions Canada. Revision to the Insurer Solvency Framework. Presentation. April 2008..

In addition to the three reasons cited by OSFI above, the *CIA Draft Paper Time Horizon* lists the following advantages in selecting a one-year time frame:

- Consistency with approaches used in banking, proposed by the International Actuarial Association (IAA), and generally by insurers in European countries
- Solvency confidence level can be calibrated to bond defaults
- Less uncertainty in management and policyholder actions over a shorter time horizon
- Impact of model risk and parameterisation is less significant over a one-year period
- A large number of scenarios can be modeled with a shorter time horizon
- More consistent with the way that stock companies are managed

Allan Brender cites several difficulties with the current prevailing approach of a one-year time horizon in his paper titled "Current problems in insurance solvency."[18] For life insurance, he comments that one year "may be too short since the recognition of a significant change in underlying experience (as opposed to a random fluctuation) as well as the introduction of compensatory management action may require several years, during which time the insurer is at financial risk." Problems can also arise with P&C insurers as a one-year time horizon is not a sufficient period of time to recognize the effects of the multi-year business cycle. Mr. Brender notes that the insurer's position within the cycle can have a significant impact on its solvency position. One further challenge, identified by Mr. Brender, is that little is known about the appropriate and consistent choices of critical stress levels for different time horizons.

Furthermore, the *CIA Draft Paper Time Horizon* notes the following disadvantages of using a one-year time horizon:

- Gradual changes/trends or sustained periods of adverse experience in risks that would not fully manifest themselves in one year may not be appropriately captured. Adjustments to the scenarios or terminal liability assumptions could be developed using other measures (such as DCAT) for these situations.
- Obligations after the one-year time horizon are only reflected via the terminal liability, making it critical that all obligations and risks are reflected.

Multi-Year with a Terminal Provision

An advantage of using a multi-year time horizon is that it allows for some trending of risk(s). Such an approach is currently used for Canadian DCAT. However, even the current DCAT time horizon of two years plus a stub period for P&C insurers may be too short to allow for full analysis of trends and in particular the P&C business cycle.

[18] Mathematisches Forschungsinstitut Oberwolfach, Report No. 7/2008, Mini-Workshop: Mathematics of Solvency, February 10-16, 2008

Disadvantages of an intermediate approach, as stated in the *CIA Draft Paper Time Horizon*, include the following:

- Time horizon is too short to allow for full analysis of risk trending
- No clear theoretical justification for a medium term time horizon
- Difficult to model management and policyholder actions over medium time horizons
- Can be difficult to set solvency confidence level on a consistent basis with the risk appetite of the company
- Computer run-time will limit the number of scenarios that can be run, particularly if nested stochastic runs are required to assess solvency annually
- The external environment and company risk profile may change materially over the time horizon from the environment and business modeled
- Calculation of the terminal liability at a medium time horizon may be more complex than the corresponding calculation at a one-year horizon

Run-Off Alternatives

The run-off alternatives, with or without periodic solvency testing, involve using a time horizon that is long enough to discharge most of the company's obligations. Both alternatives directly model the obligations, as well as the gradual changes or trends in risk, over the full life of the business. These alternatives do not require a terminal provision and are not dependent on the methodology used to assess liabilities. The difference between the two alternatives is that the run-off with periodic solvency testing requires solvency testing at the end of each time period, but the run-off without periodic solvency testing does not. As stated in the *CIA Draft Paper Time Horizon*, there are three challenges applicable to both run-off alternatives:

- Modeling management and policyholder actions over long time horizons become more and more difficult as the projection moves further into the future
- Can be difficult to set solvency confidence level on a consistent basis with the risk appetite of the company
- The external environment and company risk profile in future periods may be very different from the environment and business modelled

A specific disadvantage in using run-off approach without periodic solvency testing is the potential of resulting in insolvency at an intermediate point in the projection, even if the capital is sufficient for the full life of the business. Furthermore, more risky equity investment strategies will tend to lead to lower capital requirements without periodic solvency testing.

Theoretical and Practical Considerations – Feedback from Interviews

PACICC requested KPMG to address the issue of theoretical and practical considerations when selecting a time horizon and terminal provisions. Thus, we asked this question to all eleven interviewees. When responding to the theoretical considerations related to time horizon, there was not consistency in the responses. For example, we heard:

- When selecting the time horizon, the longer the time period, the more difficult it would be to select scenarios. One year is sufficient as P&C insurers can adapt quicker than life insurers by implementing rate changes and underwriting actions. Furthermore, the duration of the liabilities is not that long.

- One year is too short as many events have effects over multiple years. A three-year to five-year time horizon might capture more information.

- Choice of time horizon and probability are linked. The level of security that one wants relative to a probabilistic view depends on the time horizon. Essentially time horizon is arbitrary and we choose a probability appropriate for that time horizon. There are three equations: money, time horizon, and probability. We need to choose two to determine the third. The length of time that the regulator or company takes to react can determine the time horizon and level of security required. Finally, we also need to consider the time it would take to identify the problem.

- The time horizon should be infinite as insolvencies do not arise all of a sudden. There should be a long enough time horizon that there is time for corrective action. One year is not long enough; instead one professional suggested a two-year or three-year time horizon.

- The time horizon should cover at least the bulk of active risks. The time frame relates to the risk. Thus, a single time horizon is defective as there are different time horizons for different risks. The time frame selected should be a comfortable one in which the regulator is assured that management can react appropriately with necessary corrective action if required.

- The time horizon should be a time frame which allows for management actions to be implemented and results to flow through to correct capital position. A one-year time horizon is often considered sufficient to put in place actions to mitigate any risks arising over this period.

- If the company is locking itself into long term commitments, is it reasonable to use a one-year time horizon?

- Aggregating risks is difficult when there are different time horizons for different risks. Correlation can be challenging.

- Fundamental issue is to identify risk that is captured in the reserving process and to determine how to capture that risk in capital.

When responding to the practical considerations related to time horizon, the interviewees noted:

— There are many considerations from a practical perspective. First, data and modeling capabilities may not exist for all risks. Second, we do not yet truly understand how onerous the modeling for P&C insurers will be. There is not a consistent articulation of how model risk and parameter risk are incorporated in the modeling process. Finally, we must understand what we are trying to simulate at the end of the intermediate time horizon: is it the reserves actually held or the reserves that should be held?

— Computer processing time as well as hardware and software requirements can be immense for running many thousands of scenarios. The longer the time horizon, the greater the challenge.

— With respect to time horizon, would like to consider a level playing field for P&C and life insurers as well as for Canadian and international insurers. One year is appealing from a regulatory point of view as we want the company to survive one year and then be able to transfer the business.

— The choice of time horizon will depend on how difficult it is to accurately model risks over longer time periods. For example, estimating market risks over an ultra-long term horizon may often be dependent on mean reversion assumptions, which cannot be empirically verified due to the scarcity of ultra-long term market return data, or on assumed future asset strategies, which could be subject to large changes. Therefore, long-term modeling of such risks can be highly subjective.

— The starting point for the time horizon would be one year. To be shorter than one year, you would need to have mechanics of a system such that you can identify and deal with it in that timeframe. Since typical timeframes are quarterly reporting, one year should be appropriate. The target would be to have economic capital requirements by February for end of year.

SECTION 3 - TERMINAL PROVISIONS

Background

In *OSFI Life Guidance*, the terminal provision is defined as "the valuation basis for the risk that remains at the end of the initial time period."

In *Actuarial Aspects of Internal Models for Solvency II*, the authors offer two alternatives for the consideration of terminal provisions:

- Run-off: The terminal value represents the cost of settling insurer obligations as they come due. This terminal value depends on the distribution of ultimate settlement values for policy obligation foreseen as run off commences.

- Transfer Value: The terminal value is determined from a model representing the cost of transferring the unsettled policy obligations to another entity at the end of the time horizon or projection period. This terminal value depends on two distributions. Firstly, it depends on the distribution of the estimates of ultimate settlement values for policy obligations at the end of the projection period. Secondly it depends on the distribution of market risk perception, as measured by changes in cost of capital or other measures. (The one-year runoff of the SCR calibration of Solvency II is a transfer value test.)[19]

The two alternatives are consistent with the MAC Vision concepts as reported in the presentation *Revision to the Insurer Solvency Framework*.[20] During this presentation, OSFI noted that "future solvency financial requirements should … ensure that there are sufficient assets at the end of the defined time horizon to provide for the: transfer of the remaining obligations to another insurer or run-off the remaining obligations."

The above two issues are also often discussed in terms of a choice between a going concern approach and a transfer approach. In the going concern approach, the objective is to ensure that the insurer has sufficient assets at the end of the time horizon to ensure that all remaining obligations can be met given experience at a conservative confidence level. The terminal provision on a going concern basis depends on the distribution of ultimate settlement values for policy obligations foreseen as runoff commences. As noted above, the transfer approach requires a terminal provision consistent with the cost in the market to sell the business.

CIA Draft Paper Terminal Provisions

The *CIA Draft Paper Terminal Provisions* identifies two key principles applicable to terminal provisions:

[19] Brooks et al, 2009.
[20] Delivered at the Appointed Actuaries Townhall meeting in Toronto on April 2008

- The terminal provision must reflect experience along a given path and its resulting conditions at the end of the time horizon. Thus the terminal provision will generally be unique for each scenario within the time horizon.

- Second, the terminal provision must reflect the remaining obligations at the end of the time horizon over their entire remaining lifetime.[21]

The CIA Solvency Framework Subcommittee identifies five key issues surrounding the terminal provision:

- What will a company do following an adverse tail event year, e.g. continue in operation or transfer the remaining business to a third party? Knowing this dictates the function of the terminal provision and leads to a valuation method.

- Which general valuation method is appropriate, Historical Experience (Real World) or Market Consistent (Risk Neutral)?

- When should the terminal provision include margins, and how might they be calculated?

- How can risks that do not fully develop within the time horizon be captured in the terminal provision calculation?

- Are there appropriate approximations available to simplify the computational complexity implied by having to calculate a path specific terminal provision at the end of every stochastic scenario over the time horizon?[22]

The historical experience method is described as the traditional actuarial approach of projecting future experience along best estimate assumptions and adding in a moderately conservative (but not tail) margin. To the extent possible, assumptions are entity specific, not industry specific. In a market consistent approach, the terminal provision is equal to the market value of instruments based on replicating the cash flows from the remaining obligations with instruments available in the market.

The *CIA Draft Paper Terminal Provisions* notes that the key difference between the historical experience and market consistent frameworks is the approach taken to determine the appropriate allowance for risk. The historical experience framework uses judgment-based risk premiums, whereas the market consistent framework uses market-based risk premiums. The market consistent framework relies on the no arbitrage principle in which non-investment risks are typically considered diversifiable and carry no risk premium. Liquidity is an important consideration in the market consistent framework for insurance risks given the absence of a deep and liquid secondary market for insurance products.

[21] CIA Solvency Framework Committee, draft date 6 October 2006.
[22] CIA Solvency Framework Committee, draft date 6 October 2006.

Judgment is required for both the historical experience and the market consistent frameworks. For example, an approach based on historical experience requires the selection of a confidence level for a going concern approach or the market value margin for a transfer to a third party. A going concern historical approach also requires setting long term expected assumptions including economic paths, policyholder behaviour, and management action. A market consistent approach requires a risk-free rate, decision on whether to base on bid or offer price, the estimation of market prices following tail experience, and setting parameters where liquid market prices do not exist.

Theoretical and Practical Considerations – Feedback from Interviews

When asked about terminal provisions, our interviewees had the following comments:

- One must know what the purpose is – run-off or going concern.

- When selecting the terminal provision, there should be sufficient capital in the following year to respond to regulatory capital requirements. Alternatively, there should be enough capital so that after the shock the company does not become insolvent, though it should not necessarily need to remain at its target capital level. This professional provided an example of setting the provision for adverse deviation on policy liabilities to 90% VaR with capital at 99.5% VaR.

- The terminal provision will be based on the nature of the liabilities. One needs to consider whether or not reserves are released. For those types of risks where the risk goes away, then reserves can be released. If the risk does not go away then the reserves are not released. One insurance professional provided the example of mortality, a policyholder dies and the reserve is released. On the other hand, if there is an interest rate decline, the risk still exists of further decline.

- The challenge comes in shocking the reserve triangle. One solution is to categorize lines of business into short, medium, and long and require different percentiles for the three categories. For the lines of business with longer duration, use a lower percentile.

- When considering terminal provisions, one needs to consider two questions: (1) what is the worst thing that could happen (e.g., 1918 pandemic, credit crisis) and (2) what new information could arise that would change the parameters in the model. The first question is related to contagion risk and the second to parameter risk.

- There has not been a lot of work on the terminal provision in banking

- Objective is to have enough money in the tin to pass the business off to someone else after a couple of years. Could use something like 75% of liabilities are runoff and then terminal provision. If you are presuming that you can sell off after a couple of years then you can get normal unit costs.

- We model a loss distribution over one-year time horizon but don’t use terminal provision except for a few long tail lines of business. We recognize that events in the first year could have an effect on future years’ experience and thus incorporate such effects in the terminal provision.

SECTION 4 – STATISTICAL MEASUREMENTS

The two statistical measures most often considered when determining time horizon and terminal provisions are VaR, also referred to as percentile or confidence levels, and TVaR, also known as CTE or expected shortfall.

Feedback from Interviews

During our interviews, we asked about the practical differences or considerations in the use of time horizon and terminal provisions between CTE and VaR. We heard the following:

— There are good arguments for using CTE as it tells you how bad it can get beyond a certain point. However, VaR is consistent with banks.

— The decision is based on what the regulator is trying to manage – the probability of ruin or the depth of ruin. We want to have an economically viable amount of capital, and we want a reasonably robust approach for determining a flag that identifies when a firm should exit. It is important that we are able to communicate the chosen statistical measurement with both the board of directors and management of the company. For companies in run-off, the actuary has to sign off that there is a 99.5% probability that all liabilities will be met to extinction.

— CTE not VaR should be used.

— Banks use VaR and recognize the limitations. VaR is easier to apply and communicate with people. For extreme events, stress testing should be applied. Banks use a 99.97 AA default spread. A 1-in-100 year event is not sufficient in the tail.

— The choice of statistical measurement depends on the situation. For most products, CTE would be roughly double the VaR (99.0 vs. 99.5). From a theoretical viewpoint, the CTE may be better with extreme tails.

— From a purely technical perspective, CTE is a better tool. However, VaR is easier to explain. Believe that the technical shortcomings of VaR are overblown by the academic community.

— CTE is theoretically stronger. However, with CTE one needs to model the distribution all the way to the end; we may not have the capabilities to do that at this time. VaR may be more practical; though it is difficult to get to 99.5% accurately.

— CTE models the tail better, but VaR is more in line with Basel II. Canadian insurers with European parents lean towards VaR for consistency purposes. While CTE may be theoretically stronger, it may not be practically better. In the long-term, believe that CTE is better choice.

— It is more difficult to quantify CTE than VaR. Furthermore, results for CTE can be very large, subject to big changes over time, and sensitive to data input and model. For example, when using different catastrophe models, the CTE value from one model can differ by large multiples from another model.

— We use VaR since that is what our parent organization uses. Also use VaR in reinsurance decision making. Since we perform full simulations, there is no additional complication of using CTE.

— The main consideration in a model would be determining the underlying distributions of the joint risk factors or balance sheet position to be modeled. Once the underlying distributions are reasonably described, then either method can be applied equally well. For capital modeling purposes, the underlying distributions are likely to be determined by stochastic simulation, in which case either method can be applied simply.

— Simplicity is key here. VaR is probably easier to communicate. CTE is increasingly commonly used in capital allocation however it may be overly complicated for establishing the level of capital required in the first instance. One observation is that very few regimes focus on the depth of ruin in the event that a company does fail to meet its statutory obligations. If one approach gave a better explicit or implicit measure of the outcome in the circumstance of ruin then, in my mind, that would be an advantage that might support the introduction of greater complexity.

VaR and CTE Compared

The comments received through our interviews are consistent with the differences of opinion we observed in our literature review. The CTE is generally considered theoretically superior by some individuals and organizations as it more robustly reflects the “fatness” of the tail. Under heavily skewed distributions (such as property catastrophe coverage, credit insurance, or some types of professional liability coverage), an extreme percentile can be less than the expected value (i.e., mean value). On a percentile basis, the aggregate result of two risks can be higher than the sum of the stand-alone results.

We return to one interviewee’s comment that the answer as to which is the superior statistical measurement is dependent on what the regulator is trying to manage – the probability of ruin or the depth of ruin. The VaR denotes a single point in the tail of the distribution of possible losses, whereas the CTE is a measure of the expected values of the loss given that the loss falls in the adverse tail of the distribution. Thus, CTE provides information about the depth of ruin and VaR is focused on the probability of ruin.

A disadvantage of VaR is that it has the potential to be inconsistent with certain desired properties of coherent risk measures. For example, in situations with extremely low frequency events, the capital requirements can be less than the mean loss. Furthermore, separating the various risks and estimating the capital requirement for each risk can result in a lower total capital requirement. Under normal circumstances, however, these results are not likely to occur.

As noted in the interview comments, VaR is consistent with most international practice, including Solvency II and Basel II. VaR is easier to explain and easy to use when a normal or near normal distribution of losses is assumed. From a purely technical perspective, however, CTE is a superior statistical tool. One advantage is that CTE is less sensitive to sampling variability, and one disadvantage is that the entire tail of the distribution must be modeled for CTE.

It is possible to approximate a CTE framework with a VaR framework by establishing a target percentile to approximate the effect of using a CTE approach. This is more effective for risks exhibiting a normal distribution than for highly skewed distributions.

In our research, we observed that there is a common assumption that a VaR 99.5 is roughly equivalent to CTE 99. However, this holds true under an assumption of a uniform distribution, which is very unlikely for most P&C risks. The following table summarizes our estimates as to which CTE measurement is equivalent to a VaR 99.5.

Distribution	Key Assumption	CTE
Normal		98.7
Lognormal	CV = 1.0	98.5
Lognormal	CV = 3.0	98.25

Conclusion

OSFI is seeking the identification of a statistical measurement that will deliver an economically viable capital requirement. The approach must be sufficiently robust that it appropriately identifies those companies requiring corrective action. The strength of the capital requirements should contribute to a low frequency of insolvency in Canada. If the selected measurement is able to properly identify the relative levels of financial strength of companies, then it is a viable measure. We believe that both VaR and CTE, properly calibrated, when applied to an appropriately parameterized internal model, can result in a reasonable statistical measurement under most situations.

SECTION 5 – CURRENT PRACTICE

Actuarial Aspects of Internal Models for Solvency II

Chapter 3 "Time Horizon" of *Actuarial Aspects of Internal Models for Solvency II* addresses the issues of time horizon and terminal provisions in great depth. The chapter contains background information and identifies current practices, "good practice in 2012," and areas where barriers exist and further research is required. With respect to current practice, the authors state:

> Current ICA requirements require companies to consider internal models to be calibrated to a 99.5% confidence interval over one year.
>
> Most GI [general insurance] internal models already consider at least one year of new business, with a run-off to ultimate. Life models often look at stresses applied as at the capital assessment date, flexing the starting position for the stochastic run-off.
>
> Many stochastic internal models will also include the functionality to incorporate more than a single year of new business, although less emphasis is likely to be placed on the new business assumptions in years two onwards from a capital perspective.
>
> Where internal models use a run off terminal value, they are also likely to be able to consider the transfer value basis. However, where an internal model is currently on a transfer value basis, it is less likely to be able to incorporate the full run-off of liabilities. The transfer values are often only rough approximations of possible transfer values, and do not properly account for the transfer value that would be achieved in the market place. For example, looking at the risk premiums that are incorporated in the reserves in QIS4, they are relatively low for GI liability business, and do not adequately reflect the true market risk premium that would be charged by a willing buyer of the liabilities. Similarly, the recent credit crisis means life business reserve setting is more cautious with respect to credit – but this effect is not typically captured in a model. These effects mean the model projection is biased to a more favourable outcome. [23]

Interview Comments

When we asked the interviewees about the current state of practice with respect to the time horizon, the most common response was "one year." We also heard the following during our interviews:

— Reserves and unearned premiums are run off to ultimate, and all other risks are modeled for one year.

[23] Brooks et al, 2009.

— The time horizon is one year and there is not a lot of debate about this. The systems should be sufficient such that the organization can react within that time frame.

— One year is used as a simplifying assumption.

— In the Australian internal model requirements, there is a mixed approach to time horizon – a time horizon of one year for modeling catastrophe and operational risks. Over this period, it might be assumed that insurer management actions would occur to mitigate any such risks, in which case no additional terminal provisions would be required. If it were not practically possible to adequately mitigate risks after such a period, then some provision for the remaining risk may be necessary. A time horizon should be sufficient to runoff all underwriting, reserving, credit, and market risks to extinction. Given this definition, we do not believe that any terminal provision would be required to be modeled.

— Historically at Lloyds, they were projecting one year forward and then running the liabilities off to a final settlement value. Now, there is a focus on the movement in the year rather than running off all liabilities to ultimate. It is risky not to capture the variations all the way to the final payment.

— Comcare is an Australian-wide workers compensation scheme which allows large insurers to self-insure. The Workers Compensation regulator requires these self-insurers to hold a bank guarantee for an amount calculated as "the projected outstanding claims liabilities in 2 years time, with a sufficiency of 90% (VaR90) plus one reinsurance retention."

GIRO Time Horizon Survey

The General Insurance Research Organising (GIRO) Committee from the Institute of Actuaries (United Kingdom) holds an annual conference on topics relevant to general insurance practitioners. In "The time horizon conundrum," Claus and Jackson report on the time horizon survey that was carried out for the 2006 GIRO Conference. The purpose of the survey was to determine whether there was market consensus regarding the aspects of risk identification relating to time horizons. According to Claus and Jackson: "The survey collected information relating to the methodology and assumptions used in quantifying time horizon risks rather than the extent to which they were taken into account. This was partly due to the practicalities of collecting the information, but also to facilitate capital comparisons."[24]

There were 153 responses received to the survey, but only 65 had sufficient information for analysis. The authors explain that they did not observe any bias toward responses of any one sector. "Responses were evenly split between the London (including Lloyd's) market, the UK company market, international firms, and other firms, which consisted mainly of consultants." [25]

[24] "The time horizon conundrum", Claus and Jackson, December 2006, www.the-actuary.org.uk.
[25] "The time horizon conundrum", Claus and Jackson, December 2006, www.the-actuary.org.uk.

The main results of the survey were:

New business period	No consensus	— 33% one year — 23% three years — 27% five years — 17% other
Projection period	No consensus	— 40% apply a projection period of more than 5 years
Recognition of ultimate losses	No consensus	— 45% recognize deteriorations over time — 55% recognize the deterioration to ultimate immediately
Risk tolerance	No consensus	— 55% state confidence level is a function of the projection period — 45% state confidence level is a function of the new business period
Run-off basis	Broad consensus	— 70% assume going concern

Claus and Jackson conclude: "Although some of the above differences will be due to firm-specific features (e.g. types of business written), we believe there is still overwhelming evidence that there is no consensus within the general insurance market on a number of crucial time horizon issues."[26]

International Practice

The following summarizes, in tabular format, the current practice with respect to time horizon by regime. (Additional details for each jurisdiction or regime are provided after the table.)

[26] "The time horizon conundrum", Claus and Jackson, December 2006, www.the-actuary.org.uk.

Jurisdiction/Regime	Time Horizon	Statistical Measurement
Canada – segregated funds	Lifetime	CTE 95
Australia	One year plus run off of certain risks to extinction	VaR 99.5
Bermuda	One year plus run off of liabilities to extinction	CTE 99
Netherlands	One year	VaR 99.5
Solvency II	One year	VaR 99.5
Switzerland	One year	CTE 99
United Kingdom	One year or longer at comparable confidence level	VaR 99.5
FTK Model (Dutch)	One year	VaR 99.5
2002 GDV (German) Model	One year	VaR 99.78
Basel	One year equivalent	— Credit based on long run average defaults — Operational VaR 99.9 — Interest rate risk VaR 99

As indicated in the table above, Australia employs a mixed time frame for its time horizon component. The APRA requires that internal models allow for business written over a one-year time horizon, which includes both catastrophic risk losses and operational risk losses over the one-year period, and the run off of underwriting, reserving, credit, and market risks to extinction.

The Bermuda Monetary Authority[27] (BMA) is similar to APRA in using a mixed time frame for its time horizon component. Internal models must include one year of expected new business as well as renewals that are effective within one year of the valuation date. Catastrophic risk, credit risk that is not related to reinsurance, and operational risk are also considered within the one-year time frame. Liabilities, in contrast, are run-off to extinction. When running off liabilities, the models are to take into account the effects of catastrophe, underwriting, reserving, and credit (reinsurance, liquidity, and market risks).

[27] The BMA is the integrated regulator of the financial services sector in Bermuda and develops risk-based financial regulations for Bermuda's banks, trust companies, investment businesses, and insurance companies.

A critical concept of the Swiss Solvency Test (SST) is the market value margin. This margin is defined as the smallest amount of capital which is necessary in addition to the best-estimate of the liabilities, so that a buyer would be willing to take over the portfolio of assets and liabilities.[28] Under the SST, all assets and liabilities are valued market consistently. For liabilities, market consistent is defined as the sum of the best estimate of the liabilities plus the market value margin. An important assumption of the SST is that hedgeable risks will be eliminated in a timely fashion (i.e., over the first five years following the time horizon).

For companies in the United Kingdom using a time horizon longer than one year, the model must be developed in such a way that solvency is checked regularly through the time frame. The terminal valuation most commonly used in the United Kingdom is market consistent. Most companies are using models that are deterministic over the time horizon and stochastic with respect to the determination of the terminal provision.

As evident in the table above, both VaR and CTE are used around the world; however, VaR is currently used by more regulators than CTE.

[28] "Swiss Solvency Test" presentation by Phillipp Keller, Federal Office of Private Insurance, Luzern, 22 November 2005.

SECTION 6 – SHOULD THE TIME HORIZON OR TERMINAL PROVISIONS VARY BY RISK FACTOR OR BE UNIFORM?

The *CIA Draft Paper on Time Horizon* presented two very different views on the issue of whether time horizon or terminal provisions should vary by risk factor or be uniform.

- Yes. Some risks can be substantially "reset" at the end of one-year (e.g. selling an asset at market value to eliminate the credit risk) and that "reset cost" can be modeled using accepted methods. For other risks, the company may not easily "reset" the risk or it may be difficult to model the "reset cost". For these risks it might make sense to use a longer time horizon. Examples include mortality, morbidity and interest rate mismatch risk and the potential difficulty measuring these risks over one-year.

- No. It will be extremely difficult to build and maintain a consistent framework across risks if we use different time horizons for different risks. Is it possible to determine requirements that provide a consistent level of capital coverage across different risks if different time horizons are used? It will be very difficult to develop consistent confidence levels since each risk will have a different distribution of possible outcomes. Also, it will be very difficult to reflect correlations between risks if the time horizons are different. If a one-year or five-year horizon is chosen then the terminal value methodology needs to appropriately reflect risks that are not modeled effectively over the time horizon.

We also observed a range of opinions when we asked the interviewees whether the time horizon or terminal provision should vary by risk or be uniform. Responses included:

- It would be much easier to think of all risks on the same time horizon, particularly for management. It is important to note that a typical time horizon for management is not more than three years.

- It would be simpler to have the same time horizon with the one exception of catastrophe risk. For catastrophe, want to test on full in-force instead of the unearned premium only.

- The time horizon and terminal provision could vary by risk factor though there would have to be a very good reason to support such a difference.

- Terminal provisions should vary with the risk. This is similar to the current situation of different margins for adverse deviations for different lines of business and different categories of risk (i.e., claims development, investment return rates, and recovery from reinsurance ceded).

- Time horizon and terminal provisions must stay consistent. They do not necessarily have to be the same, but want the same level of protection. Certain risks may fit one-year model better than other risks.

- If the time horizon varies by risk factor, then such a methodology requires the use of different models for different risk factors. This may lead to potentially important interactions between risk factors being ignored, or to different risk factors being treated inconsistently, compared to a more integrated approach. However, with care, such considerations can be appropriately managed.

— Life insurers could probably deal with a shorter time horizon. For P&C insurers, they should vary by risk factor.

The diversity in responses to this question mirrors the differences observed in many of the previous interview questions and is consistent with the diversity of opinions found in the existing literature.

SECTION 7 – SHOULD THERE BE A STANDARDIZED APPROACH FOR BANKS, LIFE INSURERS, AND P&C INSURERS?

PACICC asked us to comment on whether or not the time horizon and terminal provision should be standardized for banks, life insurers, and P&C insurers. In *P&C Key Principles* (released January 2010), OSFI notes that the minimal capital framework should be based on a risk measure level that is common to all institutions. OSFI continues: "The risk measure should establish a time horizon (combined with an appropriate measure of terminal liabilities) that is common to all institutions."

Life Insurers

The *Framework for a New Standard Approach to Setting Capital Requirements* (*Framework*) (November 2008, Autorité des marches financiers (AMF), OSFI, and Assuris) sets out the risk horizon for life insurers as one year. The *Framework* states:

> ***Risk Horizon***
>
> The solvency buffer will be calculated for all risks that could have a negative financial impact on a life insurance company. The solvency buffer will be calibrated so that a company can withstand adverse conditions over a one-year time horizon with a very high degree of confidence and have enough assets to sell or run off the business after the year. This is consistent with the MAC Vision.
>
> ***Confidence Level***
>
> The degree of confidence for the one-year risk horizon will be set at a level equivalent to the 99% CTE level expected to be used in the future modeling approach. The terminal provision will be based on a methodology to be determined at a later date. Additional calibration considerations will include current capital levels, the outcome of future approach impact studies and a rating of at least a BBB grade security.

In *OSFI Life Guidance* (January 2010), a one-year time horizon is identified for determining total asset requirements, subject to the use of appropriate modeling philosophies and calibration criteria.

It is important to recognize that there are different risks for life insurers and P&C insurers. Assets are the main risk for life insurers; balance sheets of life insurers are vulnerable to historic economic scenarios. On the other hand, insurance risk (e.g., underwriting including risk to natural and man-made catastrophes) is a primary risk for P&C insurers; balance sheets of P&C insurers tend to be resistant to economic scenarios. Differences in risk could lead to different conclusions regarding time horizon and terminal provisions for P&C insurers when compared to life insurers.

Banks

In October 2006, Stuart Wason, then Chair of the International Actuarial Association (IAA) Solvency Sub-Committee, delivered a presentation at the Society of Actuaries (SOA) annual meeting titled *Convergence of Capital Standards in the Financial Services Industry*. Mr. Wason presented the following table comparing banks and insurance entities:

Solvency Component	Banks (Basel Accord)	Insurers (Proposed)
Approach to supervision	3 Pillar	3 Level
Key risks	Credit, Market, Operational	Insurance, Credit, Market, Operational
Asset/liability consistency	No	Yes
Target confidence level	95%-99.9% VaR	99% CTE
Advanced and standardized approaches	Yes	Yes

In January 2010, Patrick M. Liedtke commented on the differences between insurance companies and banks. He states:

> Regardless of how the recession might play out and what other negative developments might still occur, there is one important lesson to be drawn from the credit crisis that has so far not received enough attention, namely that insurers are markedly different from banks and that their distinct business models expose them to lesser risks in the liquidity domain. In fact, the nature of the services rendered by banks and insurers, the underlying business models and the risks associated with them, differ considerably. This must be reflected in different regulation and capital requirements for both industries in the future. "*Insurers are not banks*" is a simple statement but with far-reaching implications as far as the economic system and policy-making are concerned.[29]

Similar comments are expressed in July 2008 by The Geneva Association's Amsterdam Circle if Cuef Economists (ACCE) working group on the credit crisis in a paper titled *The role of insurance and why it is different from banking*. In this paper, the Working Group notes:

> Moreover, in recent years, the banking and insurance sectors have grown increasingly similar with respect to product offerings, distribution, regulation, and supervision. Despite this convergence, differences nonetheless remain in

[29] From the "Foreward: A hard look at financial intensive care" to *The Geneva Reports, Risk and Insurance Research*, "Anatomy of the credit crisis – An insurance reader from The Geneva Association," January 2010. The Geneva Association (The International Association for the Study of Insurance Economics) defines itself as "the leading international insurance 'think tank' researching strategically important insurance and risk management issues."

> the basic function and business models of banks and insurers. These differences are reflected in asset allocation, asset-liability management, as well as risk and capital management that generated different outcomes in terms of exposure to – and damage from – the credit crisis.

As noted in the two quotes above, the underlying risks differ and the business models differ. Within a banking institution, the primary risks are related to the assets. For P&C insurers, the primary insurance risks are underwriting risk, pricing risk, and claims risk. The three different types of financial institutions (i.e., banks, life insurers, and P&C insurers) sell different types of products that encompass different time periods. Much of the volatility in results between these institutions can be traced to these different product offerings. For example, life insurers are concerned with policyholder behaviour which often exceeds many other risks. In contrast, catastrophic risks, both natural and man-made, are of much greater concern to P&C insurers than to life insurers.

In addition to a difference in the time horizon, there is also a difference in the terminal provision requirements. The calculation of terminal provisions is more important for insurers than banks due to the long term nature of the risk exposure and the obligations to policyholders.

Feedback from Interviews

When we asked our interviews whether or not there should be a standardized approach for banks, life insurers, and P&C insurers, we received the following responses:

- It would be very helpful if regulatory capital was consistent, particularly for shareholders in making investment decisions.

- Would like it to be consistent between banks, life insurers, and P&C insurers but not necessarily standardized. For example, there may be different time horizons. One must recognize that there are many adjustments that are incorporated into the analysis for banks; and for banks, many risks are well taken into account (e.g., mismatch risk).

- Believe that there should be a standardized approach for life insurers and P&C insurers but this should not necessarily be the same as banks.

- All financial institutions should have the capabilities to model for a one-year time horizon. The concepts should not matter regardless of the type of entity.

- Theoretically there should be a standardized approach for banks, life insurers, and P&C insurers. However, in practice the approach should be customized to the specifics of the situation. This would address a degree of fairness in recognizing different risks.

- Yes, there should be a standardized approach. However, life insurers and P&C insurers have to capture terminal provisions and a three to five year issues. This recognizes that banks' risks are much shorter in their time frame.

— Not necessarily. The nature of the underlying risks for P&C insurers, banks and life insurers are necessarily different, and the scope and time frame for management actions to address capital issues are also different. Therefore different time horizons may well be appropriate to deal with different types of organizations.

— Few P&C companies have liabilities that are linked explicitly to investment asset values or performance. The key risks relate to catastrophes, major individual claims and therefore diversification and correlation aspects are key.

— Banks, and to a certain extent life insurers, accept risks that are asset-linked. However the time period in which those risks are retained is likely to be far shorter for banks than for life insurers. P&C risks are generally driven by uncertainly in insurance liabilities. Therefore, solvency problems will be generated from different risk factors, and the time frames to address those problems will be different.

— A bank may well be exposed to short-term trading and liquidity management risks, with much of the risk able to be removed from the books in days or months. A P&C insurer writing long-tailed liability business may retain and have to manage risks for decades, and given the illiquid nature of liabilities, liquidity risk is unlikely to be a significant source of risk.

— Probably. There is no reason why the time to react should be different. Life insurers were supportive of shortening the time horizon.

— The conceptual framework should be standardized but the time frames should vary.

Conclusion

We believe that a common, standardized framework for the determination of capital requirements would be valuable to facilitate a comparison among different types of financial institutions, However, it is critical that OSFI recognize that the different types of financial institutions have very different types of risk exposures, and thus different time horizons for measuring such risks and different requirements for terminal provisions are likely most appropriate from a regulatory perspective.

SECTION 8 – PRACTICAL ISSUES RELATED TO INTERNATIONAL FINANCIAL REPORTING STANDARDS (IFRS)

As of March 10, 2010, the latest tentative decisions for IFRS 4 (Phase II) regarding the discount rate noted that the rate will not be based on the supporting assets but rather some sort of benchmark. Such a benchmark could be corporate bonds or government bonds. There has been significant reaction to this tentative decision and we are aware that the CIA submitted a comment letter to the International Accounting Standards Board (IASB) on this issue in March 2010. To the extent that the discount rate is comparable to the rate at which liabilities would be discounted in a market transaction, there would be no inconsistency between the solvency balance sheet and the IFRS balance sheet as it is related to the discount rate. The most recent tentative decisions while supportive of a risk margin building block, have offered no specific guidance to its determination. Furthermore, there still remains considerable differing opinions both within the IASB and within the Financial Accountings Standards Board (FASB) of the United States. Depending on upcoming decisions on risk margins and their role in the measurement of claims liabilities, there could be differences between the solvency balance sheet and the IFRS balance sheet if a market consistency valuation is used. At this time, we are not aware of any other IFRS issues which would affect decision-making regarding the time horizon and terminal provisions.

Currently, the methodology for calculating certain values for a Solvency II balance sheet is different from that proposed under IFRS. If an internal model is to be used for business planning as well as for solvency calculations, then it will require two different bases for the balance sheet. This could result in an indication of insolvency under one basis but not the other. We believe that this is not an ideal situation for either company management or the regulator.

During our interviews, we asked about the practical issues for time horizon and terminal provisions as they are related to IFRS, and in particular IFRS 4 (Phase II). Most of the actuaries that we spoke with either responded that they did not know or asked to skip this question. Only one actuary responded to this specific question. He noted that there are many practical issues. As his company is approximately five years into the development of the economic framework, they will have one tool to handle both IFRS and Solvency II. There are a number of differences as the company's "own" model focus is on a going concern basis, which is not the focus of IFRS. He noted that there may be different parts required of the model to apply for each purpose (i.e., own company and IFRS). He indicated that there will be significant implementation issues.

SECTION 9 – WINDING UP AN INSURANCE COMPANY

The intent of this section is to provide some insight into the liquidation of insurance companies to assist with the discussion about a new capital framework for Canadian P&C Insurers. Principle 6 of the *P&C Key Principles* states that risks should be measured on a going concern basis and should consider winding-up and restructuring costs. Additionally, as discussed in the Introduction, regulatory capital has two key functions, including protecting policyholders and creditors from loss in the event of liquidation. Further to this, we discuss the winding-up of insurance companies, including the application of the *Winding-up and Restructuring Act*[30] (WURA), the statutory order of priorities in liquidation, and the costs imposed by a liquidation. We also address some of the issues faced by a liquidator, which are different than those faced by a going concern insurance company and cross-border complexities arising from the insolvency of insurers that are part of complex group structures.

Applications of WURA

Three pieces of legislation provide the legislative framework for responding to insolvencies in Canada:

- *Bankruptcy and Insolvency Act* (BIA)
- *Companies' Creditors Arrangement Act* (CCAA)
- WURA

Financial institutions such as banks, trust companies, and insurance companies may only be liquidated under WURA and are excluded from the BIA and the CCAA.[31]

WURA applies to both solvent and insolvent financial institutions, including the insurance business in Canada of foreign insurance corporations (i.e., Canadian Branches). Section 10s and 10.1 of WURA provide that a court may make a winding-up order in a number of circumstances, including where the entity is insolvent or where the Court is of the opinion that it is just and equitable to do so. Depending upon the circumstances, and provided the requirements of WURA are met, an application for a winding-up order may be made by the company, a shareholder of the company, a creditor of the company or, where the applicable insurance regulator has taken control of the financial institution or of the assets of the financial institution (including a Canadian Branch). An example of where a Canadian P&C insurance operation was wound up under WURA because it was just and equitable to do, and not because of a finding of insolvency, is the Canadian Branch of The Home Insurance Company (The Home (Canada)). A winding-up order was made in respect The Home (Canada) in 2003 in order to protect the interests of Canadian policyholders and creditors after the parent company in the United States was placed into liquidation and declared insolvent earlier in June 2003. [32]

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[30] R.S.C. 1985, c. W-11
[31] Thomas Telfer & Bruce Welling, "The Winding-Up and Restructuring Act: Realigning Insolvency Law's Orphan to the Modern Insolvency Law Process" (2008) 24 *Banking & Finance Law Review* 235-270, at 240
[32] PACICC notice to policyholders concerning the wind-up of the Canadian Branch of The Home Insurance Company, July 14, 2003. www.pacicc.com/english/announc/ann030714.htm.

The winding up of a corporation pursuant to WURA is largely a court-driven process by which a corporation can be wound up and its assets liquidated. On the winding up of an insurance company, the winding-up court usually grants two orders – one to wind up the company and another appointing the liquidator. The court granting the winding-up order retains jurisdiction over the proceedings.

Teller and Welling summarize WURA proceedings as follows:

> The purpose of WURA is to wind up, finally, the affairs of the company as inexpensively and speedily as possible, in the interests of creditors, and all others concerned in it.
>
> The proceedings take on a collective nature: those with claims against the company are confined to remedies found in the Act.[33] An application for a winding-up order precludes creditors from enforcing their individual claims outside the winding-up proceeding and substitutes the right to participate *pari passu* in a distribution of dividends. Thus an important purpose of the Act is to get within the control of one Court all of the estate of the insolvent company and to settle there all claims against the estate in the simplest and least expensive way and to distribute the assets amongst the creditors in the quickest way possible without incurring needless expense by litigation in other Courts.
>
> The central winding up proceeding avoids the piecemeal realization of the debtor's assets and an unequal distribution of those assets that might otherwise occur.[34]

Differences between P&C Insurer and Life Insurer Liquidations

There are some important differences between the approach to P&C insurer and life insurer liquidations. These differences in the approach arise because of differences in the P&C insurance and life insurance businesses. Some of the differences between the P&C and life insurance industries are discussed in Section 7 in our analysis of the different risks faced by life insurers and P&C insurers. Michael Hale of Assuris[35] observed at the Proceedings of the Standing Senate Committee on Banking, Trade and Commerce on March 5, 2008, that:

> the most important difference between property and casualty insurance and life insurance is that individual life insurance contracts are long-term, multi-year contracts…. Retirees want their retirement policies to continue paying an income as long as they are alive. For life and disability insurance, a person's insurability will tend

[33] The Act referred to is WURA.
[34] Telfer and Welling (2008) at 236-237. Internal quotations and citations omitted.
[35] Assuris is a not for profit organization that is funded by the life insurance industry. Its role is to protect policyholders by minimizing the loss of benefits and ensuring a quick transfer of their policies to a solvent company where there benefits will continue to be honoured. www.assuris.ca

> to change over time; replacement life insurance benefits can be hard to get if one's policy is discontinued.[36]

As Mr. Hale further testified, with a life insurance insolvency the objective is to continue the policies in force and to transfer the policies to solvent companies as soon as possible with the support of Assuris. If additional funding is required to provide liquidity for the transfer, Assuris may advance funding to the liquidator to assist with the transfer.[37] [38] Since 1990 there have been 3 life insurance company failures – Les Cooperants, Sovereign Life and Confederation Life. The policies of these three entities were transferred to new carriers.

Section 162 of WURA gives the liquidator the power, with the approval of the court, to transfer or reinsure some or all of the policies of the company to another insurance or reinsurance company. Where the assets of the company are not sufficient to provide for the transfer or reinsurance in full of the company's policies, Section 162.1 provides that, subject to the court's approval, the policies may be transferred at less than the full amount of the policies; the effect of this is similar to proportional reinsurance and the policies will not be covered in full. Additionally, Section 162.2 permits the court on the application of the liquidator to modify policies.

In contrast to life insurer liquidations, generally with P&C insurer company liquidations, the business is run off over time and the policies may or may not be terminated. In addition, PACICC protection is provided to certain policyholders.[39] For example, the Liquidator of Reliance Insurance Company, Canadian Branch (Reliance Canada), has been running off the business in an orderly manner, dealing with policy liabilities and collection of reinsurance on a commercially reasonable basis since December 2001. Given the nature of Reliance Canada's business, a complete run-off process can be expected to take many years. The consulting actuary retained by the liquidator to calculate actuarial liabilities estimates that the run-off could continue to 2019.[40]

In Section 3, we discuss two proposed alternatives for the consideration of terminal provisions – run-off and transfer value. We observe that the approach to liquidating P&C insurers is more consistent with the calculation of a terminal provision on a run-off basis, while the approach to liquidating life insurers is more consistent with the calculation of a terminal provision on a transfer value basis. However, we also observe that nothing precludes the liabilities of a P&C insurer from being transferred to or reinsured en bloc after the issuance of a winding-up order. We note though that to date no P&C liabilities en bloc have been transferred.

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[36] Proceedings of the Standing Senate Committee on Banking, Trade and Commerce. Issue 10 – Evidence – Meeting of March 5, 2008. Evidence of Michael Hale, Executive Vice President, Assuris. http://www.parl.gc.ca/39/2/parlbus/commbus/senate/Com-e/bank-e/10eva-e.htm?Language=E&Parl=39&Ses=2&comm_id=3

[37] Supra

[38] Section 35 of WURA gives the liquidator power to enter into agreement with compensation associations to facilitate the payments of claims to policyholders and preserve the value of the estate.

[39] PACICC was established in 1989 to protect policyholders from undue financial loss in the event that a member company exited the market involuntarily.

[40] Report of KPMG Inc,. the Liquidator of Reliance Insurance Company – Canadian Branch, December 9, 2009, available at www.relianceinsurance.ca

Priorities and Distributions

In the normal course, going concern insurance companies pay their obligations in full as they come due, and do not prioritize payments. In contrast in a liquidation scenario, the payment of obligations is governed by WURA and expenses and claims of the company are not paid in full on a first come first served basis. Once a winding up order has been issued, Section 161 of WURA governs the scheme of priorities for the liquidation. These priorities do not distinguish between policyholders and creditors in Canada and those outside of Canada. Expenses of the liquidator in carrying out the liquidation have a first charge on the assets of the liquidating estate. Subject to a narrow group of preferred employee claims, claims of policyholders have priority over all other creditors (other than secured creditors). We note though that with a life insurance company – claims on guarantees given in respect of segregated funds rank with ordinary creditors, after other policyholder claims.

This scheme of priorities means that the claims of creditors cannot be paid until policyholders can be paid in full. In addition, within their priority ranking, the policyholders and creditors must be treated equally. As discussed above, this means that all policyholders are to paid on a *pari passu* basis.

The liabilities for a P&C insurer in liquidation may take decades to develop. Rather than wait for the full claim book to develop, the liquidator may seek to make interim distributions, for example to policyholders, provided the full obligations of those with higher ranking priority will be met. In order to calculate the ability to pay and the amount of any interim distributions, and in order to ensure that all policyholders and creditors are paid on a *pari passu* basis, the liquidator needs to estimate the expected ultimate realization of the company. In the case of the first distribution by the Reliance Canada liquidator, the liquidator asked its consulting actuary to confirm their best estimate of the policy liabilities in accordance with accepted actuarial standards. The liquidator then introduced further elements of conservatism for purposes of reaching its recommendations with respect to the distribution, including:

- estimating all costs for the completion of the liquidation on a very conservative basis
- taking reserves for certain policies at their full limits, not withstanding that claims have been asserted at limits, and
- ascribing no value to reinsurance recoverables.[41]

We note that this estimation of the liabilities is effectively assuming a run-off to extinction with no terminal provision and a high confidence level.

Costs of Liquidations

There are a number of costs incurred in a liquidation that may be different than the cost structure for a going concern P&C insurer. As discussed above, the costs of the liquidator are a first charge against the assets of the assets. These costs include the professional fees of the liquidator and its advisors, and the

[41] Report of KPMG Inc, the Liquidator of Reliance Insurance Company – Canadian Branch, June 20, 2003, available at www.relianceinsurance.ca

day-to-day expenses of running the liquidation. There are also other costs arising from a liquidation, which are not borne by the insolvent insurance company. These include financial loss to policyholders either because they may lose their unearned premiums or because their claims may not be paid in full or on a timely basis. As noted by Dibra and Leadbetter,

> In addition to the claims-related costs of guarantee funds, A.M. Best (2004) notes that the full costs associated with involuntary exit are difficult to measure, since in addition to claims costs and unearned premiums, they include costs incurred by the regulatory authorities, agents, accountants and reinsurers. Additional costs also include the lost wages, commissions, taxes and other expenditures of liquidated insurers.
>
> While not the full cost, the simplest measure of the costs on involuntary exit are the insolvent insurer's claims and unearned premium payments borne by the surviving insurance companies in the industry…[42]

Dibra and Leadbetter further observe that the between 2000 and 2005, there were six insolvencies in Canada for which the value of PACICC assessments was approximately $22.4 million. This resulted in a cost of 0.13 per $1,000 net premium written. "In two instances PACICC was able to secure loan agreements with the estate of an insolvent insurer that reduced the guarantee fund's assessment requirement by $53 million. PACICC's cost of insolvency per $1,000 NPW would have increased to 0.43 if these assessments had not been made."[43]

In Section 7, we note that for life insurers, assets are the main risk, while insurance risk is a primary risk for P&C insurers. In a liquidation scenario, while insurance risk continues to be a significant factor for P&C insurers, asset risk increases. For an insurance company in liquidation, the reinsurance is generally the most significant asset. As discussed in the report of KPMG Inc, liquidator of Reliance Canada, for the motion returnable December 16, 2009, the collection of reinsurance from some markets is challenging for companies in run-off and for a number of reasons, including set-off issues and the lack of an on-going relationship, reinsurance collections slow significantly.[44] The slow down in reinsurance collections and the increased costs to collect reinsurance, if it is collected at all, are additional costs of liquidation that a going concern company may not incur.

Cross-border Complexities and Complicated Group Structures

Many Canadian insurance operations are part of complex international groups (e.g., the Canadian operations may be a branch of a foreign company, have a foreign branch, or be a subsidiary or parent of foreign insurance companies). In the event of an insolvency of an insurer with international operations, national differences in prudential regulation and distributions priorities may come into play. Therefore, we suggest that any discussion about solvency requirements may need to consider the international dimensions of insurer insolvency. Because a full discussion of this topic is beyond the scope of this research paper, we have focused on one aspect of this complex topic – assets located in a foreign

[42] Suela Dibra and Darrell Leadbetter. *Why insurers fail? The Dynamics of property and casualty insurance insolvency in Canada*. PACICC, 2007
[43] Dibra and Leadbetter
[44] Report of KPMG Inc. (2009)

jurisdiction. Our concern is whether assets are included in Canadian solvency calculations which may not generally be available for the payment of liabilities in the event of a liquidation. In our discussion of this matter, we first address Section 164 of WURA. We then give two brief examples of insurers operating internationally which became insolvent, and where a resolution had to be reached with respect to assets located in a foreign jurisdiction.

WURA contains provisions to assist with the orderly gathering and realization of the assets and the rateable distribution of those assets among the creditors under court supervision. Section 164 provides a mechanism for the liquidator of a Canadian insurance company to bring assets of the company located in another jurisdiction into the estate. Where assets are deposited inside Canada (e.g., with provincial regulators), the court may order their transfer to the liquidator. Where assets are deposited outside Canada and are beyond the Canadian courts' jurisdiction, the liquidator may require the person with whom the assets are deposited to:

- Either transfer the assets to the liquidator, thereby entitling the policyholders for whose benefit the assets are deposited to participate in the liquidation under the liquidator's administration and resulting in a single pool of assets from which the liquidator will make distributions to all policyholders and creditors wherever situate; or

- Retain the assets, thereby triggering a deemed forfeiture by such policyholders of all rights and claims to any share of the assets of the company other than those assets deposited for their protection outside Canada. If the foreign assets are not transferred, the result is a separate distribution of assets and allocations of liabilities in the two jurisdictions.

The following two examples are provided to bring awareness to the complexities of cross-border insolvencies, and presented as additional examples of how the course of liquidation is very different from a going concern operation.

The first example is the insolvency of HIH Casualty and General Insurance. HIH was a large insurance company resident in Australia where most of its business dealings were based. However, it had an extensive international book. In addition, HIH has substantial assets and substantial unsecured creditors in the UK. In 2001, HIH was put into wind up by the Australian court. HIH was also placed into provisional liquidation by the English High court. The Australian liquidators made an application to the English High Court for an order that the assets of HIH in England and the claims against HIH in England be remitted to Australia. The High Court and later the Court of Appeal did not accede to this course. However, in 2008, the House of Lords decision decided the HIH assets in the UK should be remitted to the main Australian liquidation.[45]

[45] Lord Newberger of Abbotsbury, Master of the Rolls, speech at the Insolvency, Internationalism & Supreme Court Judgements Insolvency Law Dinner, November 11, 2009. Available at http://www.judiciary.gov.uk/docs/speeches/mr-insolvency-law-dinner-lecture-11112009.pdf

The second example is Confederation Life Insurance Company (Confed). On August 15, 1994 a Canadian court order was made ordering Confed to be wound up in Canada pursuant to WURA with the Superintendent of Financial Institutions in Canada as the provisional liquidator. Confed had business in the United States, including a U.S. Branch. As a result of decisions made by a Michigan Court, all of Confed's businesses in the U.S., including its U.S. Branch (which became known as "Confederation Life Insurance Company (U.S.) in Rehabilitation) was liquidated separately from the Canadian liquidation under the management, direction and control of the Commissioner of Insurance for the State of Michigan as rehabilitator and later as liquidator.[46]

[46] Report of KPMG Inc, The Liquidator of Confederation Life Insurance Company, April 30, 2007. Available at www.confederationlife.com (KPMG Inc. was appointed permanent liquidator of Confed in 1997.)

SECTION 10 – IMPLICATIONS FOR THE CANADIAN INSTITUTE OF ACTUARIES

The CIA has already proven itself ready and able to tackle the areas of time horizon and terminal provisions, particularly for life insurers, in the two draft discussion papers referred to in this report. Currently, there are two committees working on issues related to internal models – the Solvency Framework Subcommittee and the P&C Subcommittee of the Committee on Risk Management and Capital Requirements.

At this time, we believe that it is most important that OSFI, based on inputs from a varied range of interested parties, reach decisions as to both time horizon (i.e., one year or multi-year) and terminal provisions (i.e., going concern or transfer value and statistical measurement). Following these decisions, we expect that the CIA will develop educational guidance to help support actuaries practicing in Canada meet OSFI's requirements. Such educational guidance could be delivered through Educational Notes, conferences, webinars, and if necessary revisions to the Standards of Practice. At this time, we do not make specific recommendations as to the format or delivery mechanism of CIA guidance as we expect the CIA Practice Council and the Actuarial Standards Board will work through the various committees and subcommittees to determine the best means of educational support.

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Appendix B – Interview Questionnaire

Property and Casualty Insurance Compensation Corporation
Time Horizon and Terminal Provisions
Actuarial Research – Questionnaire

1. What are your current practices in the use of time horizon and terminal provisions within models?

2. Can you see any practical issues related to IFRS and the implementation of IFRS 4 (Phase II)?

3. What are the theoretical and practical considerations when selecting a time horizon or terminal provision?

4. Should the time horizon and terminal provision be standardized for banks, life insurers, and P&C insurers?

5. If not, what are the key differences between P&C insurance and other members of the financial sector?

6. Is there a standard/common usage of time horizon and terminal provisions in models currently in use?

7. Should the time horizon or terminal provision vary by risk factor or be uniform?

8. What are the practical differences or considerations in the use of time horizon/terminal provisions between Conditional Tail Expectation (CTE) (also known as TVaR) and Value at Risk (VaR).

Appendix C - Good Practice in 2012

In *Actuarial Aspects of Internal Models for Solvency II*, the authors identify seven good practices for 2012. We reproduce these practices below.

> Capital models will cover the number of years suitable for the specific purpose e.g., assessing required economic capital, strategic planning, feeding into the ORSA process, calculating the SCR, etc.
>
> We assume the theory underlying transfer values will be better established by 2012 than it is at present. Nonetheless, models will be able to project using terminal values of either runoff or transfer value tests. This is because each of the run-off tests contains useful information and also they provide reasonableness checks against each other.
>
> The model will be able to produce results for various assumptions regarding new business. The Directive specifies new business assumptions. The firm might use those assumptions or alternative assumptions, if the firm can show that the alternative produces a result that is equivalent to the required calibration. Thus for SCR, the model must be able to reflect the new business assumptions in the directive and assumptions the firm actually uses. In addition, the model should be able to use a longer time horizon (e.g., a full economic cycle or pricing cycle) for other purposes, e.g., ORSA, rating agency analysis, reinsurance and pricing.
>
> The transfer value terminal provision required by Solvency II will use the cost of capital approach specified in the Directive and parameters from related implementing regulations, if such parameters are specified. If other accounting rules apply then the model would also be able to supply values on that basis.
>
> The use of a time horizon along with a terminal provision to calculate the capital requires, in theory, a set of scenarios during the time horizon as well as another set of nested scenario beyond the time horizon for each of original scenarios. While nested stochastic calculations have been complex and time consuming to run, computing power and improved approximations/efficiency shortcuts will be used (e.g., stratified sampling of 'important scenarios' to reduce the number of scenarios, replicating portfolios). The modeller will justify that the impact of the approximations assumed is not material.
>
> The firm will investigate the impacts of both run-off value and transfer value terminal provisions. The terminal value on a run-off basis is not necessarily higher or lower than terminal value on a transfer value basis (for one year or other time frames). The two aspects of the transfer that cause this will be well recognized. That is, assuming transfer after one year, the transfer value basis requires considering the variation in estimates of ultimate settlement values based on incomplete information after one year. Those estimates after one year

may be higher or lower than the ultimate settlement value used in the run-off terminal provision. Moreover, the terminal value on a transfer basis also needs to include the possible variation in market perception of risk from year to year. For a run-off test, depending on the accounting rules, the change in market risk perception might not be relevant or might require consideration of long term changes, not year to year changes.

New business assumptions in the economic capital assessment (not merely the SCR) for life and GI will be process driven from recent business plans, and events. New business profits will rely on expert judgement for a qualitative check on such projections.

A significant amount of research and the development of new methodologies, particularly for the measurement of transfer values, is required to achieve the state of good practice identified above. Additional research is required for defining when the different types of terminal provisions are most appropriate. The correlation of insurance risks can be critical for P&C insurers, especially in multi-year models; additional research on this topic is also required. Finally, further research is required to estimate liability uncertainty (e.g., claims development patterns) within the models.