

The importance of Risk Management to life insurance companies

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Abstract

Risk is the reason of being for insurance. Through insurance contracts customers seek to transfer financial uncertainties to the insurer in exchange for a set of premiums levied by the insurer. Life insurance contracts provide protection in the event of death, longevity, morbidity, critical illness, or health care costs. Contracts for other types of insurance afford protection against costs or losses to property, for example, owing to contingencies such as fire, theft, accident, and storms. Therefore, it is to be expected that an insurer's core operations, the estimation of the amount and timing of policyholder payments, and the present value of their amount (taking account of the future costs to administer these obligations) are subject to risk. It is vital that insurers manage the risks inherent in the insurance contracts they assume. This paper discusses about the importance of risk management processes to life insurance companies and provides applied strategies for better management of key risks in life insurance.

Keywords: risk management, life insurance, interest rate, loss, strategy

Introduction

Risk management at insurance companies, since it is so old, is most likely to have evolved gradually rather than developed within a complete conceptual framework. The Basle committee on Banking Supervision proposed a set of principles for the management of interest rate risks by banks in 1997. These principles can be easily generalized to apply to all risk management and to insurance companies. Figure 1 is a sampler of generalized principles.

1	Clear lines of responsibility for risk management
2	Separation of risk takers and risk managers
3	Quantitative risk limits
4	System for promptly reacting to positions that exceed limits
5	Risk management must apply to new products
6	Focus on both earnings fluctuation & economic value fluctuations.
7	Need to assess all material Risks
8	Risk measurement system should utilize generally accepted financial concepts and measurement techniques
9	Well-documented assumptions and parameters
10	Need to measure risks under wide ranges of underlying economic situations and regularly re-evaluate assumptions
11	Stress testing to evaluate extreme fluctuations and develop contingency plans
12	Regular internal and independent review of Risk Management system

Figure 1. Some principles for the management of interest rate risks

From these or other basic principles, a company can begin the process of forming a complete and modern risk management process (Herget, 2017).

As in most industries, the quest for growth is the main source of strategic risk in the life sector. Because it requires life insurance companies to place bets on specific Products; Distribution channels; Customer segments and new business models. Like any business, the business of insurance involves many functions to be successful. The successful execution of these business functions also entails risk. Some risks are specific to the insurance sector, such as underwriting risks and risks related to the evaluation of technical provisions. Other risks are similar to those of other financial institutions, for example, market (including interest rate), and operational, legal, organizational, and conglomerate risks (including contagion, correlation, and counterparty risks). In other words, insurers are subject to risks inherent in their core business as well as to general business risks applicable to any business. In the rapidly developing field of risk management, there is no single globally accepted manner of naming and categorizing insurer risks. However, there is growing convergence on the key broad categories of insurer risk. The development of a common means of categorizing risks is most important to ensure clarity of communication among insurer stakeholders (Wason, 2016).

Insurer key risks might be categorized under the following major headings:

- Underwriting
- Credit
- Market
- Operational
- Liquidity
- Strategic (Koller, 2017).

Figure 1 shows the major risks in the life insurance industry.

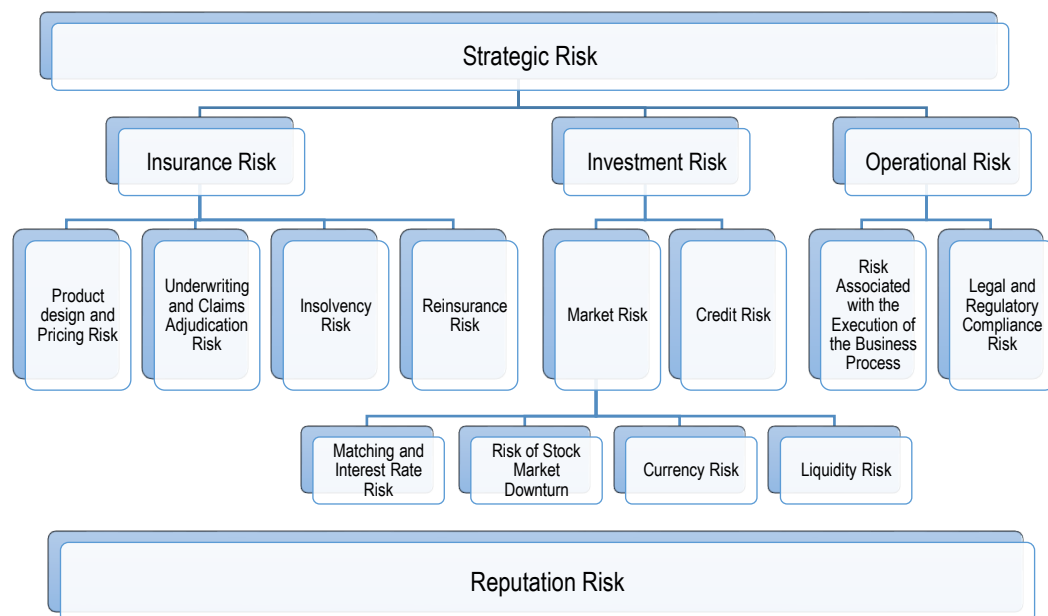


Figure 1. The Major Risks in the Life Insurance Industry (Bernier, 2015)

Strategic risk is the risk arising from inadequate planning or a company's failure to effectively adapt to the business environment:

- It encompasses the various risks a life insurance company is exposed to through the implementation of its business strategy (insurance, investment and operational risks).
- Of utmost importance to a company's Board of directors.

A life insurance company's value depends directly on its risk management policy in at least 2 ways:

- Risk management by life insurance firms affects the probability of financial distress and therefore the premiums potential customers are willing to pay. Customers focus on whether financial commitments under the contract will be met (product quality).
- The asset risk in an insurance company's private placement loan portfolio depends on its customers' risk management policies. Hedging by lenders is not a substitute for hedging by borrowers.

Life insurance firms have long exploited both:

- Risk-reduction benefits of diversification on both sides of the balance sheet;
- Reinsurance to control financial implications of extreme observations from loss distributions.

Life insurance firms have also traditionally relied on a variety of control techniques for their risk management systems:

- Standards and financial reports;
- Underwriting authority and limits;
- Investment guidelines and recommended positions;
- Incentive schemes making compensation risk-related.

More recently, life insurance firms have also been relying more intensively on derivative products (options, futures, swaps, etc.) for hedging their financial risk exposures (Bernier, 2015).

Underwriting (insurance) risk

Insurance companies assume risk through the insurance contracts they underwrite. Underwriting risks are those associated with both the perils covered by the specific line of insurance (fire, death, motor accident, windstorm, earthquake, etc.) and the risk mitigation processes used to manage the insurance business. The types of perils that are insurable are limited perhaps only by one's imagination and the judgment of an insurer that the risk is insurable (Kawatkar & Basu, 2013).

Importance of good data

For each insurable peril it is vital for the insurer to understand the frequency and severity data. For the vast majority of perils, achieving this understanding requires gathering data on both exposure (the amount and number of insurable risks) and claim (the amount and number of claims arising from the exposure base). The study of the frequency and severity of claims arising from each peril can be used to prepare a claims distribution. This statistical information provides the insurer with much valuable information about the number and amount of claims arising from each peril (for example, mean, median, standard deviation, coefficient of variance, tail variance) that is used for pricing and valuing those risks.

It is vital that the insurer have as clear an understanding as possible of the key drivers behind each peril. For a peril such as automobile collision, key risk drivers might include the operator's past accident record, the operator's driving habits, the type of vehicle, the geographic region, and the demographics of the operator. For traditionally insured perils (such as mortality, disability, longevity, and many products in the personal and commercial lines of non-life insurance), considerable data are available to the insurer either from the insurer's experience or from broader databases of industry experience. The data must be reliable, credible, and internally consistent. An insurer can gain much insight from such data.

Insurers naturally seek additional data on the risks they insure. A useful and common technique is to combine the data gained from experience studies over several time periods. In so doing, however, the insurer needs to consider the possibility that combining data from additional time periods masks underlying volatility (random fluctuations), trends (such as mortality improvement), or periods of unusual activity (such as a flu epidemic for the peril of mortality, and severe floods in the case of property insurance). Therefore, when assessing experience studies, insurers must consider the implications of prior experience for the future experience of the risks already underwritten, as well as for the future experience of the risks resulting from new business.

Another technique insurers use to gather more data is to consider relevant industry data. This is particularly helpful when the insurer does not yet have sufficient statistically credible data of its own on the peril being insured. However, in selecting this technique, the insurer must consider the many possible differences between industry experience and its own experience (such as the perils being insured, the types of subjects being insured, and the trends inherent in each set of data).

In some situations (for example, a new product, an emerging market), little claims experience may be available to the insurer. In such situations, the insurer must rely on some combination of experience gained in related markets, the experience of local reinsurers, and industry experience (where available). Clearly, where there is a public interest need for these types of insurance products, the local insurance industry should be encouraged to provide such products. The local supervisory authority can be of assistance in supporting or encouraging the development of pools of experience data among insurers and within the local industry. Until credible experience data are obtained, insurers should value these risks conservatively, recognizing the uncertainties they have assumed (Wason, 2016).

Underwriting process

The gathering of accurate, credible, and relevant data is vital for the underwriting of risks by an insurer. There are many components to the underwriting process (Koller, 2017).

Some of the generic processes involved with underwriting risks are as figure 2.

Underwriting process risk	• Risk from exposure to financial losses related to the selection and approval of risks to be insured.
Pricing risk	• Risk that the prices charged by the company for insurance contracts will be ultimately inadequate to support the future obligations arising from those contracts.
Product design risk	• Risk that the company faces risk exposure under its insurance contracts that were unanticipated in the design and pricing of the insurance contract.
Claims risk (for each peril)	• Risk that many more claims occur than expected or that some claims that occur are much larger than expected claims resulting in unexpected losses. This includes both the risk that a claim may occur, as well as the risk that the claim might develop adversely after it occurs.
Economic environment risk	• Risk that social conditions will change in a manner that has an adverse effect on the company.
Net retention risk	• Risk that higher retention of insurance loss exposures results in losses due to catastrophic or concentrated claims experience.
Policyholder behavior risk	• Risk that the insurance company's policyholders will act in ways that are unanticipated and have an adverse effect on the company.
Reserving [provisioning] risk	• Risk that the provisions held in the insurer's financial statements for its policyholder obligations (also called claim liabilities, loss reserves, or technical provisions) will prove to be inadequate.

Figure 2. Some of the generic processes involved with underwriting risks

Underwriting risk management framework

Figure 3 shows the Underwriting risk management framework. The need to manage underwriting risk is driven by some combination of the insurer's risk appetite and risk tolerances, the risk versus reward tradeoff of potential risk responses, the degree to which a response will reduce the risk's severity or probability, and the impact of the response on the business unit's return on equity.

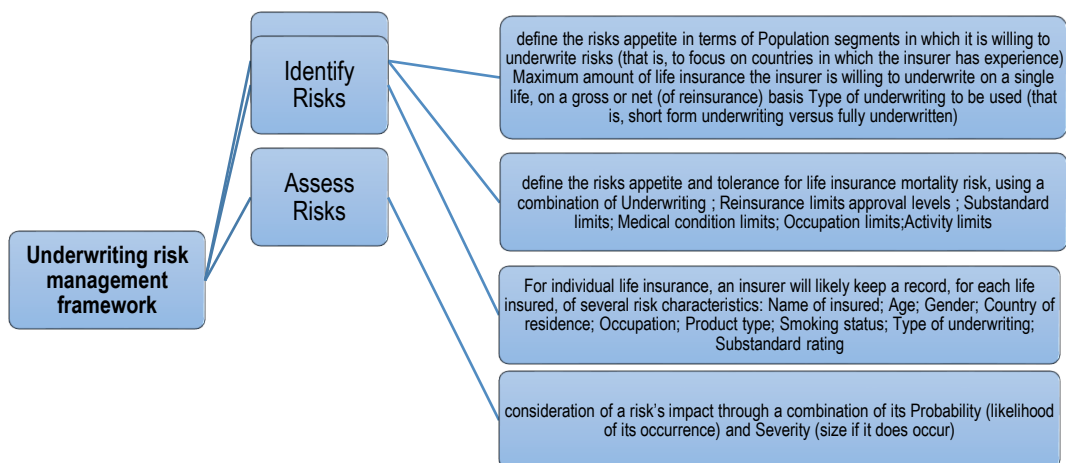


Figure 3. Underwriting risk management framework

Plan Strategies

An introduction: The general strategies for managing risk fall into five major categories:

1. Avoid: eliminate, stop, prohibit, or sell the risk exposure

- ϣ. Retain: accept and self-insure the risk exposure (perhaps by integrating it with other risks or by diversifying risks)
- ϛ. Reduce: mitigate or cap portions of the risk exposure
- ξ. Transfer: reinsure, hedge, securitize, or outsource the risk exposure
- ο. Exploit: expand and diversify the risk exposure.

The insurer tries to select the optimal combination of strategies from these categories. Generally, all these strategies, except for risk transfer, depend solely on the actions of the insurer. Risk transfer uses a counterparty to assume some or all of the risk. In most cases, the policyholder relationship is unaffected by risk transfer. However, if the counterparty fails to perform, there are financial repercussions on the insurer and if any element of policyholder service is outsourced, policyholder relations may also be affected.

Whichever strategies are adopted by an insurer in managing its risks, the insurance supervisor should expect the insurer to demonstrate:

- A sound level of understanding of the underlying risks as well as the risks entailed in the strategies adopted;
- An appropriate level of expertise to manage the strategy adopted based on the complexity of the risks and strategies (for example, the use of professional reinsurers is a common strategy for transferring risk for all sizes of insurers, whereas the use of a dynamic hedging strategy requires sophisticated employee or external consultant expertise and software) (Koller, 2017).

Reinsurance: Reinsurance is one of the most important risk management tools available to all types of insurers. Reinsurance companies are specialized insurers that assume risk from direct writing insurers. Reinsurance refers to insurance purchased by an insurer to provide protection against some or all of certain risks (primarily, but not only, underwriting risks) of the insurance policies issued by the insurer. In exchange for assuming these risks, the reinsurer receives payment in the form of reinsurance premiums or allowances from the direct writer of the business, the insurer.

In a reinsurance arrangement, the insurer cedes risks to the reinsurer. Reinsurers can do the same thing by a retrocession to other reinsurers. Reinsurance is purchased for several reasons:

1. Increase new business capacity;
2. Limit catastrophic claims;
3. Limit total claims;
4. Transfer investment risk;
- ο. Gain product expertise;
6. Gain underwriting advice;
- γ. Divest a product line;
8. Manage financial results.

From the perspective of the insurer, the direct writer of insurance policies, reinsurance provides for a transfer of risk to the reinsurer. The extent of the transfer depends on the specifics of the reinsurance agreement or treaty. It is important to note that reinsurance also creates risk for the insurer. The insurer must carefully evaluate these risks:

- Reinsurance exposes the insurer to the risk that the reinsurer defaults on its obligations through insolvency. Depending on local legislation or case law, the insurer may find that many other classes of creditors will rank higher for distribution of proceeds from the liquidated reinsurer.
- The terms of the reinsurance agreement may not match exactly those of the underlying insurance contracts.
- Heavy reliance on reinsurance may expose the insurer to increased costs in tightening reinsurance markets.

Policy Adjustability or Pass-Through Features: Many types of insurance products have some degree of product adjustability or pass-through of emerging experience feature, regardless of whether they are called participating, variable, unit-linked, and adjustable nonparticipating, or other names. Regardless of the type of policy, the best insurer practices entail:

1. Clear communication between the insurer (and intermediaries) and the policyholder regarding the nature of the adjustability or pass-through feature
2. Clear communication between the insurer (and intermediaries) and the policyholder regarding how the insurer will act in the face of emerging experience
3. Development of insurer policies related to the operation of these product features at the board level

- ξ. Well developed internal studies of emerging experience for these products, such as sophisticated contribution analyses (asset share or embedded value analyses)
- ο. Formalized or written communications to policyholders regarding their emerging experience (Conwill, 2016).

Figure 4 shows some examples of needed control mechanisms.



Figure 4. Control Activities in risk management

The monitoring of underwriting risks depends on the timely availability of accurate data on the insurer's exposure to each risk, as well as frequency and severity data for related claims. Skilled risk professionals seek to establish a statistically credible pool of experience. Where that is not possible, they seek industry experience from similar risks to supplement the insurer's experience. For individual life insurance, larger insurers often conduct regular annual experience studies of mortality, withdrawals, and expenses. Actual experience can then be compared with expected experience. It is important that these experience studies include sufficient detail by product, size of policy, age, gender, and duration, so that appropriate risk management decisions can be made. Monitoring claims experience helps the insurer make necessary modifications to its pricing, underwriting, provisioning, or claims management practices to better manage its risks and to be alert to emerging trends as early as possible. The underwriting risk management framework would not be useable, reliable, or effective without an appropriate set of control activities. (Wason, 2015).

Credit risk

Credit risk is the inability or unwillingness of a counterparty to fully meet its on or off balance sheet contractual financial obligations. The counterparty could be an issuer, a debtor, a borrower, a broker, a policyholder, a reinsurer, or a guarantor. The IAIS defines credit risk as "the risk that a counterparty to the insurer is unable or unwilling to meet their obligations causing a financial loss to the insurer. Sources of credit risk include investment counterparties, policyholders (through outstanding premiums), reinsurers, and derivative counterparties." Intermediaries can also be a potential source of credit risk to the extent that they do not properly forward policyholder premiums to the insurer. This risk can be particularly important for non-life insurers, where insufficient attention to outstanding premium levels can threaten the solvency position of the insurer. Credit risk has traditionally been associated with assets. However, it can exist for any set of projected future cash flows. Credit risk is therefore also important in assessing the true relief provided by a counterparty to an insurance transaction, such as a reinsurer or a party to whom the insurer has outsourced some work functions. Credit risk can be reflected in the present value of a set of cash flows, either implicitly through a credit risk spread incorporated in the discount rate or explicitly through modeling of the cash flows themselves. The market value of a stream of projected future cash flows (say, a bond) reflects the current market view of (among many things) the credit risk of the provider of the cash flows. Such a view might reflect a variety of information available to the market about the bond issuer, such as credit ratings provided by various agencies. Necessarily, such a view will likely reflect the current financial position of the issuer as well

as the current economic environment. Such a view will consider the possibility of the issuer slipping in its ratings (and its ability to pay) as well as the probability of default and the amount of loss given that default occurs (Kawatkar & Basu, 2013).

Credit risk management framework

Figure 5 shows the Credit risk management framework. This framework applies the lessons learned about the general risk management framework to credit risk.

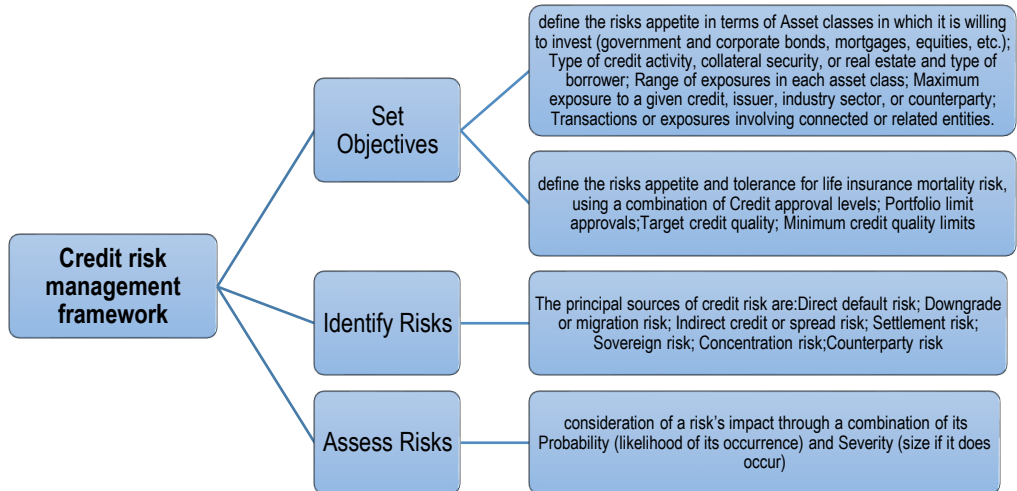


Figure 5. Credit risk management framework

Key to the assessment of credit risk is the rating of all exposures for their quality (the probability that the issuer of the exposure will meet its contractual obligations). For publicly traded exposures (such as corporate bonds), the ratings are assigned by various commercial rating agencies. For other credit exposures (such as mortgages), the insurer must develop a comparable internal rating process. Once the ratings have been determined, commercially available credit risk software can assist the insurer in making provision for future credit risk events (Bikker, 2016).

Plan Strategies

Important in the insurer's management of credit risk are a combination of sound underwriting practices and appropriate lending limits. A broad definition of hedging strategies used to offset credit risk includes:

- Letters of credit
- Contingency deposits
- Securitization of mortgages (mortgage-backed securities)
- Securitization of other assets (asset-backed securities)
- Credit derivatives
- Credit default swaps
- Total return swaps
- Collateralized debt obligations
- Credit-linked notes
- Credit spread options
- Basket derivatives.

Important tools to monitor credit risk include

- Detailed reporting of new credit risk exposures assumed or purchased;
- Summary of all credit exposures assumed by rating;
- Exception reports identifying issuers whose rating has changed;
- Watch list reports for those exposures exhibiting early signs of distress;
- Delinquency reports for exposures in default.

Insurance supervisors should expect insurers to have sound procedures for selecting, rating, and monitoring all credit risk exposures. These rating systems should be subject to periodic audit and expert external review. This includes insurer research (or access to appropriate outside expert advice) into relevant credit risk trends for the exposures assumed. Insurance supervisors should also expect close control and preventive actions for all emerging credit risk events.

In general, the control activities needed for credit risk are generally similar to those needed for other key insurer risks (as described earlier for underwriting risk) (Wason, 2016).

Market risk

The following definition of market risk for insurers has been proposed by the IAA (2004, 131):

- Market risks relate to the volatility of the market values of assets and liabilities due to future changes of asset prices (/yields/returns). In this respect, the following should be taken into account:
- Market risk applies to all assets and liabilities.
- Market risk must recognize the profit sharing linkages between the asset cash flows and the liability cash flows (e.g., liability cash flows are based on asset performance).
- Market risk includes the effect of changed policyholder behavior on the liability cash flows due to changes in market yields and conditions.

The IAIS definition of market risk captures these concepts in a briefer definition: “The risk to an institution’s financial condition resulting from adverse movements in the level or volatility of the market prices of interest rate instruments, equity-type instruments, currencies, or property.”

An insurer’s investment policies (and specifically its market risk policies) are designed to ensure that the insurer holds sufficient assets of appropriate nature, term, and liquidity to enable it to meet its obligations as they become due. The timing and amount of insurance benefit payments is usually uncertain and in some cases sensitive to changes in financial markets (policyholder behavior can be related to expectations in financial markets, relative investment performance, and quality of customer service). Furthermore, the business of insurance usually involves a mismatch, in timing or amount, between the receipt of premium income and the payment of expenses and policy benefits.

The management of market risk focuses on the economic value of the insurer’s net asset and liability market risks. Such a long-term focus may be better aligned with the long-term best interests of the policyholders, shareholders, and other stakeholders than with other short-term measures (such as accounting). Economic value is consistent with the horizon of the liability or surplus, which tends to be long-term by nature. Insurers that focus on economic value are viewed by many as performing better than other insurers.

The market risks of assets and liabilities of insurers (especially life insurers) need to be considered together because of the need to manage the relationship between asset and liability cash flows to achieve financial objectives. The overall level of market risk associated with a given financial objective can be reduced through diversification by combining exposures that are less than 100% positively correlated. Risks are diversifiable through aggregation up to the point where only systematic risk remains. For example, the return volatility of a portfolio of assets caused by changes to the level of prevailing interest rates is diversifiable through investment in different asset classes, such as stocks versus fixed-income securities. However, the residual systematic risk cannot be diversified through simple aggregation, although it can be reduced through hedging.

A related risk is liquidity risk, the risk that various events will require the insurer to attempt to liquidate various asset holdings prematurely on short notice and under unfavorable terms. A trigger for liquidity risk could be market risk, but other operational and policyholder behavior risk factors could also be the trigger (Wason, 2016).

In addition to the volatility of market risk affecting the net market value of the insurer's assets, market risk may also affect the liabilities (and net surplus position) as follows:

- Changing asset yields will affect the market value of the liabilities through their effect on the rate(s) used to explicitly or implicitly discount the liability cash flows.
- Changing asset returns (yields) may affect the amount and/or timing of future liability cash flows. Policyholders may be entitled to some form of profit sharing related to actual and/or historical asset returns. In this respect, the different types of "interest" profit sharing within the global insurance market might be categorized into the following three groups:
 1. Profit sharing that is fully based on objective indicators of the performance of the capital market, e.g., an indicator of the actual interest rate level that is calculated and published periodically by a government agency or a stock market index. The company may or may not actually be holding these asset-referenced benchmarks to back the liabilities.
 2. Profit sharing that is somehow related to the actual performance of the company ("performance linked"), particularly with respect to the company's investments. Note: This type includes the systems where the management is entitled to "declare the bonus rate."
 3. Profit sharing that is related to the actual performance of the assets that are "locked in" at the policyholders' discretion, i.e., policyholders themselves are, at least partially, responsible for the way their premiums are invested.

All three types of profit sharing may also include certain types of guarantees offered by the insurer, such as a bonus rate that will never be negative or a minimum level of the maturity benefit. Changes in asset returns in the external market may affect the amount and/or timing of future liability cash flows by inducing policyholders to "arbitrage" the external returns with those available in the policy by either surrendering or paying additional premiums (Koller, 2017).

Market Risk Management Framework

Figure 6 shows the market risk management framework. This framework applies the lessons learned about the general risk management framework to market risk.

Market risk can be assessed by sophisticated insurers by "modeling cash flows over a broad range of economic scenarios, using stochastic modeling for the time horizon specified and the confidence level desired" (IAA 2004, 133). A reasonable time horizon for this modeling is considered to be one year at a high (99% CTE [conditional tail expectations]) confidence level (IAA 2004, 133).

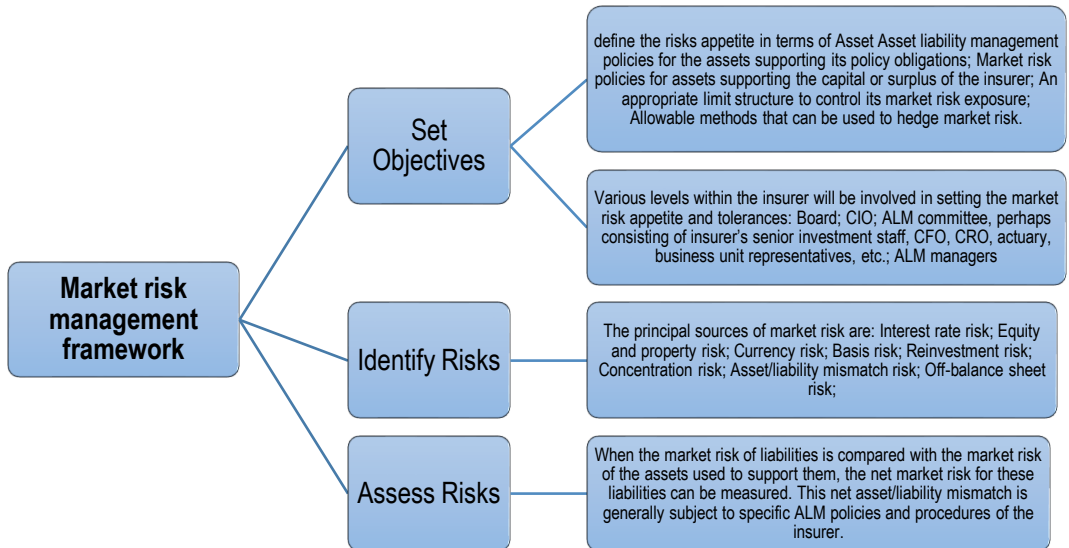


Figure 6. Market risk management framework

In developing appropriate economic scenarios, in figure 7 the desirable characteristics of the constructed scenarios are noteworthy:

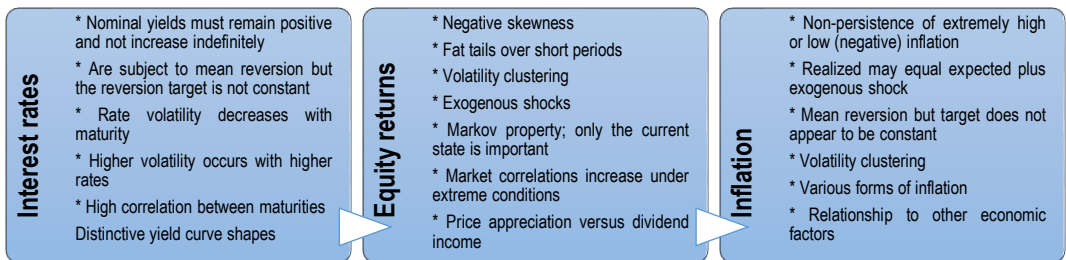


Figure 7. Desirable characteristics of the constructed scenarios

Plan Strategies

ALM strategies comprise both pure risk mitigation (eliminating the net market risk) and optimization of the risk/reward tradeoff (maintaining a specific market risk position to reap a current financial reward). Risks can be mitigated by modifying existing risks simply through rebalancing the asset or liability portfolio (for example, by trading some assets for others that represent a better match) or through a variety of financial engineering techniques such as swaps (for example, agreement to exchange a set of fixed cash flows for a variable set) or hedges (for example, the use of a combination of cash instruments and futures contracts). A full treatise on monitoring market risk is beyond the scope of this module. But some common techniques for monitoring market risk are:

- Cash flow matching (comparing the net asset-liability cash flows month by month);
- Duration matching (time -and interest- weighted present value of the asset and liability durations);
- Option-adjusted duration matching (Conwill, 2016).

Operational risk

Though operational risk exists in all enterprises, including insurance companies, awareness of its importance in the insurance sector and efforts to manage it are relatively new developments. Leading insurance supervisory authorities and insurers have begun to encourage and build operational risk management frameworks. Although leading global banks have spent the past few years preparing for the Basel II operational risk capital requirements, much remains to be done by them to gather sufficient data and develop industrywide best practices for a complete operational risk management framework. Insurers have historically paid attention primarily to the direct risks they assume in the course of their business, namely underwriting, credit, and market risk. But now there is growing recognition among insurance supervisors and insurers alike of the risks inherent in the operation of a business (operational risk). The IAIS Glossary defines operational risk as “the risk arising from failure of systems, internal procedures and controls leading to financial loss. Operational risk also includes custody risk.” It is useful to note that the definition used in the banking sector is similar but contains some differences. As initially developed by the British Bankers’ Association (generally adopted within the banking sector, including by the BCBS) for capital purposes operational risk is defined as “the risk of loss resulting from inadequate or failed internal processes, people, and systems or from external events.” As this definition points out, inadequate (not just failed) processes, people, and systems can be a source of loss (and insolvency). Insurers and their supervisors should therefore proactively and comprehensively address weaknesses that may create operational risk (Bikker, 2016).

Operational Risk Management Framework

Figure 8 shows the Operational risk management framework. This framework applies the lessons learned about the general risk management framework to operational risk.

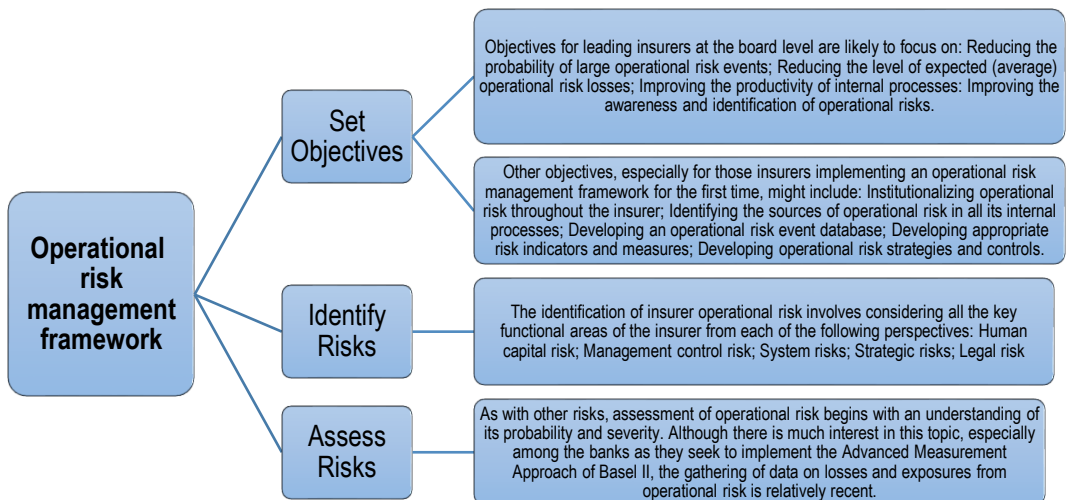


Figure 8. Operational risk management framework

Plan Strategies

Some examples of strategies for managing operational risk:

1. Avoid: eliminate, stop, or prohibit certain types of business activity to avoid a particular source of operational risk;
2. Retain: accept and self-insure the risk exposure;
3. Reduce: mitigate or cap portions of the risk exposure;
4. Transfer: insure or outsource the risk exposure;

- . Exploit: expand and diversify the risk exposure.

Useful monitoring of operational risk includes:

- Risk exposure monitoring for each source of operational risk
- Risk event monitoring, to enable frequency and severity to be estimated
- Key risk indicators, to warn of changes in risk levels and effectiveness of controls
- Self-assessment, to enable business units to assess the effectiveness of their internal processes and controls (Jones, 2013).

Putting it all together

This module has discussed each major risk type prevalent in an insurer and how these risks are typically managed. However, the insurer's board and senior management need to understand and manage all the insurer's risks in a comprehensive manner. Unfortunately, the aggregation of all the insurer's various risks is not as simple as adding the individual risks together. This section focuses on the concepts involved in putting the risk management framework together.

Figure 9 illustrates the process of aggregating risk in an insurer.

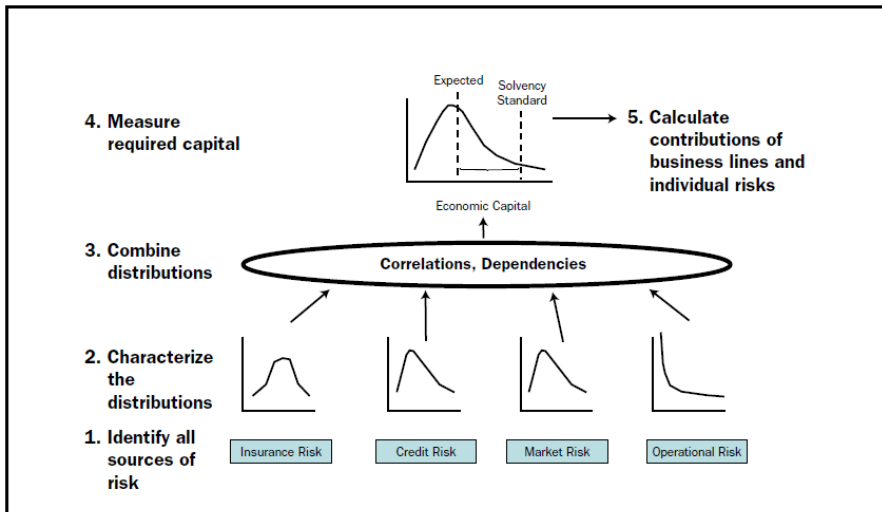


Figure 9. Risk aggregation

Two of the main elements of the risk management framework are illustrated in this diagram (risk identification and risk assessment). Also important in the aggregation of insurer risks are the concepts of risk dependency, diversification, and concentration (Jones, 2013).

Dependency

In simple terms, the many risks experienced by an insurer vary directly or indirectly based on their interaction with other risks. They are dependent on each other. For example, the eventual mortality experience of a group of life insurance policies may depend on the withdrawal experience of those same policies. While all insured lives may be underwritten to the same standard at time of issue, over time, policyholders' health changes. If the withdrawal pattern of the policyholders varies based on their emerging health (through self-selection, in which those policyholders who develop health problems are more likely to retain their policies than those without health problems), then the emerging mortality experience will differ (be worse) from that of a cohort of lives in which this self-selection did not occur. In another example, the manner in which

premium rate increases for automobile insurance are allocated across different operator rating classes may affect future policyholder persistence and product profitability.

In its 2004 report the IAA discussed the issue of risk dependence in the context of capital requirements as follows: "The risks an insurer faces often exhibit comovement or dependencies. This means that knowledge about results for one risk can be used to better predict the results of another risk. Dependence between two risks may be because there are known relationships between these two risks or simply because certain correlations or other relationships have been observed historically. Dependence can increase or decrease the capital required to support the combined two lines. If losses for one risk tend to increase as the losses for the other increases, there is a positive correlation, usually resulting in more capital required than if the two risks are mutually independent. Similarly, if one tends to increase as the other decreases, the two risks form natural hedges and usually require less capital. If an insurer builds an internal model, it needs to reflect the nature of all significant dependencies. Similarly, with factor-based models, the formula used to combine risks needs to reflect all significant dependencies" (IAA 2004, 75).

Therefore, risk dependencies must be recognized to the extent possible when assessing, modeling, and aggregating risks.

Concentration

The 2004 IAA report defines risk concentration as "the risk of having higher-than-normal relative risk exposure in a single risk" (IAA 2004, 75). The Chief Risk Officer Forum, in its recently published study entitled "A Framework for Incorporating Diversification in the Solvency Assessment of Insurers," stated "Concentration of risk is bad for the insurance industry and consumers. It is the main contributor to insurer impairments, especially in times of major stress" (2005, 4). The concentration of risk can occur within a risk type as well as within the businesses of an insurer. For example, risk concentration can arise with respect to credit risk if too high a proportion of the assets of an insurer are invested in one asset class, individual credit, industry, or geographic area. Risk concentration can also arise if the insurer assumes underwriting risks from only one product type and does not have other sources of income to compensate in the event of weakened performance by that product type.

Diversification

Risk diversification is the opposite of risk concentration. According to the IAA, "Diversification reduces risk to the extent that less total relative capital is required when combining two risks" (2004, 75). The Chief Risk Officer Forum report states, "Diversifying strategies are the basis of sound risk management and can be used to counter concentrations of risk, particularly in times of stress" (2005, 4). However, risk diversification requires deliberate risk management by the insurer. According to the Forum, Strong management practices are essential for creating well-diversified portfolios. Measurement is necessary but not sufficient alone for realizing the benefits of diversification. Appropriate practices, organizational structures and internal controls are also required. Many of these practices are already implemented at leading insurers. (2005, 4). Further, the Forum recommends that Diversification effects must be recognized when risk factors, their dependencies, and the company's exposure to them are as figure 10.

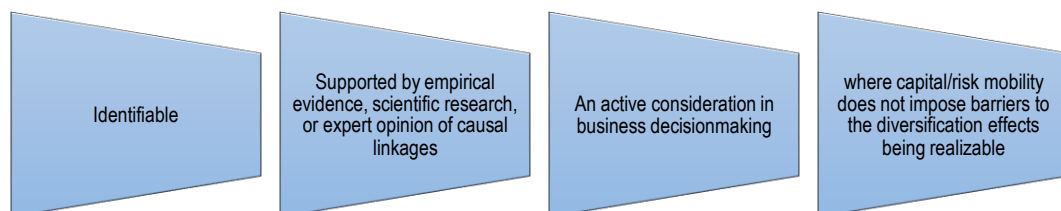


Figure 10. Risk factors, their dependencies, and the company's exposure to them

Evidence to date indicates that substantial diversification benefits can arise within a major risk category (such as credit risk) by combining the risks from many assets. Additional benefits can be gained by combining risks across lines of business

within an insurer. This evidence seems to indicate that the diversification benefits resulting from combining the operations of different legal entities (say, a fund management firm and an insurer) can be expected to be more modest (Koller, 2017).

Modeling

An insurer's assessment of all its risks generally requires the use of various types of models. The complexity of these models will vary with each insurer, depending on their need, size, and the complexity of the risks they face. Very important in developing models are data quality, model design, parameter selection, and scenario selection.

Modeling insurer risks and aggregating those risks requires specialized expertise. For credit risks, this usually requires an investment professional. For underwriting risks, this usually requires an actuary. For market risks, collaboration between the investment professionals and the actuary is usually needed. While it is appropriate for the complexity of the modeling to vary by size of insurer, certain complex risks (such as embedded options with significant tail risk to the insurer) require high-caliber expertise for their management, regardless of the size of the insurer.

An insurance supervisor should:

- Confirm that the insurer has retained a suitable caliber of expertise to model its risks;
- Retain a suitable caliber of expertise on its own staff (or retain consultants) to be able to review the insurer models;
- Ensure that the insurer's models have been reviewed by independent experts;
- Ensure that the models have been calibrated against relevant market and common sense statistics;
- Ensure that the models are comparable (for similar risks and scenarios) across insurers.

It is vital that the use of models be embedded in the risk management and operations of the insurer. Internal model standards have existed for some time for banks thanks to the Basel Capital Accord, but their development in the insurance sector is just beginning. Two relevant examples include the standards established by APRA for non-life insurance capital model requirements (2002) and by the Office of the Superintendent of Financial Institutions Canada (OSFI) for life insurance segregated fund capital model requirements (2002).

Although the use of internal models for risk management should be expected for the more sophisticated insurers, these insurers tend to focus on their most material risks. Even the largest insurers may opt for simpler models or standardized approaches to managing other, less material risks that they face. Smaller insurers may not be able to devote sufficient resources to building sophisticated internal models but they should be expected to have appropriate standardized models for their most significant risks.

It is important to note that it is not yet possible to model all aspects of an insurer's risks in an integrated manner using quantitative techniques. Inevitably there are certain risks or aspects of risks that can be addressed only (or best) by using qualitative rather than quantitative techniques. Operational risk might be one example (Jones, 2013).

Scenario testing

Risk management decisionmaking is enhanced through the use of scenarios. Scenarios enable insurers to examine the effects of a course of action on its risks if a range of assumptions hold or events occur. They also help management determine the best course of action to follow in managing the insurer's risks. Scenarios can be used to provide information on the impact of instantaneous shocks to specific assumptions or variables. They can also be used to answer "what if" questions. Stochastic modeling is used when the underlying processes driving an insurer's risk(s) are well understood and the range of possible scenario results can be calibrated to actual insurer or industry results. Scenarios can also be effectively used to demonstrate the impact of a given course of action over a specific time frame. In some jurisdictions insurers are required to project their future financial condition under various adverse scenarios selected by the insurer. For example, in Canada, where such reports are required by OSFI, such confidential reports provide an insurer's senior management and board with much useful risk management information.

Adequacy of capital

Should the risks faced by the insurer be more onerous than provided for in its product pricing and in its provisioning for these risks in its balance sheet, access to various forms of capital protects the insurer's ability to meet its obligations to policyholders. Risk modeling and scenario testing can provide valuable information about the adequacy of an insurer's capital in providing such protection.

Capital may be present in the form of unrestricted equity provided by shareholders. It may also be present in various other partially restricted forms (such as preferred shares). Additional ("hidden") capital may exist in various sorts of conservatism that are present in the provisions for future risk in the insurer's financial statements (such as conservatism in the determination of the technical provisions) (Koller, 2017).

Advanced risk management and risk financing

In seeking to better manage their risks, reduce earnings volatility, and protect against severe losses, leading insurers use a variety of advanced risk management, risk financing, and financial engineering tools. Although reinsurance has traditionally been one of the most important strategies used to mitigate risk, particularly underwriting risk, insurers now have available several advanced mechanisms for risk management and risk financing. It is important for insurance supervisors to understand their key features.

Frequently, these advanced mechanisms are described by the phrase "alternative risk transfer" or ART. The advent of these advanced approaches has been primarily due to financial engineering by reinsurance, risk, and finance professionals.

Traditional reinsurance pricing is often based on industry experience for specific risks. Because of asymmetric information between insurer and insured (especially for larger and more sophisticated corporate policyholders), good risks may not be able to obtain traditional insurance cover at rates reflecting their perceived risk level, only at the higher (average) market rates. As a result, corporate policyholders with good risk experience, reluctant to subsidize bad risks, may turn instead to self-insurance (such as qualified self-insurance and captives) and risk financing solutions (such as finite risk solutions and contingent capital). In addition, some insurers have turned to the capital markets to find advanced risk solutions (such as derivatives and swaps). Some of these solutions (such as catastrophe bonds and securitization) have been developed because of greater capacity to absorb risk than may be available in certain reinsurance markets for certain risks (say, hurricane and earthquake losses).

Although an indepth discussion of these mechanisms is beyond the scope of this paper, the following paragraphs provide a brief description of several of them (Jones, 2013).

Captives

Narrowly defined, a captive is an insurance or reinsurance company owned by a corporation or group that is not active in the insurance business. The primary business purpose of a captive is to insure the risks of its parent(s) and related companies. In recent years, a captive has been more usefully described as an insurer that writes risks whose origins or access are restricted. Captives were developed because corporations questioned the efficiency of risk transfer through the traditional commercial lines of insurance. Being incorporated as insurance companies, captives have access to the global reinsurance market. By using a captive to access the reinsurance market, the buyer can substitute the costs of the primary insurer with the lower costs of the captive. In addition, the reinsurance market may be more flexible in structuring risk transfer programs and may grant a better reward for variations in risk retention levels.

Finite Risk Solutions

In recent years, finite risk solutions have received considerable attention from regulators concerned that these solutions constituted risk financing more than transfers of risk. One description of finite risk is as follows:

Finite [solutions] covers shift the main value proposition from traditional risk transfer towards risk financing. Finite [solutions] covers are multi-year contracts reducing the client's cost of capital by means of earnings smoothing. The year-to-year earnings volatility is reduced while limiting the total amount of risk transfer over the contract period. It is somewhat difficult to provide a general definition of finite reinsurance, but the products typically have the following features:

- Risk transfer and risk financing are combined and the time value of money is emphasized in the contract;
- Limited assumption of risk by the (re)insurer;
- Multiyear contract term;
- Explicit inclusion of investment income in the contract;
- Sharing of the results with the insured/cedant.

Contingent Capital

To secure a line of credit in times of severe losses, an insurer can arrange contingent capital with a bank or reinsurer. Such an agreement allows the insurer access to specified amounts of capital in the event that certain insurer balance triggers are exceeded. This arrangement is similar to a line of credit with a bank, except that it is activated only when the triggers are exceeded. The arrangement exposes the insurer to credit risk from the counterparty (Jones, 2013).

Derivatives

Derivatives are financial market instruments that derive their value from the value of other assets. The traditional financial market derivatives involve movements in interest rates (for example, an interest swap might exchange regular payments of short interest according to an index with a level return payment according to a long-term bond yield). These instruments have expanded to include insurance derivatives (for example, based on weather conditions). A complete discussion of derivatives is beyond the scope of this module. However, derivatives tend to require sophisticated knowledge of the derivatives marketplace as well as the use of sophisticated software. Even with these requirements in place, the insurer needs to have careful scrutiny and controls of the derivatives trading function on a daily basis. The failures at Barings Bank and Long-Term Capital Management are but two examples of the challenges involved in properly managing and controlling this useful risk transfer tool (Jones, 2013).

Securitization

Securitization of insurance risks enables insurers to transfer their insurance risk directly to investors in the capital markets. Although this risk transfer tool is still fairly new, interest in it is increasing. Primarily it has been used to transfer catastrophe risk (such as hurricane risk) to investors in the capital market. The interest in this vehicle stems from insurers who have found that normal reinsurance capacity to cover catastrophe risks is limited, while the potential capacity of the capital markets to absorb such risks is much greater. Investors are attracted for the diversification benefits offered by a catastrophe bond, because it offers returns that are not correlated with financial market risks (Jones, 2013).

Conclusions

This paper has discussed the major risk types prevalent in an insurer (underwriting, credit, market, and operational) and the ways in which these risks are typically managed. Risk Assessment and Management, "The supervisory authority requires insurers to recognize the range of risks that they face and to assess and manage them effectively." This paper also dealt with the main considerations involved in putting together a risk management framework.

It is likely that large insurers will implement ERM so they can manage their businesses better and provide value to all their stakeholders. Smaller insurers may be wary of the costs to implement ERM, but if they focus on its fundamentals they can derive considerable benefit at reasonable cost.

As insurers place greater emphasis on managing their risks using ERM, dialogue between insurers and insurance supervisors will focus on key risks and the strategies for managing them. This dialogue will have repercussions for how insurers are supervised and for the education, training, and experience expected of supervisory staff.

Although insurers will find considerable value in the development of quantitative approaches to risk management, the benefits of qualitative approaches for some types of risk should not be underestimated.

In conclusion, it is most important that a risk management culture be established throughout an insurer. The ultimate responsibility for risk management rests with the board. Supervisors play a critical role in reviewing the entire risk management process.

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