FA Module 21: IFRS 17 risk adjustment for non-financial risk – practice problems

(The attached PDF file has better formatting.)

[This reading explains how to compute the risk adjustment for non-financial risk. The final exam problems give you the risk adjustment for non-financial risk; you are not asked to compute it.]

Risk adjustment for non-financial risk

The fulfilment cash flows are the present value of future cash outflows minus future cash inflows plus a risk adjustment for non-financial risk. IFRS 17 paragraph 37 says

> *An entity shall adjust the estimate of the present value of the future cash flows to reflect the compensation that the entity requires for bearing the uncertainty about the amount and timing of the cash flows that arises from non-financial risk.*

Risk adjustments may represent three different items:

A. the capital that an insurer must hold to support claim payments even in adverse scenarios
B. the difference between the market value and the risk-free present value of an asset or liability
C. the extra income a person requires for uncertainty

(A) Regulatory capital requirements are the capital that insurers hold to help pay claims in adverse scenarios. Solvency II in the European Union uses value at risk (and the Swiss Solvency Test uses tail value at risk) to determine these capital requirements.

Some statutory accounting systems for insurance require insurers to add provisions for adverse deviation to their claim liabilities, either as higher claim amounts or lower discount rates.

IFRS 17, *Basis for Conclusions*, paragraph BC209, explains that the risk adjustment for non-financial risk is *not* a regulatory capital margin:

> *a risk adjustment for non-financial risk is not an amount that would provide a high degree of certainty that the entity would be able to fulfil the contract. Although such an amount might be appropriate for some regulatory purposes, it is not compatible with the Board's objective of providing information that will help users of financial statements make decisions about providing resources to the entity.*

(B) Fair value risk adjustments are the difference between the market value and the risk-free present value of an asset or liability. If the present value of future dividends from a stock is 80 and the market price of the stock is 100, the fair value risk adjustment is 100 – 80 = 20. Asset pricing models, such as the Capital Asset Pricing Model, try to estimate fair value risk adjustments. In practice, market values are readily available only for traded assets, and present values at risk-free interest rates are not available for equity investments (such as common stocks), so financial economists disagree about the value of these pricing models.

IFRS 17, *Basis for Conclusions*, paragraph BC209, explains that the risk adjustment for non-financial risk is not a fair value risk adjustment:

> *a risk adjustment for non-financial risk should not represent the compensation that a market participant would require for bearing the non-financial risk that is associated with the contract. … the measurement model is not intended to measure the current exit value or fair value, which reflects the transfer of the liability to a market participant. Consequently, the risk adjustment for non-financial risk should be determined as the amount of compensation that the entity—not a market participant—would require.*

(C) IFRS 17 says the risk adjustment for non-financial risk is a compensation for uncertainty. IFRS 4, the predecessor of IFRS 17, specified three techniques to measure this risk adjustment:

- a confidence level approach, often interpreted as a value at risk method
- a cost of capital method
- a third method generally viewed as a tail value at risk method

IFRS 17 does not specify how this compensation for uncertainty is measured. IFRS 17, *Basis for Conclusions*, paragraph BC213(a), explains that

> *limiting the number of risk adjustment techniques would conflict with the Board's desire to set principle-based IFRS Standards. In particular situations, some techniques may be more applicable, or may be easier to implement, and it would not be practicable for an IFRS Standard to specify in detail every situation in which particular techniques would be appropriate. Furthermore, techniques may evolve over time. Specifying particular techniques might prevent an entity from improving its techniques.*

The IFRS 17 definition of the risk adjustment for non-financial risk has two problems:

(1) Persons, such as individual investors, are assumed to be risk averse – that is, they require compensation to assume uncertain cash inflows. The risk aversion is measured as the present value of the uncertain cash flows at a risk-free rate minus the present value of a certainty equivalent cash flow at a risk-free rate.

Illustration: An investor is indifferent between two income streams: an uncertain income stream with equal probabilities of 0 and 200 in one year and a fixed income stream of 90 in one year. The one year risk-free rate is 6%. The expected present value of the uncertain income stream is ½ × (0 + 200) / 1.06 = 94.34, and the present value of the fixed income stream is 90 / 1.06 = 84.91. The compensation required for the uncertainty is 94.34 – 84.91 = 9.43.

Certainty equivalent cash flows depend on the person and the circumstances. One person might be highly risk averse and requires a large compensation for uncertainty; another person might be less risk averse and requires less compensation. For a given scenario, wealthy persons are generally less risk averse than poor persons, and older persons are generally more risk averse than younger persons. Moreover, risk aversion depends on the circumstances. Many persons like to gamble even at unfavorable odds, preferring uncertain cash flows to fixed cash flows.

No model for risk aversion is commonly used, and the models that have been proposed have parameters whose values are unknown and hard to estimate. Certainty equivalent cash flows are theoretical ideals, not practical tools.

(2) Corporations (such as insurers) are not risk averse. Their senior managers and their shareholders may be risk averse, and corporate behavior may reflect the risk aversion of managers and shareholders, but this reflection is weak. Modern financial theory posits that if shareholders are risk averse, they should invest in diverse assets; corporations should not diversify for the risk aversion of shareholders. Corporations diversify for other reasons, such as economies of scale and scope and risk aversion of senior executives.

Confidence level approach

IFRS 17 discusses the confidence level and cost of capital methods. Paragraph 117 says

> *An entity shall disclose the confidence level used to determine the risk adjustment for non-financial risk. If the entity uses a technique other than the confidence level technique for determining the risk adjustment for non-financial risk, it shall disclose the technique used and the confidence level corresponding to the results of that technique.*

The confidence level technique is not defined in IFRS 17. For regulatory capital requirements, the confidence level technique sets the risk adjustment so that the fulfilment cash flows (the future claim payments plus the risk adjustment) have a specified probability that they will suffice to pay the claims.

Illustration: Suppose the present value at a risk-free rate of future cash outflows is 100. If the insurer holds assets of 100 and the distribution of future cash outflows is symmetric, the probability that it can pay the claims is 50%. If it needs 120 of assets for a probability of 95% that it can pay the claims, the risk adjustment is 120 – 100 = 20 at a 95% confidence level (a 5% value at risk).

The Swiss Solvency Test uses a 99% tail value at risk for solvency requirements; Solvency II uses a 99.5% value at risk for solvency requirements. IFRS 17 is not a regulatory capital requirement. The confidence level technique estimates the certainty equivalent cash flows with the same value to a risk averse insurer.

The IFRS 17 risk adjustment for non-financial risk requires insurers to estimate the compensation they need to assume uncertain cash flows, with no guidance from accounting boards or financial theory. The appropriate risk adjustment prevented acceptance of fair value measurement for insurance cash flows for many years. The 1990 GAAP discussion paper on present values was unable to measure the appropriate discount rate for insurance cash flows, and the FASB and the IASB disagreed so strongly about the risk adjustment for non-financial risk that they issued separate exposure drafts for IFRS 4 and the FASB decided not to continue in the IFRS 17 deliberations.

The IFRS 17 *Basis for Conclusions* paragraph BC211 explains that the risk adjustment for non-financial risk *conveys useful information to users of financial statements about the entity's view of the economic burden imposed by the non-financial risk associated with the entity's insurance contracts*. But investors want to know the market values of their investments, not the insurer's own assessment of its risk aversion or of the certainty equivalent cash flows it might be indifferent to.

IFRS 17 *Basis for Conclusions*, paragraph BC215, explains that insurers may determine the risk adjustment different ways to reflect their own assessment of risk:

> *to allow users of financial statements to understand how the entity-specific assessment of risk aversion might differ from entity to entity, IFRS 17 requires entities to disclose the confidence level to which the risk adjustment for non-financial risk corresponds.*

The requirement to disclose the confidence level might be useful if insurers used the same method to estimate the confidence level. In practice, the estimated confidence level may vary widely among insurers for the same expected claims and risk adjustment. It is not clear whether the cost of estimating a confidence level is more of less than any benefit the readers of the financial statements might receive.

Cost of capital method

Solvency II and the Swiss Solvency Test use a cost of capital method to provide a fair value risk margin for technical reserves (the liabilities for future claim payments). The cost of capital method is the cost of holding the capital needed to support insurance operations because of the uncertainty of the future claim payments.

IFRS 17, *Basis for Conclusions*, paragraph BC217 says:

> *The Board also considered whether … the cost of capital approach should be used as the basis for comparison. Although the usefulness of the confidence level technique diminishes when the probability distribution is not statistically normal, which is often the case for insurance contracts, the cost of capital approach would be more complicated to calculate than would the confidence level disclosure. Also, the confidence level technique has the benefit of being relatively easy to communicate to users of financial statements and relatively easy to understand. The Board expects that many entities will have the information necessary to apply the cost of capital technique because that information will be required to comply with local regulatory requirements. However, the Board decided not to impose the more onerous requirements on entities when a simpler approach would be sufficient.*

Which method (cost of capital or confidence level) is easier to understand or easier to calculate is debatable. Solvency II and the Swiss Solvency Test use the cost of capital method because it gives the fair value (the market value) of the risk margin. The IFRS statement of financial position should give unbiased estimates of

fair value when the information is available, not entity-specific estimates. Many insurers may use the cost of capital method for the IFRS 17 risk adjustment since they use it for Solvency II and for internal pricing.

We illustrate the cost of capital method below, since insurers subject to Solvency II or the Swiss Solvency Test use it for the risk margins on technical reserves and many financial economists use it to estimate fair values.

Risk adjustment for financial risk vs non-financial risk

IFRS 17 distinguishes two types of risk: financial risk vs non-financial risk. The discount rate for the present value of future cash flows reflects both the time value of money and the financial risks related to those cash flows, such as timing, currency, and liquidity.

In other contexts, discount rates include risk adjustments for non-financial risk. The opportunity cost of capital is adjusted for business risks of the project, and some actuaries reduce the discount rate for claim liabilities as a risk adjustment for non-financial risk when pricing the policies.

IFRS 17 requires an explicit risk adjustment for non-financial risk separate from the discount rate for the time value of money and financial risks. The *Basis for Conclusions* paragraph BC212 says that

> *combining the adjustments [for financial risk and non-financial risk] is inappropriate unless the [non-financial] risk is directly proportional to both the amount of the liability and the remaining time to maturity. Insurance contract liabilities often do not have these characteristics. For example, the average risk in a group of claims liabilities may rise over time because more complex claims incurred may take longer to resolve. Similarly, lapse risk may affect cash inflows more than it affects cash outflows. A single risk-adjusted discount rate is unlikely to capture such differences in risk.*

Exercise 21.1: Risk adjustments

A. What are the two risk adjustments in IFRS 17 to the present value of the future cash flows?
B. Which risk adjustment is an adjustment to the discount rate?
C. Which risk adjustment is shown separately from future cash flows?

Part A: The two risk adjustments in the fulfilment cash flows are

- the risk adjustment for financial risk
- the risk adjustment for non-financial risk

Part B: The risk adjustment for financial risk is an adjustment to the discount rate.

Part C: The risk adjustment for non-financial risk is shown separately from the future cash flows, and insurers must disclose how they calculate this risk adjustment.

Question: Is this risk adjustment shown separately or is it part of the fulfilment cash flows?

Answer: The risk adjustment for non-financial risk is part of the fulfilment cash flows, but the insurer must prepare reconciliation exhibits with separate entries for the future cash flows and the risk adjustment.

Cost of capital method

The fair value of insurance claims includes the cost of holding capital to support the claims. The cost of holding capital is the opportunity cost of capital demanded by investors minus the yield on the investment of that capital.

Capital is fungible: if capital earns less than its appropriate return in one industry, investors move their capital to other industries. In the short term, an industry may be under-capitalized or over-capitalized. The capital held by catastrophe reinsurers may be depleted after a serious hurricane (or other natural catastrophe) and rises during years without serious hurricanes (or other natural catastrophes). In the long run, the capital held by the insurance industry is presumably the capital needed for the industry.

The opportunity cost of capital differs by industry, depending on its systematic risk. Insurance is presumed to have average to somewhat lower than average systematic risk. The investment yield on capital is assumed to be the after-tax risk-free rate for medium- to long-term investments.

Illustration: An insurer expect to incur and pay a claim of 100 in one year. The average capital held by insurers for this line of business is 20% of the present value of expected claims. The pre-tax risk-free rate is 6% *per annum*, the after-tax risk-free rate is 5% *per annum*, and the opportunity cost of capital is 11% *per annum*. The present value of the expected claims is $100 / 1.06^1 = 94.34$. The cost of holding capital for this claim is $95.24 \times 20\% \times (1.11 - 1.05) = 1.14$ *per annum*.

The cost of holding capital is an annual cost that accrues over time: the cost for two months is twice the cost for one month.

The risk margin accretes interest, just as the fair value of the claim accretes interest. The fair value of the claim increases from 94.34 to 100 over the year, so the cost of holding capital increases from 1.14 *per annum* to 1.20 *per annum*.

The cost of capital method often uses a ratio of capital held to the *nominal* value of expected claims. If the average capital held by insurers is 20% of the nominal value of expected claims, the cost of holding capital is $100 \times 20\% \times (1.11 - 1.05) = 1.20$.

The opportunity cost of capital varies with the after-tax risk-free rate, though the correlation is only moderate. Both the opportunity cost of capital and the after-tax risk-free rate depend on a country's tax law and economic conditions. Instead of separately estimating the opportunity cost of capital and the after-tax risk-free rate, one might estimate the difference between the two rates over a long period. As a common formula for all insurers, the fair value risk margin on technical reserves in Solvency II and the Swiss Solvency Test uses a 6% cost of holding capital regardless of investment yields, risk-free rates, and tax laws. The risk adjustment for non-financial risk in IFRS 17 may use a cost of holding capital specific to the investment yields and tax laws of the insurer's country.

Exercise 21.2: Risk adjustment for non-financial risk – cost of capital method

An insurance contract issued on January 1, 20X1, has three expected claims:

- 200 on December 31, 20X1
- 400 on December 31, 20X2
- 300 on December 31, 20X3

The insurer uses the cost of capital method to derive the risk adjustment for non-financial risk.

- The cost of capital is the after-tax risk-free rate + 6%.
- The risk-free discount rate is 5% *per annum*.
- The required capital is 20% of the present value of the technical reserves.

We evaluate the required capital at December 31 of each year and assume this capital is held a full year.

A. What is the required capital for each claim right before the claim occurs?
B. What is the cost of holding this capital each year?
C. What is the cost of capital risk margin for each claim each year?
D. What is the risk adjustment for non-financial risk each year?

Part A: The required capital right before the claim occurs is

- 20% × 200 = 40 for the 20X1 claim
- 20% × 400 = 80 for the 20X2 claim
- 20% × 300 = 60 for the 20X3 claim

Part B: The insurer can invest the capital at the risk-free rate, so the cost of holding the capital is the cost of capital minus its after-tax risk-free return = 6% here.

Part C: The fair value risk margin is the required capital times the cost of holding capital.

- The risk margin for the 20X1 claim is
  - 40 × 6% = 2.40 in 20X1.
- The risk adjustment for the 20X2 claim is
  - 80 × 6% + (80 × 6%) / 1.05 = 9.37 in 20X1.
  - 80 × 6% = 4.80 in 20X2.
- The risk adjustment for the 20X3 claim is
  - 60 × 6% + (60 × 6%) / 1.05 + (60 × 6%) / 1.05^2 = 10.29 in 20X1.
  - 60 × 6% + (60 × 6%) / 1.05 = 7.03 in 20X2.
  - 60 × 6% = 3.60 in 20X3.

Actual computations use the capital requirements for underwriting risk, reserving risk, and asset risks, as well as patterns of claim payments and capital flows. The Swiss Solvency Test and Solvency II require insurers to estimate their capital requirements at each future year but considering only existing insurance contracts and claims using the statutory formulas. The simplified exercise here shows the intuition.

Exercise 21.3: Confidence level vs cost of capital method

How do the confidence level approach and the cost of capital approach (used to compute the risk adjustment for non-financial risk) differ with respect to

A. the change in the risk adjustment as the claim ages
B. the accretion of interest on the risk adjustment
C. the relation of the risk adjustment to the risk aversion of the insurer
D. the effect of diversification on the risk adjustment

Part A: The cost of capital risk adjustment is the present value of the future cost of holding capital to support the insurance claims. Capital is held each year the claims are outstanding. As the claims age, the remaining period that capital is held becomes shorter, and the risk adjustment declines.

The uncertainty about the future claim payment is highest when the claim is incurred but not yet reported. The uncertainty declines as the claims is reported, investigated, and paid, so the risk adjustment also declines. The decline varies by line of business: higher for commercial liability than for whole life insurance.

IFRS 17, *Basis for Conclusions*, paragraph BC187 says that

> *non-life insurance contracts are more uncertain than life insurance contracts with respect to:*
>
> *(a) whether the insured event will occur, whereas the insured event in some life insurance contracts is certain to occur unless the policy lapses;*
>
> *(b) the amount of the future payment that would be required if an insured event occurs, whereas the future payment obligation is generally specified in, or readily determinable from, a life insurance contract; and*
>
> *(c) the timing of any future payments required when the insured event occurs, whereas the timing of future payments in a life insurance contract is typically more predictable.*

Part B: The cost of capital approach is the present value of the cost of holding capital each year until the claim is paid, so interest is accreted on this cost each year.

Illustration: The risk adjustment for the 20X3 claim (from the previous exercise) in 20X1 is

$$60 \times 6\% + (60 \times 6\%) / 1.05 + (60 \times 6\%) / 1.05^2 = 10.29.$$

At the end of 20X1, interest accretes at 5% *per annum* and the cost of holding capital in 20X1 is no longer relevant and is released, so the risk adjustment for 20X2 is

$$1.05 \times (60 \times 6\% + (60 \times 6\%) / 1.05 + (60 \times 6\%) / 1.05^2 - 60 \times 6\%) = 7.03 \text{ (as calculated earlier).}$$

The confidence level approach does not have a standard formula. The risk adjustment any year is not the risk adjustment in the previous year increased for accretion of interest and reduced for the release of part of the risk adjustment.

Part C: The cost of capital method is a fair value risk margin that is not directly related to the risk aversion of the insurer. The required capital is usually based on regulatory formulas or on the average capital held by the insurance industry for a given line of business and country, so the risk aversion of the insurer is not relevant. A fair value risk margin depends on the behavior of market participants, not on the risk aversion of any insurer.

One might argue that more risk averse insurers may hold more capital to support the future claim payments, so the risk adjustment might be indirectly related to the insurer's risk aversion. In practice, the capital held by

insurers depends more on historical happenstance than on risk aversion. Successful insurers, risk averse or not, have earned profits and generally hold more capital than unsuccessful insurers.

The confidence level risk adjustment depends on the risk aversion of the insurer. IFRS 17 assumes that firms (insurers) have risk aversion. But risk aversion depends on the person; firms have many owners with differing risk aversion. Financial economists assume that the risk aversion of an investor does not affect the price the investor pays for assets, though it does affect the choice of assets held by the investor.

Part D: Regulatory capital requirements, such as Solvency II, depend on the diversification of the insurer. A cost of capital risk adjustment based on the required capital for the insurer would similarly depend on the diversification of the insurer. The average capital held by the insurance industry for a given line of business and country does not depend on the diversification of the insurer holding the risk adjustment, which would not be related to the insurer's diversification. A fair value risk margin is independent of the characteristics of the firm holding the risk margin, including its diversification.

The value at risk, which is often used to measure the confidence level risk adjustment, depends on the size and diversification of the portfolio.

IFRS 17, paragraph B88, says

> *the risk adjustment for non-financial risk reflects the degree of diversification benefit the entity includes when determining the compensation it requires for bearing that risk.*

IFRS 17, *Basis for Conclusions*, paragraph BC214 says

> *the risk adjustment for non-financial risk reflects any diversification benefit the entity considers when determining the amount of compensation it requires for bearing that uncertainty.*