

October 2016

**Subject F202 — Life Insurance**

**Specialist Applications**

**EXAMINER'S REPORT**

## QUESTION 1

A life insurance company writes only conventional annuity business and follows industry best practice in pricing policies and in its investment strategy. For many years the new business volumes and the size of the overall annuity portfolio have been stable. The excess of the value of assets over the value of liabilities has changed from 2014 to 2015 as set out in the table below.

	31 Dec 2015 R '000	31 Dec 2014 R'000
Excess Assets as at end of reporting period	47 600	50 800
Excess Assets as at beginning of reporting period	50 800	50 400
Change in Excess Assets over the reporting period	(3 200)	400

This change in the excess assets is due to the following factors:

	31 Dec 2015 R '000	31 Dec 2014 R'000
Investment Income	2 900	1 500
Capital Appreciation	-	-
Total investment return on shareholder capital	2 900	1 500
Operating profit	(5 200)	(1 000)
Changes in valuation methods or assumptions on in-force business	(3 000)	500
Tax	2 100	(600)
Total earnings	(3 200)	400
Capital raised	-	-
Dividends paid	-	-
Total change in excess assets	(3 200)	400

The Statutory Actuary is concerned with the change in Operating Profit. A detailed breakdown of the 2014 operating profit has been produced, but not yet for 2015.

- (i) Outline the main components of the Operating Profit; how each component is calculated and the likely impact of each component on operating profit.

*This question was poorly answered. Many candidates adopted a simple “premiums – claims” approach which did not allow for the detail of all the components that contribute to operating profit. Very few students mentioned release of margins, changes in reserves or new business strain as components of profits.*

New business profit/strain at point of sale.

New business strain is calculated as the income statement items (premiums, less initial expenses, less initial commission) less the statutory reserves.

The Change in valuation methods or assumptions on ‘Dec 2014 in force’ is calculated on the in-force business only. The value of new business is therefore calculated on the closing valuation basis.

The new business profit/strain is expected to be negative because of the supervisory reserving strain and initial expense overruns.

The size of the reserving strain will depend on the difference between the profit margin and the valuation margins.

The new business profit/loss will also be influenced by the difference in the pricing assumptions and the closing best estimate assumptions.

The new business volumes have been stable, so the new business strain should be of the same order size as in previous years, provided the assumptions haven’t changed dramatically.

#### Release of the planned margins

This is calculated as the release of the planned margins in the statutory reserves over the valuation period.

Any changes in the size of the annuity portfolio, as a result of growth in the business or decrements, will have a direct impact on the release of planned margins figure.

With stable volumes, this item should also be of the same order size as in previous years.

#### Experience variance: Investment return

The contribution to profit will be the difference between the actual investment return (income) and the expected best estimate investment return on the assets backing the annuity portfolio.

With annuities most likely backed by bonds the investment return should be stable from year to year.

Annuities are in the Untaxed Policyholder Fund so there is no tax.

#### Capital appreciation, depreciation or mismatch profits

If there was a change in long term expected investment returns, this will change the market value of the bonds backing the annuity portfolio.

This will be offset by a basis change, i.e. long term investment return assumption in the calculation of the liabilities.

The difference between the change in assets and change in liabilities is a mismatch profit. This can be included in operating profit, or some companies may show this as a basis change.

If the assets and liabilities are well matched, this item should be small. It will be influenced by the availability of bonds with long enough terms to maturity.

It looks like the shareholder's fund is invested in cash or something similar that doesn't generate any capital gains. The higher investment returns imply that there was an increase in the short term interest rates or profit from money market derivatives.

If the shape of the yield curve reacted to this and the longer term interest rate increased, it will affect value of the assets, the liabilities and as a result the mismatch profit/loss.

#### Experience variance: Mortality/longevity profit

The contribution to profit will be the expected annuity payments less the actual annuity payments on policies in force (as a result of a change in longevity) less the change in the reserve as a result of a change in the expected longevity experience (positive change in reserve for an increase in longevity experience and vice versa).

Mortality/ longevity experience is generally stable from year to year, so it is unlikely that the lower operating profit is as a result of this. A likely trend of improving mortality experience (not allowed for in the reserving calculations) will increase operating losses.

#### Experience variance: Decrements (e.g. lapses, non-taken ups)

With no surrender values, there should be no lapses/surrenders over the policy term.

The profit or loss will depend on the cooling off assumptions and conditions. If there is a small loss on early lapses, it will be because of un-recouped initial expenses or commission. This should again be a relatively small figure.

#### Experience variance: Expenses

The contribution to profit will be the expected best estimate expenses less the actual expenses.

This is a fairly small/medium sized company so a small change in operating expenses (e.g. employment of senior staff member) would have a noticeable impact on the expense profit/loss.

Other experience items, (e.g. take up rate of options for additional premium with no underwriting). Options are only reserved for if they increase reserves. If it is reserved for, there will be a loss if the take up rate is more than expected and a profit if it is less than expected.

There will be an operating profit from any take-ups if the option was not explicitly reserved for.

Exceptional items, e.g. Unexpected tax changes, once-off expenses

It is very likely that the operating loss could be from exceptional items like administration system upgrades, development costs. This item should be clearly explained.

The financial impact of each of these items will be calculated as the incremental change in profit. The method (build up or average) and/or sequence of the calculation will have an impact on the absolute values.

Any unexplained profits/loss should be kept to a minimum.

The commission payments should be as expected so this item should be negligible.

Any variance in the new business experience from point of sale until the valuation date should also be reflected, but this is expected to be a small item.

**(ii) Provide possible reasons for the loss from the “change in the valuation methods or assumptions on in-force business” item.**

*This question was well answered. Some easy points such as changes to modelling or methodology were missed by a surprising number of candidates though.*

There is a drop in this profit item indicating a strengthening in the reserves.

A strengthening in the assumptions is usually accompanied by experience variance losses, i.e. assumptions that were too optimistic.

The increase in reserves could be from the following:

- Reduction in the mortality or AIDS rates (mortality improvement) or a strengthening in the mortality improvement rate.
- Increase in the renewal expense assumption; administration costs.
- Take up rates of annuity increases. If the option is reserved for, it will be from an increase in the assumed take up rates.
- Change in valuation method. Any refinement to the model or change in valuation method (e.g. increasing model points) will be included here. If this is a significant item, further explanation will be required.

- Interest rate assumption. This could be a change in the yield curve (e.g. drop or change in shape of the swap/bond curve), a reduction of risk premiums of other asset classes (if there is exposure to non-bond assets) or a change in the asset mix assumption.
- Increase in the inflation rate assumption. This will be the result of an increase in the interest rate assumption (if the inflation rate is a premium above the yield curve), CPI rate or real yield curve.
- Some companies include mismatching profits or losses as a basis change.
- Any increases in reserves as a result of changes to regulations, legislation or taxation. It will affect the whole industry and should be shown separately or explained if it is significant.

**The company developed a unit linked living annuity product and started selling it for the first time during 2015.**

**Single premiums of R10m were received during the year and there is a 97.5% allocation of premiums. There is a guarantee in the first 5 years that the surrender value will not be less than the full premium paid. The fund charges are expected to exceed the asset management fees and other operating costs. The company launched a marketing campaign to sell the unit linked living annuity business and this was financed by additional capital raised from the parent company.**

**The unit linked business has been accounted for separately, but needs to be merged with the rest of the business to prepare consolidated financial statements.**

**(iii) How would each of the items in the tables above change with the introduction of the unit linked business?**

*There was a split in the attempts at this question, with candidates either scoring well or poorly. Candidates who went through the table systematically and commented scored better. Some candidates did not actually discuss why any of these components might change, which meant the answers had no basis or substance. These candidates also scored poorly.*

First table:

The excess assets at the end of the reporting period: Assets increase by R10 million less initial costs and commission.

Liabilities will be the unit reserve plus the rand reserve. The unit reserve is R9.75m.

The surrender guarantee will increase the rand reserve and the excess fund charges over expenses will reduce the rand reserves.

The guarantee component is not that significant (not excessive guarantee and only for 5 years), so rand reserves expected to be negative.

The closing Excess of assets is therefore expected to be higher than it is currently.

The excess assets will also be higher as a result of the extra capital raised, but it will be offset by campaign costs.

Second (Change in excess assets) table:

The investment income will be higher from the additional return on the higher excess assets.

The extent of the increase will depend on the timing of the cash flows during the year.

There should be no change in capital appreciation unless the company changed its investment strategy.

Operating profit:

New business profit/loss at point of sale: The unallocated premium is most likely more than sufficient to cover acquisition expenses and commission, so the assets should exceed the unit reserve.

If the negative rand reserves are zeroised, this will be the new business profit. Negative rand reserves will increase the new business profit further.

A difference between the pricing basis and closing valuation basis will further influence the new business strain if rand reserves are not zeroised.

Release of margins from point of sale until valuation date. Zero if rand reserves are zeroised.

Expenses, mortality and investment variance: It is not expected that any of these items will make a material contribution to operating profit since the closing basis should reflect to a large extent the actual experience during the year.

Other decrements:

New business includes business written during the reporting period that has subsequently gone off the books, but excludes policies cancelled at inception.

Given the surrender value, there could be noticeable contribution from experience variance of policies cancelled after inception.

Drawdown rate: If the selected drawdown rate of the annuities was changed after sale, it will have an impact on the rand reserve, if it was not zeroised.

Once off exceptional items, e.g. campaign costs.

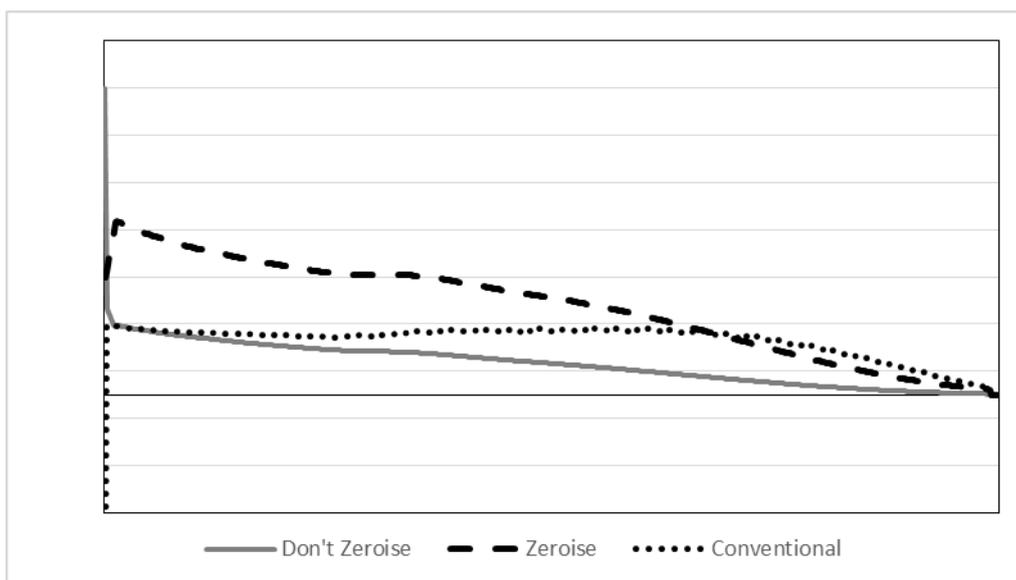
There will not be a change in valuation basis as the new business value will be on the closing valuation basis.

The capital raised item will be higher from the additional shareholder contribution and will largely be offset the campaign costs.

There will be a higher tax in the corporate fund from the additional transfer and from higher investment return.

**(iv) Describe the expected shapes of the profit profiles (or profit signatures) over the duration of the two annuity products and highlight the reasons for the different emergence of profit.**

*This question was poorly answered. Few candidates understood that the release of margins gives rise to the expected profit profile. Many candidates spoke about potential future cash flows and experience variances instead. Very few candidates considered the final part of the question relating to the reasons for the differences. Only a handful of candidates distinguished between zeroising and not zeroising negative rand reserves.*



Conventional annuity

The profit is the release of compulsory and discretionary margins.

The profits are relatively flat as the reserves reduce by annuity payments and deaths (not lapses), but increase by investment returns. The profits reduce in the long term time as the reserves and the policies in force decrease rapidly.

Because of the new business strain (initial expenses recouped over the term of the policy and the valuation strain), there is usually a loss at inception, but the loss (or profit) will depend on the profit criteria that was used in the pricing.

#### Unit linked annuity. Don't zeroise rand reserves

The profit is the release of compulsory and discretionary margins and the expected excess of the fund charges over the renewal expenses.

Since the fund charges are expected to exceed the operating expenses, a negative reserve is set up that capitalises the expected excess fund charges. If the negative reserves are not zeroised, it results in a profit at inception.

The remaining profit release over the term of the policy is the release of margins.

The extent to which the graph differs from the conventional annuity depends on the difference in the profit criteria and the runoff of the respective reserves.

A high drawdown rate will result in a shorter tail and a low drawdown rate will result in a longer tail.

The surrender guarantee might result in a steeper drop off in curve compared to conventional annuity.

#### Unit linked annuity. Zeroised rand reserves

The planned margins are usually captured in the rand reserve (as an increase in the reserve). Zeroising rand reserves will eliminate the setting up and release of planned margins.

Since expected profits are not capitalised by holding negative rand reserves, any expected profits will be released as and when they are expected to occur.

The expected release in profit is only the expected excess fund charges over the maintenance expenses).

The profit/loss at inception will depend on whether the 2.5% unallocated premium is sufficient to pay initial commission and initial expenses.

## QUESTION 2

**A listed South African life insurance company writes only conventional with profits and unit-linked endowment assurance business. The shareholders are entitled to receive all the surplus arising from the without profits business (which includes the unit-linked business) and a maximum of one-ninth of the cost of bonuses declared on the with profits business.**

**(i) Describe the components of the appraisal value of the company.**

*This question was well answered.*

An appraisal value is a method used to put a value on an insurance company.

Where the EV is only concerned with the value of existing business, an appraisal value also looks at the value of future new business of a company.

Hence the appraisal value of a company is made up as follows:

- Embedded value (EV)
- Present value of future new business (PVFNB)

### Embedded value

Embedded value is calculated according to APN 107.

Embedded value, as well as the analysis of change in embedded value, is published in the annual financial statements of the company.

The embedded value (EV) of a listed life insurance company consists of

- the free surplus, in respect of the shareholders' fund,
- the required capital to support the business,
- the present value of the future after tax profits from the p/h fund (VIF)
- an adjustment in respect of the cost of the required capital (CoRC)

The free surplus plus the required capital should equal the adjusted net worth (ANW) of the company.

### Present value of future new business (PVFNB)

PVFNB is often referred to as the 'goodwill' value of the company.

The PVFNB is a very subjective value as assumptions on future business volumes needs to be made.

It is therefore common to produce a range of appraisal values based on different levels of future new business.

One method of calculating the PVFNB is to look at the VNB written over the last 12 months.

The PVFNB can then be estimated by using a multiple of the VNB.

The VNB should be calculated as per APN 107.

The multiple used in calculating the PVFNB will depend on:

- the company's tax position,
- expected future new business growth
- as well as the RDR.
- It is also common practice to use a higher RDR in calculating the PVFNB than for the VIF.
- For products where insufficient business volumes were sold or new products that have not been launched yet, alternative methods can be used.

One possible approach is to project

- the number of expected new policies during the next five years and discount the shareholders' cash flows to the current date.
- All acquisition costs and costs of capital requirements should be taken into account.

Goodwill could also include an allowance for the value of non-covered business.

**Each year the company analyses the change in embedded value. It also projects the expected transfers between the policyholder funds and the shareholder fund.**

**(ii) Discuss the main components of the analysis of change of the embedded value.**

*This question was book work and well answered.*

### Change in embedded value

A suggested template for the analysis of the change in EV is set out in APN 107.

The three components (ANW, VIF and CoRC) of the embedded value should be analysed separately.

The expected profit transfer should have offsetting values in the ANW and VIF column – a positive value in the ANW column and a negative value in the VIF column.

The VIF would increase with unwinding of the risk discount rate.

The main components into which the change in ANW and VIF would be analysed are:

- The value of new business written during the year.
- The difference between the actual and the expected transfer to/from the VIF to the ANW.
- This difference includes operating experience (from mortality, persistency, alterations, expenses) variances and investment return variances
- Any change in operating assumptions (e.g. Decrements and expenses)
- Any model changes
- Any economic assumption changes.
- Any data changes (e.g. model point changes)

In addition to above the ANW will also change due to:

- Investment return (income and capital appreciation/depreciation ) on ANW
- Capital movements : Capital injections into the company and dividends paid out

**(iii) Why would a company analyse the change in its embedded value?**

*This question was book work and well answered.*

An analysis of the change in the EV from year to year is important as an indication of the sources of the added value for the company from the shareholders' perspective.

Reasons

To assist in checking the calculation of the EV

To assist in the revision of assumptions by comparing actual experience against expected

To provide the management with the value of the new business written in the year

To identify the individual sources of EV profit and loss, and so indicate areas where management action may be desirable or required

To identify unprofitable contracts so that they can be redesigned, re-priced or cancelled

To improve management's understanding of the business

To assist in the calculation of management incentive schemes

To provide investment analysts and the investing public with a more realistic picture of the true underlying sources of additional value creation.

To comply with APN 107:

- APN 107 requires that the change in the EV from the previous to the current calculation date be disclosed and.
- split between those items that relate to the value of in-force (VIF), those that relate to the ANW and those that relate to the CoRC.
- An actuary may not certify compliance with APN 107, unless the disclosed EV information complies in all material aspects with the APN, or where alternative approaches are allowed by the APN, this fact has been clearly disclosed.

**The actual transfer from the policyholders' funds to the shareholders' fund in recent years has often differed considerably from that predicted at the start of the year.**

**(iv) Discuss the possible causes of these differences and the extent to which they can be mitigated by the company in future.**

*This question was poorly answered. Many candidates answered generally and didn't consider the differences between the with-profits and unit-linked business. Many candidates seemed to focus on errors as the reason for the differences rather than experience variations.*

*Candidates answered the mitigation part of the question particularly poorly. Many didn't distinguish between reversionary and terminal bonuses and the options these presented. The points relating to the discretion the company had over the bonuses were also often missed.*

It is difficult to predict accurately what the transfer will be the next year.

This transfer will reflect both the cash flows relating to existing business and those relating to new business.

#### With Profits Business

For with profits business the transfer represents the shareholders' 1/9th (maximum) cost of bonus.

The cost of bonus is dependent on the valuation basis which may have changed from that assumed at the year start.

The actual bonus rates may have differed from those assumed at the year start.

The actual mortality or withdrawal experience may have differed from that assumed in estimating the cost of bonus.

The % of surplus distributed to shareholders may be different from that assumed at the year start. [Unlikely, since usually the maximum is distributed.]

#### Unit-Linked Business

In calculating the embedded value it will have been assumed that all emerging profit is immediately transferred to shareholders.

The expected cash flow is therefore the net cash flow at the year-end on assumptions made at the beginning of the year.

The difference could therefore be due to actual experience differing from that expected. For example,

- expenses,
- lapses,
- mortality, or
- investment returns.

The expected cash flow will also reflect an assumption about the reserves which are required to be held at the end of the year. The actual valuation basis may differ from that assumed at the start of the year.

### New Business

New business tends to have a negative cash flow in the first year.

Thus, even if this new business is profitable and will increase the shareholder value, it will reduce the transfer to shareholders in the year in which it is written.

So, if actual new business volumes differ from those expected, the transfer to shareholders will differ from that expected.

### How to mitigate deviations from expected transfer?

For with profit business (e.g. Reversionary Bonus) the bonus rates will tend to reflect the company's expectations of long term future investment returns more than the actual return earned in the last year.

So, barring very exceptional investment years, it is unlikely that bonus rates will differ significantly from that assumed at the year start.

The company is therefore not exposed significantly to variations from this source in normal circumstances.

Terminal bonus will, however, reflect more closely the investment return earned in the year and it is likely that a significant % of the assets are held in equities which tend to produce volatile returns from year to year.

Therefore, a 1/9th of terminal bonus may be a source of variation.

However, it can attempt to adopt an approach of a more stable terminal bonus so as to limit variations from this source.

Other than restrictions on the maximum change in the % of surplus distributed to shareholders in respect of with profits business from that in the previous year, and any restrictions in the company's constitution, the % distributed to shareholders is at the company's discretion.

The company can, therefore, control the extent to which variations arise from this source.

Most companies are likely to distribute the maximum permissible to shareholders.

The company can minimise its exposure to variations in mortality experience through the use of reinsurance.

The company has limited control over variations in withdrawal experience although keeping service levels constant should help.

The company can obviously control, to an extent, expense levels and therefore reduce variations from this source.

For unit-linked business, the company can reduce fluctuations in profits due to investment return volatility by setting monetary and charges rather than fund related charges, although this is likely only to be possible for future new business.

Other than reducing premiums, which might not be viable from a profitability point of view, the company has little control over variations arising from lower volumes of new business than expected due to competitive pressures.

It could restrict variations due to selling more new business than expected by setting a maximum volume of business for the year.

But, assuming that business can be written on profitable terms, an increase in shareholder value might be preferable to reduced volatility of the transfer to the shareholder's fund, subject to new business strain.

**Over the last year there has been a significant increase in inflation and yields available on fixed interest securities and equities.**

- (v) **Explain the impact that this might have on the analysis of the change of embedded value over the year.**

*This question was relatively poorly answered. Again, many candidates didn't consider the differences between the with-profits and unit-linked business. Many candidates did not distinguish between what happened during the year and future expectations as at the end of the year.*

*Not many candidates were able to effectively demonstrate that they understood the impact of a change in economic environment on the EV.*

### Risk Discount Rate

The risk discount rate is based on the return on risk-free assets, increased to reflect the extra risk involved in writing the particular business.

Thus an increase in expected long term gilt returns will lead to a higher risk discount rate. This will act to reduce the present value of future profits (VIF).

Therefore, the EV will reduce due to this change of the economic basis.

When the risk discount rate is changed, this is likely to be the most significant impact of the change in investment conditions.

### Value of With Profits

The increase in yields and inflation is likely to lead to higher long term expected returns on the policies.

This is likely to lead to an increase in future reversionary bonus levels.

In itself, if this is allowed for in the calculation of the present value of future profits, it will act to increase the VIF.

However, higher yields are also likely to lead to an increase in the interest rates assumed in the reserves and hence a decrease in the reserves.

Since these reserves are used in calculating the cost of this bonus it will tend to decrease the present value of future profits of the business. It will also tend to decrease the transfer to shareholders during the year below that assumed at the year start since the value of the reversionary bonus declared during the year will be lower.

Higher long term total returns are also likely to lead to higher terminal bonus in the future which, as it is costed at face value, will tend to increase the present value of future profits.

The increase in yields over the last year is likely to have led to a decrease in asset value which may lead to terminal bonus during the year lower than predicted at the start of the year. This would cause the transfer to shareholders for the year to be lower than expected at the start of the year.

### Value of Unit Linked

The assumption about future expected investment returns will tend to increase. This will increase the monetary value of the fund management charge which will tend to increase the present value of future profits.

It will also increase the rate earned on the non-unit reserves which will tend to increase the present value of future profits.

However, the assumption about future renewal expense inflation will also be increased which will tend to decrease the present value of future profits.

The assumption for the future rate of increase of any discretionary policy fees will also be increased which will tend to increase the present value of future profits.

These investment return and expense inflation assumptions will also be changed in the calculation of the non-unit reserves assumed at each year end.

If this results in an decrease in these reserves it will increase the transfer to shareholders funds during the year from that expected at the year start (and vice versa).

#### Change in Value of Free Assets

As the yields have increased over the year, capital values will have decreased so the actual investment return in the year is likely to be lower than predicted at the year start.

Thus, the reduction in shareholder value relating to the investment return earned on the free assets is likely to have been greater than what it would otherwise have been.

**END OF EXAMINER'S REPORT**