EXAMINATIONS

September 2003

Subject 402 — U.K. Fellowship Life Insurance

Paper Two

EXAMINERS' REPORT

Introduction

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The report does not attempt to offer a specimen solution for each question — that is, a solution that a well prepared candidate might have produced in the time allowed. For most questions substantially more detail is given than would normally be necessary to obtain a clear pass. There can also be valid alternatives which would gain equal marks.

J Curtis
Chairman of the Board of Examiners

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1 (i) The board is likely to want at least to maintain the level of profit the company generates from writing business. Profitability of protection business is declining so we may feel the need to broaden the product range in order to maintain overall profitability. But what are potential sale volumes of new and old products? Will we be able to sell sufficient volumes to cover development and fixed costs?

Do we agree with the consultant's analysis of the future market? Can pensions business be written profitably? We should look at other companies' pension products and assess the existing level of competition.

Another important financial consideration is the capital requirement of writing pensions business. The board will need to consider whether the company has sufficient capital to enter into selling this product type, which may have a larger and longer lasting new business strain. Capital is also required to cover the initial development costs. Since the company is unlisted, it may be harder to obtain capital than if was listed.

We should assess our ability to meet the requirements of regulators before entering this new market.

The sales capability of the company is also important. The board would need to consider whether the current salesforce is authorised to sell this type of business.In order for our salesforce to become authorised we are likely to need to make an investment in their training. Ultimately, it may be that this type of business is best sold via a different distribution channel from our current capabilities.

Our current sales channels may not have access to the right target market. We may need to build a new sales channel or build relationships with new intermediaries. Building a new sales channel will involve significant time and cost. However, there may be cross-selling opportunities.

The administration capabilities of the company would be an important constraint. Protection products are typically quite simple. Pensions products however are often quite complex with more flexibility around premium payment amounts and investment options, and potentially different tax treatment and legislative requirements. We may need to build additional capability to be able to deal with these, for example we may need to build computer systems and train administration staff. Alternatively, we could outsource systems and administration functions. We should investigate the costs and benefits of this alternative.

The consultants' report has highlighted that with profits business is a particular area of growth., but this is a difficult market to break into as, having sold only protection business, we are likely to have a low free asset ratio.

Additionally, we may find the management of such business difficult as we have no estate for smoothing and may not have the actuarial skills to manage

bonus strategies effectively. Whether we choose to offer with profits or unit-linked pensions business, we have no investment track record. This means it may be difficult to attract business from intermediaries. We may also need to seek investment management expertise externally.

We also do not have expertise in pensions product design and do not have past experience to use in pricing. We may to purchase consulting expertise, at a cost.

The risk adversity of the board would be an issue. The risks involved in this kind of business are different to those in protection business. They may be more onerous if guarantees are given in marketable products. This may not be in line with the shareholders' appetite for risk.

There are also regulatory and political risks associated with pensions business. Should the company consider other strategic options such as a merger with another company?

This question was generally well answered with the better candidates covering the range of practical and financial considerations. However, there was evidence of poor time planning in a few scripts, with long repetitive answers to Q1 leaving some candidates with insufficient time to do justice to the later parts of Q2 (particularly the calculations).

(ii) The price would be based on the appraisal value of the company. This is the sum of the embedded value and the value attributed to future new business i.e. goodwill. The embedded value is the value of in-force business plus the value of any free assets / net assets within the long term business fund or in any separate shareholder funds.

Assets may be adjusted to make allowance for inadmissibles.

The value of in-force business would be based on projections of future cashflows. This requires assumptions for future economic, demographic and expense experience. A fair price would be based on best estimate assumptions.

If we were negotiating a sale price we may want to make the assumptions slightly optimistic to increase the value derived. In particular, the discount rate used may be reduced to the lower end of the potential range. But all assumptions must be supportable (e.g. demographic based on up to date experience investigations). The extent to which the assumptions are adjusted will depend on whether the bid is friendly or hostile.

Free or net assets may be valued at face value, or may be reduced to reflect a delay in their release to shareholders.

Goodwill will be based on an assessment of future new business volumes. Again we will need to project future cashflows to calculate the expected present value of profits. The volumes used may be based on this year's business plus expected future growth. The goodwill will be the sum of values in all future years appropriately discounted.

We should allow for the expected impact of market changes and their impact on volumes and/or margins. We would not want to overstate any negative impacts in order to keep the value high and may want to allow for reasonable actions we could take to protect profit e.g. reduced commissions or targeted underwriting savings. Again, the extent to which this is done depends on the level of hostility of the bid.

Alternatively we may just use current new business value and a simple multiplier i.e. *x* times the value of new business in the current year. A lower multiple may need to be used given the uncertainty over future new business margins in the market.

This may be compensated by making some allowance for the potential volumes of new products (e.g. pensions) and the value, net of any development costs, these would be expected to generate. However, it is likely that the purchaser of the company would not pay the full value for this because the volumes which may be sold are uncertain.

Ultimately, the goodwill payable would be negotiated between the vendor and purchaser but the report needs to indicate to the board the range of possible values to assist with any negotiations on the price.

There would also need to make an appropriate adjustment for shareholder tax.

We may also wish to take into account value arising from synergies (e.g. economies of scale) expected from the acquisition.

The company is unlisted and therefore a market price per share is not readily available. However, the valuation might take into account information from any recent trades in the company's shares or information from prices paid recently for similar companies.

This was generally well answered, with the better solutions being those that concentrated on the specific situation described in the question, rather than simply stating a theoretical approach to an appraisal / embedded value calculation.

(iii) The consideration would be based on the overall value to shareholders of each of the options. The assessment of value would be based on appraisal value techniques.

In valuing each of the merger options, we would need to consider the terms of the merger. In particular we would need to consider the share our shareholders would have in the combined company and the overall value of this company.

We should also take into account the one-off costs of performing the merger and the likely timescales and level of management distraction. This should include the regulatory requirements in respect of a merger (e.g. court approval), and whether there are any potential barriers e.g. anti-competition legislation.

We should obtain as much information as possible on the products that the other companies write. We should also investigate the financial strength of the companies, and look at accounts and other published information over at least the last five years.

Projections would be required for both entities being merged, including expected volumes of future new business. These projections would need to allow for any synergies involved in merging the businesses. Depending on their size, the synergies may make the merger options preferable to entering the market alone. However, the combined appraisal value should also be reduced to reflect overlaps (e.g. systems, competing business plans) and therefore may be less than the sum of the value of the individual companies.

There may also be issues arising from having very different head office locations, and the impact of redundancies on morale as well as costs should be considered.

With the pensions company, synergies may be small as we would be combining separate businesses. However, we may be able to obtain some efficiencies in management overheads. In time we may be able to reduce costs through salesforce efficiency and/or better bargaining power with intermediaries.

There may be larger synergies with the protection insurer. We may be able to make more immediate efficiencies with salesforce integration, and gain efficiencies in systems and administration costs. In both cases, we would also need to project the overall impact on taxation to assess any potential tax synergies.

In reality we may be reliant on the projections provided by the other companies, so we need to consider the risks associated with the quality of information and accuracy of the profits assessment for each. This may reduce our confidence in the value gained from either of the merger options.

We are more familiar with the protection market so may have more certainty over the future profits projected by the protection insurer. However, this market is emerging so volumes may be uncertain.

We have no experience of the pensions market and may need to obtain sensitivity analyses to understand the profitability of the pensions market. We should perform full due diligence on any information provided by the other companies.

We also need to consider other intangible items that may impact on the value of the company on merging - for example, there may be a positive impact of adding the merger partner's brand to our business.

Conversely are there any reputational issues with either company that may impact on future sales e.g. mis-selling scandals?

We should consider the extent of risks arising from the options and guarantees within the target's business, such as guaranteed annuity options or conversion options.

We need to consider the quality of management of the other businesses, how their strategic intentions fit our own and how this may impact on the future outlook for the merged business.

We should also compare each merger option with the option of entering the new markets alone. To do this we would consider the appraisal value of our own company, allowing for volumes and profitability expected from the new types of business. In deriving this value, we would need to allow for the development costs associated with starting to write new types of business including product design, marketing launches, sales channel development and systems and administration issues.

In considering this option we need to allow for the fact that we have no experience in this area. There is a risk that our assumptions associated with the new products, e.g. estimates of new business volumes and administration costs, may not be accurate. We would need to understand the risks to shareholder value of sensitivities in key assumptions.

The optimal choice would be a function of the expected future value of our share of profits under each of the options and the perceived variability in the possible future outcomes. There may be a trade off between the expected value and the risk, which should be evaluated with reference to the perceived attitude to risk of the shareholders.

Candidates should not expect to receive marks here simply for listing the opposite of the points made in their solution to part (i)! As in part (i), candidates were expected to consider both financial and practical issues. The better answers focussed on examples of potential synergies (identifying the key

difference between the two potential partners) and other benefits / issues. Whilst many candidates noted the importance of shareholder value, relatively few discussed the risk / reward trade-off. The solution given here is not exhaustive and due credit was given for other valid points.

2 (i) Payouts are normally smoothed over time. Payouts will exceed asset share when markets perform badly, and be below asset share when markets are strong but also payouts may be temporarily augmented above asset share for competitive reasons, or they may be increased above asset share to distribute a one-off surplus or part of the inherited estate.

Payouts might instead be reduced to less than asset share to provide capital for other purposes, e.g. to support the solvency position.

The asset share calculation might not allow for a deduction in respect of a contribution towards the cost of capital. It might also not include the regular addition of miscellaneous profits/losses, e.g. from surrenders or without profits business written into the with profits fund.

Guarantees could result in payouts exceeding theoretical asset share. For example, guaranteed basic benefits could exceed asset share, perhaps as a result of an equity market crash. In addition there could be guaranteed annuity or cash conversion options.

Death benefits could exceed asset share. For example if there is a guaranteed minimum sum assured or a no-MVA guarantee on unitised with profits products.

Some companies may aim to pay out less than asset share on surrender, as a form of surrender penalty. Some contracts may have a guaranteed minimum surrender value, in which case the payout could exceed asset share. Often no-MVA guarantees are given on UWP products for regular income withdrawals or on surrender at specified dates (e.g. ten year anniversary).

Early asset shares can be negative, in which case early payouts will always exceed asset share. Early surrender values may be set by reference to premiums paid rather than asset share.

Terminal bonus, TB, scales are broad-brush for practical reasons, so the payout on an individual policy will rarely the asset share exactly. Also TB scales are not recalculated every day and may be up to a year out of date.

The same terminal bonus rate is normally applied to policies irrespective of premium size. Similarly, there are often approximations in the TB setting approach. In such circumstances, exact asset share is unlikely to be paid. For

example the same TB rates may be used for PUPs as for in-force, or for whole of life products as for endowments.

Shareholder transfers in respect of the annual bonus declaration are normally deducted from the asset share calculation year on year. However, the asset share calculation is not normally reduced by the amount of shareholder transfer in respect of the accrued terminal bonus element.

Hence, since the amount that the policyholder receives as a payout does have this shareholder transfer element deducted, it will always be less than the calculated asset share at that time to the extent of the accrued shareholder transfer on terminal bonus.

This was reasonably well answered. Most candidates made the basic points regarding smoothing and reasons for general under/over payment at maturity. Fewer discussed fully the practical limitations of the terminal bonus mechanism, and surprisingly few candidates considered the impact of guarantees. Several candidates incorrectly stated that the use of an MVA means that the payout is less likely to be close to asset share.

(ii) (a) *Impact on liability*

The economic value calculation is basically a gross premium valuation using a gilt yield as the interest rate and best estimate experience assumptions. The key differences between this and the current valuation approach are therefore the interest rate and experience margins.

The current valuation rate of interest may be greater than or lower than gilt yields over the appropriate term. This principally depends on whether the hypothecated backing assets are government or corporate bonds.

Since the company is required to take a prudent margin under current regulations, the current valuation rate of interest is likely to be lower than the gilt yield. If the current valuation rate of interest is lower than the gilt yield, then (all else being equal) the economic value liability will be a similar calculation to the current valuation but using a higher yield. Hence the economic value liability will be lower, it might even be negative.

If the current valuation rate of interest is higher than the gilt yield then the opposite is the case.

Even if the underlying average rates are similar, using term dependent yields rather than a level yield assumption might have an impact, depending on the shape of the yield curve.

The removal of prudence margins from the other assumptions (i.e. expenses and mortality) will further reduce the liability, as will introducing a lapse assumption will also reduce the liability.

Impact on profit profile

Overall the total profit arising over the life of a policy is unaffected by the reserving basis, it is simply the timing of profit emergence which varies. A reduction in the initial liability will reduce any initial loss and may produce an initial profit, depending on the pricing basis.

However, profits expected to emerge in future years will be lower and may even be zero, depending on the actual assets held. This is because there is a lower (possibly zero) margin between actual earned and assumed interest and because there are no prudence margins in the expense or mortality assumptions to emerge year on year. In other words, the use of "economic value" in this example is likely to accelerate profit emergence.

Most candidates understood the basic concepts being tested and split their answers appropriately into separate consideration of liability and then profit, as indicated by the question. The most common reason for not scoring highly was not giving enough explanation to validate the conclusions (see command word "Explain" in question).

(b) *Impact on liability*

The immediate annuity market is likely to be competitive, as in the UK. Hence, normally companies will back this product with high yielding corporate bonds. Under the valuation regulations, corporate bond yields must be reduced in respect of credit risk, but any margin reflecting illiquidity can be retained within the valuation rate of interest, as assets are usually not traded regularly.

It is therefore likely that the requirement to use a gilt yield for economic value calculation will result in a lower valuation rate of interest under economic value than under MSB. As a result, the initial liability will be increased. This will be offset by the fact that there are no longer prudence margins in the expense and mortality assumptions, which will reduce the liability.

The net impact depends on which has the greatest financial significance: the level of mortality and expense prudence margins, or the extent to which additional margin over gilt yields is currently anticipated.

Impact on profit profile

Under MSB it is likely that an initial loss will arise on writing an immediate annuity, due to the margins in the basis. If it is the case that the reduced interest rate has a greater financial impact than the experience margins, then the liability will be increased and hence the initial loss will also be increased.

However, in these circumstances profits later in the term of the policy will be expected to be higher. This is because there will be a greater margin between actual earned and assumed interest. This will more than compensate for the fact that there are no mortality and expense prudence margins to unwind.

Only the strongest candidates scored well on this part of the question, the key point being recognition that the valuation rate of interest is likely to be lower under economic value due to the probable use of corporate bonds to support this type of product.

Some candidates simply repeated the same points made in part (a). However, since there were five separate marks available for part (b) those candidates should perhaps have suspected that something different or additional was required.

(iii) The liability cashflows arising are as follows:

Future expected benefits, based on current unit value accumulated with future investment earnings less all charges, plus future expenses.

For this in-force unit-linked product, this breaks down to:

1. Current unit value accumulated with future investment earnings (paid out as a benefit on surrender, death or maturity)

2. Less future annual management charges of 1% per annum on these units

3. Less future annual policy fees, increasing with retail price inflation

4. Plus future expenses, e.g. maintenance costs including inflation, plus investment expenses expressed as a percentage of fund

The matching portfolio for each component is as follows:

1. The assets backing the units currently allocated to this policy.

2. For each year for which the policy is expected to remain in-force, 1% of the assets backing the units allocated to the policy. This is because, irrespective of future earned investment return, it is known that an amount equal to 1% of the in-force units will be deducted from the benefit value in each future in-force year. Hence the matching portfolio is 1% of the assets backing the units for each of these 1% deductions, i.e. for each expected in-force year.

3. A series of index-linked zero-coupon bonds of one year, two year, three year etc terms (until the end of the policy term), with maturity values equal to the uninflated annual policy fee adjusted to allow for expected future decrements (deaths and lapses). This is based on the assumption that the country issues bonds linked to the retail price index, as in the UK.

   If this is not the case, then standard zero-coupon bonds with maturity values equal to the expected inflated policy fee in each year would be suitable.

4. If maintenance expenses are expected to increase with retail price inflation, the matching portfolio is as for the policy fee.

   However, expenses may be expected to increase at a higher rate, e.g. somewhere between retail price and average earnings inflation. In that case it would be necessary to assume a future absolute level of expense inflation, or alternatively to state expense inflation in terms of retail price inflation + p%. In the former case, standard zero-coupon bonds would be used in the matching portfolio.

   For investment expenses expressed as a % of fund, the matching portfolio is as for the annual fund management charge.

Hence the "economic value" is calculated as:

1. Market value of the assets backing the current unit holding.

2. Less x% of the current unit value, where x is based on the expected term of the policy, allowing for lapses and deaths on a best estimate basis, and allowing for the compounding effect of the annual fund management charge and the interaction with the policy fees.

3. Less the present value of the expected uninflated policy fees (allowing for expected future decrements) discounted using an interest rate based on the *real* yield on government index-linked bonds, or the present value of the inflated policy fee discounted at a *nominal* yield based on standard government bonds.

4. Plus the present value of future expenses, discounted as for the policy fee (or real yield on index-linked bonds less *p*%).

   Plus *z*% of the current unit value, where *z* equals *x* multiplied by the ratio of the investment expense to the annual fund management charge.

This question was generally quite poorly answered, with many candidates unable even to identify the separate cashflow elements. At first glance the question appears to be complex and "outside the syllabus"; however, the principles being tested are relatively straightforward.

Some candidates appeared to be confusing the cashflows required to determine a liability with those that would be used for profit testing.

Many candidates dismissed the "unit liability" and considered only the "non-unit" liability, as defined within a UK statutory valuation context. As a result of this approach, as well as missing out on some relatively straightforward marks for considering the matching portfolio for the unit benefits, those candidates also tended to overlook the point that the annual management charge is in fact best matched by (some of) the assets backing the unit fund.

Some candidates interpreted the definition of "economic value" liability as always requiring matching by a government bond. The lengthy text in the question sets out the definition in terms of the value of the theoretical best fit asset portfolio. It then exemplifies this concept using one particular case: cashflow amounts which do not vary in line with any particular asset/economic performance, and hence would be best matched by asset cashflows with the same characteristic, i.e. risk-free fixed interest bond payouts. If the definition of "economic value" of a liability was simply to perform a gross premium valuation at a risk-free rate, then candidates should perhaps have expected the question to state this, rather than giving a more complex definition involving selection of appropriate matching assets! Further, this part of the question asked the candidate to consider each cashflow element separately, and it would therefore have been reasonable to expect that some, if not all, of those separate elements would require different treatment. The number of marks available for this part of the question should also have been noted.

A number of candidates missed the point in the question that the benefit on death, maturity or surrender was always the full unit value.

The better solutions were set out in the three stages implied by the wording of the question. Of those candidates who acknowledged the third stage (how to calculate "economic value"), many simply included a line saying "and the economic value is the market value of the matching portfolio". This is not a pragmatic calculation approach, and examiners were expecting the candidate to construct their answer in the same way as the example given within the

question, for example by translating "economic value" to a series of cashflows to be valued using an appropriate discount rate (possibly zero).

(iv) First calculate yield on Asset K:

75% probability of payout 155, 25% probability of 75, so expected maturity value = 135

Therefore annual yield i is derived from: $(1 + i)^5 = 1.35$
$i = 6.18588\%$

The annual yield on Asset K is greater than on Asset J . The valuation uses the maximum under the regulations, which permit notional hypothecation of assets. Hence we should assume optimal hypothecation. in other words assume 100% backed by Asset K, provided there is sufficient of Asset K available.

Expected mean cashflow under the liability = £178,000 * (0.75*1.4 + 0.25 * 1) = £231,400

Note there is no reinvestment so no need to limit the valuation rate of interest

Therefore liability = £231,400 / $(1 + i)^5$
where i = maximum permissible under UK regulations
= 97.5% of yield on hypothecated assets
= 97.5% of yield on asset K
= 6.03123%

So liability = £172,661
(This is less than the value of Asset K, so the assumed optimal matching is OK).

These should have been reasonably straightforward marks and several candidates did score full marks. The most common error was not to apply the 97.5% yield adjustment factor. A number of candidates did not maximise the yield as per the question, instead taking a weighted average. A few candidates lost easy marks due to aggressive rounding (e.g. unadjusted yield on K = 6%).

(v) Need to construct a portfolio comprising assets J and K that matches the liability cashflows exactly. Say matching portfolio is J of Asset J and K of Asset K, in current value terms (NB issued at par so market value = nominal value). Then:

If the economy succeeds, after five years total assets will be worth
$1.04^5 * J + 1.55 * K$

If the economy does not succeed, after five years total assets will be worth $1.04^5 * J + 0.75 * K$

If the economy succeeds, need assets to pay maturity amount of £178,000 * 1.4 = £249,200 after five years

If the economy does not succeed, need assets to pay maturity amount of £178,000 after five years. Hence to construct portfolio of assets that exactly replicates the required liability cashflow after five years then need to solve:

$1.04^5 * J + 1.55 * K = 249,200$
$1.04^5 * J + 0.75 * K = 178,000$

By subtraction, $0.8 * K = 71,200$
So K = £89,000
And $J = (249,200 – 1.55 * 89,000) / 1.04^5$ = £91,439

Check: $1.04^5 * 91,439 + 0.75 * 89,000 = 178,000$ so OK

Economic value of liability equals value of assets which exactly matches liability cashflows, so the economic value of this liability equals J + K = 91439 + 89000 = £180,439

Economic value is higher because:

- Were able to use free assets to maximise yield under current regulations, but economic value is independent of actual assets held (since is based on a theoretical matching portfolio).

- This is counter-balanced to some extent by holding a prudence margin in the existing liability calculation.

The better candidates identified that a combination of assets J and K would provide the best matching portfolio, and most were then able to solve the simultaneous equation. A number of candidates made the assumption as noted above in part (iii), i.e. that "economic value" simply means to discount at a risk-free rate; the same comments therefore apply here as were made in part (iii).

Candidates tended either to do very well or very badly on this question part, but there was a strong correlation between marks for this part and performance in the rest of the paper(s).