Institute of Actuaries of India

INDICATIVE SOLUTION

May 2012 EXAMINATION

Subject ST2 — Life Insurance

Solution 1:

a)

Surrender values should:

- Take into account policyholders' reasonable expectations (PRE)
    - SVs are normally at the discretion of the insurer
    - Legislation may exist to ensure that policyholders are treated fairly and that PRE are met
    - PRE will be influenced by, for example, the past practice of a company and any literature issued by it

- At early durations, not appear too low compared with premiums paid, taking into account any projections given at new business stage
    - At short durations, natural for a policyholder to compare with the premiums paid, or even premiums plus some interest.
    - However, the asset share at such durations will usually be less than this.
        - If the asset share is negative, the company cannot avoid making a loss.
        - It may feel obliged to accept a loss, or at the least a reduced profit, on surrender up to several years into the contract so that the surrender value paid does not appear too low compared with premiums paid.
    - Try to recoup the cost from later surrenders, *ie* penalise later surrenders
    - Not to offer surrenders at all for some initial period
        - This may in fact appear to policyholders less harsh than offering some very small value

- At later durations, be consistent with projected maturity values
    - Where a benefit will become payable on maturity, the policyholder will expect that a surrender value payable prior to maturity will be consistent with this.
    - The surrender value payable at the end of each policy year should progress smoothly into the maturity value at the end of the contract.

- Not exceed earned asset shares, in aggregate, over a reasonable time period
    - One of the starting points in considering what surrender value can be offered is the asset share of the policy.
        - The asset share represents the money that the company has *really* accumulated in respect of any policy
    - The asset share does not define the unique value the company could afford in all cases
        - It could give some policies a little more than this value and others a little less.
        - In total it should represent the maximum the company can afford to pay out measured over a reasonable period of time.
    - Basing the surrender value closely on an asset share implies distributing accrued profits (or losses) to the policyholder.

- Take account of surrender values offered by competitors or policy trading
    - The financial press may publish tables showing the surrender values offered by different companies.
    - Will need to decide to what extent it should be influenced by any comparisons

  - A company may want to be seen to offer competitive surrender values as well as competitive maturity terms
  - Compare against auction values quoted by intermediaries

- Not be subject to frequent change, unless dictated by financial conditions
  - This a practical requirement to avoid confusion to customers, distributors and company service staff

- Not be excessively complicated to calculate, taking into account the computing power available
  - Preferably a simple formula, or table of applicable factors
    - o Will allow mass production of surrender values by administrative staff, probably using some computer application
    - o Likely to require some simplification and smoothing of the "real" situation.
    - o Smoothing implies some cross-subsidy
  - Smoothing is not overly detrimental either to policyholders or to the company.

- Be capable of being documented clearly
  - This will ensure no mis-communication to the customer

- Avoid selection against the insurer
  - The surrender terms should minimise the risk of policyholders selecting against the company
  - An opportunity for selection against the life company may occur after a market crash, especially for single premium business.
    - o The company would need to revise terms immediately after any such movement
  - Surrender and re-entry
    - o Ensure that surrender terms, when looked at in conjunction with the current premium rates for that product, do not make it advantageous for the policyholder to discontinue his policy and then take out a new policy.
    - o Cause the company to suffer costs it would not otherwise have, in respect of setting up the new contract.

b)

- Since the book has been closed to new business five years back, surrender values now would be set based on prospective values
- Having computed prospective values, surrender value scales would need to allow for loss of future profits from such surrender
- In setting prospective values, assumptions will be needed for interest, expenses, expense inflation and mortality. It might also be necessary to make assumptions in respect of tax.
- Interest
  - This will be the most important assumption
  - Companies will probably cover their without-profits liabilities with fixed-interest investments, perhaps chosen to give a reasonable matching by term, assuming suitable securities exist for that purpose.
  - Hence, a company might consider the current weighted average redemption yield of suitable securities to be its best estimate assumption.

- It may also consider the interest rate used in the premium basis if it wishes to use a blended basis.
- Expenses
  - Consider most recent expense investigation for renewal expenses
    - May well be the same as those used to set current premium rates
  - It is unlikely that any margins would be included in the assumption as these will increase the surrender value
  - Allowance needs to be made for renewal commission as paid
  - Allowance also needs to be made for the expenses involved in surrendering the policy
- Inflation
  - Chosen to be consistent with the investment return assumption
  - Consider real return anticipated on index-linked government stock to give an indication of expected inflation
- Mortality
  - The mortality basis chosen should reflect the future expected mortality of those policyholders who are surrendering.
    - Reasonable to assume that such people will experience lighter mortality
  - For most assurance contracts that have surrender values the mortality assumption will not in any case have much effect upon the resulting values.

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Solution 2 :

a) Reinsurance is the process by which a direct-writing life insurance company transfers part of its risk under a contract to another life insurance company. This may be another direct-writing company or a professional reinsurance company. The reinsuring company may in turn reinsure some of the risk with another direct-writing or reinsurance company. Larger companies may also use reinsurance to transfer liabilities between companies within their own group.

b)

A life insurance company could seek reinsurance to:

- Limit the amount paid on any particular claim
- Limit total claims payout
- Reduce insurance parameter risk
- Reduce claim payout fluctuations
- Receive technical assistance
- Reduce new business strain
- Increase profits, return or risk-adjusted return on capital (by reducing risk cost or increasing volumes)
- Reduce overall capital requirements by using a reinsurer's capital
- Segregate different risks from a product

- Allow aggregation of risks the cedant cannot manage on its own, so allowing manufacture of product lines

c)

- Reinsurance can reduce the financial risk associated with new business
    - Through an increase in its available capital or
    - Through a reduction in its financing requirement
- Original terms reinsurance (usually on a quota share basis) or financial reinsurance can be used
- Financial reinsurance of an existing block of business will improve the balance sheet of the company immediately by
    - Increasing the available capital.
    - More new business may be written before the resulting new business strain leads to an unacceptably low solvency position

- Any original terms reinsurance will mean some of the liability is passed to the reinsurer
    - The company will need to hold lower statutory reserves
    - There may be limits on this imposed by the regulators
    - The new business strain is reduced by around the same proportion.

    - Initial reinsurance commission will make a contribution to the company's assets at the time of sale
    - Effectively discounting the future profits that will be tied up in the reinsurance premiums
- Reducing new business strain means that more new business can be written for the same amount of capital
- Quota share reinsurance is ideal for this purpose
    - It gives the insurer greatest control over the amount of financing it will receive in relation to the volume of business
- The direct writer's decision on how much business to cede will result from considering the company's future solvency position as projected using a model office

[10]

Solution 3:

a) The valuation should take account of the nature, term and method of valuation of the corresponding assets, depending on the type of policy

- Consistency between the valuation of assets and liabilities
- Relationship between yield and the valuation rate of interest

- Assumption of future bonuses included in the liability valuation
- The reference to term implies that if the assets and liabilities are badly matched by term then some mismatch reserve would be called for

b) The method of calculation of the reserves from year to year should be such as to recognize profit in an appropriate way over the duration of each policy and should not be subject to discontinuities arising from arbitrary changes to the valuation basis.

- Does not imply that discontinuities can always be avoided
- Changed conditions may legitimately require changes to valuation bases, giving rise to one-off changes in reserves.
- In calculating the reserves from one year to the next, the actuary should avoid any arbitrary changes to the valuation basis with the purpose of manipulating the resulting reserves
- The issue of changes to the basis will be less important when using the net premium method, because compared with the gross premium method it is less sensitive to any basis changes.

c) The allowance for expenses should allow for the possibility of the company ceasing to write new business, if that would increase the reserve.

- Normally consider expenses assuming an ongoing business situation
- Implies taking credit for future business
- The ongoing-business scenario per-policy administration expenses are probably lower than they would be in a closed-to-new-business scenario
- In closing to new business, total expenses will reduce
    - Although there might be a big one-off cost initially
- But the per-policy expenses will increase over time because those expenses are being borne by a shrinking base.

d) The amount of the reserves should be calculated by a suitably prudent actuarial valuation of all future liabilities for all existing policies, including taking credit for the premiums which are due to be paid under the terms of each policy.

- Future premiums contractually due to be paid can be taken as a form of asset
    - Subject to the overriding principle of prudence.
    - It would not be appropriate to take credit for all the future premiums if this resulted in the company capitalizing future profits
- Recurrent single premium business will need to be treated as if normal single premium, to avoid taking credit for very uncertain future premiums

[10]

Solution 4 :

Advantages for the insurance company

- The product should be a better match for the needs of the customers; therefore the company should be able to increase its market share of the annuity market through the addition of this product.
  - The above is particularly true for emerging markets where the rate of inflation is often high
- If such products are not widely available in the market, then the insurer can use this feature to reduce its risks (as compared to a fixed benefit annuity) matching the assets and liabilities. There will be less impact on the marketability of the product as customers may not be able to compare it with other annuities in the market due to dominance of fixed benefit annuities.

Disadvantages for the insurance company

- This product may increase the investment risk for the company as the company will have to invest in assets where the returns increase in line with inflation

  - However such assets may not be widely available especially in less developed markets
  - Further, if the supply of such assets is limited, the returns on those assets may turn out to be lower and the expenses associated with dealing in those assets may turn out to be higher than the pricing assumptions
  - Even if such inflation linked assets are available, they may not be able to match the exact movement in the inflation index with which the benefits of the annuity will be linked
- The inflation indexing feature may make the product more complicated for distributors to explain to the customers and for the customers to understand, thereby causing sales to be lower than expected vis-à-vis those of fixed benefit annuities

Advantages for the customers

- The product provides a better match for the needs of the customers as both the needs and the benefits from the product are linked to inflation and therefore the customer's chances of outliving his/her savings are reduced.
  - This is particularly true in markets where mortality is significantly improving as that combined with inflation can significantly increase the chances of customers outliving their savings.
- Further the customer does not have to make other arrangements for obtaining inflation protection by investing in other inflation linked assets

This is particularly important as other inflation linked assets such as property or equity may not provide a comprehensive match for inflation

Disadvantages for the customers

- The product will be visibly more expensive for the customers as they will have to pay higher premium to get the same level of initial benefit as compared to a fixed benefit annuity.
- While the customer may think that they are adequately protected from inflation, this may not be the case as the rate of increase in their financial needs and that of their annuity payments may be different
- The customers may perceive this product to be less value of money especially if their health is worsening as the initial payments in this product are lower than those under a fixed benefit annuity

[8]

Solution 5:

a) The following approach may be followed for carrying out the review of premiums of existing policyholders:

- Although the company would primarily be considering those cohorts that are due for their five-yearly review, it would probably wish to see how rates would be changing for the other years as well.
- The first step is to consider the set of policyholder that you want to subject to review and group them into appropriate groupings such as:
    - Year of issue
    - Gender of the policyholders
    - Smoker status of the policyholders
    - Medical underwriting status of the policyholders
    - Agents through which the policies were sourced
    - Sum assured brackets of the policyholders
    - Policy terms
    - Premium payment terms
- If some of the above categories are not relevant or do not have sufficient data in them, then these may be combined. This is one reason why all the data would probably be considered.
- For each of these categories, an actual versus expected percentage should be calculated both on sum assured basis as well as number of policies basis.

- If some of the categories include large scale deaths due to catastrophes, the same may be excluded from the analysis as such events would skew the results of the study
- Similarly, more recently issued policies (say since the last two years) may be excluded from this analysis as their pricing basis will anyway reflect the most recent view of the company vis-à-vis mortality.
- For calculating the A/E ratios, the expected should be based on the mortality assumptions used for pricing these policies;
    - If within one category of policyholders more than one pricing bases has been used, that category may be further split into the number of pricing bases that have been used within the category.
- Ideally any A/E ratio different from 100% may warrant a change in the premium rates of the concerned policies
    - However, this may lead to a change in the premium rates for a large number of policies where the change may be very little .
    - Therefore a tolerance limit may be established so as to ensure that any A/E ratio of say at least 10% different from 100% would result in the premiums for those policyholders getting affected.
- For all the groups of policyholders where the A/E is out side the tolerance limit, the premium rates may be recalculated assuming the same assumptions as those used in the initial pricing with the mortality assumptions changed by the A/E percentage
- Alternatively, a simpler approach of multiplying the premium rate with the A/E ratio may be used as most of the premium in case of a term assurance would relate to the cost of providing life cover.
- Again, a tolerance limit may be applied so that all policies where the premium is changing by less than a percentage, say 5%, are not subjected to a review to avoid changing premiums for small amounts.
- It is also important to ensure that the new premiums of the affected policyholders is no higher than those of the new business premiums that would be available to these policyholders if they would buy a new policy of the same terms from the company.

b) The following factors should be considered before deciding to implement changes to the policyholder premiums as part of this exercise

- The overall impact of this exercise on the financials of the company should be considered before deciding to implement this exercise.
- The above estimation should not only allow for the change in the future premiums of the affected policyholders but should also allow for the following
    - The cost associated with making this change in the form of increased policyholder communication etc.

  - Change the behavior of policyholders whose premiums are getting reviewed e.g. higher lapses on the groups of policyholder where premiums are getting increased .
  - The changes to the renewal commissions that have to be paid to the agents of the policyholders whose premiums are getting affected should also be considered.
- The implications of making this change on the new business sales of the company should also be considered as increasing policyholders premiums might put off future customers from buying policies from the company

- The impact on brand of making the changes should also be considered as increasing premiums may invite negative press for the company.
- The reaction of the competitors should also be considered as they may use this action of the company as a negative point in order to increase their own sales.
- The regulatory implications of the exercise must be assessed especially since this exercise is being done for the first time
  - The regulations might prohibit changing premiums on all or at least some group of policyholders say policyholder who are only a few years in the policy
  - Alternatively, there might be specific regulations on how much (say in percentage terms) can the premiums of existing policyholders are allowed to be changed.
  - There could also be a chance that while there is no current regulation vis-à-vis this subject, the regulator may still object to the policyholder's premium rates being changed in general.
  - To avoid the above, the company may consider sharing its approach with the regulator before implementing it so that any objections that the regulator may have can be resolved before the actual implementation of the exercise.
- Further, one should also consider whether there are any other guidelines (internal to the company, professional guidance etc.) that should be looked at to ensure conformity of the proposed approach to such guidelines.
- The viability of the admin systems to be able to cope with the change in the future premiums on existing policyholders should also be taken into account

  - If the systems would require considerable changes in order to be able to incorporate the new premiums, the cost of the same should be factored into the costs of implementing this exercise.
- The company may also want to consider getting external advise on the reasonableness and technical accuracy of its suggested approach from external auditors/consultants before deciding to implement the approach.
- Similarly, the company might want consider getting external opinion on the legality of the proposal to review existing customer's premiums to ensure that there are no issues vis-à-vis any legal aspects.

c) How policy data can be a source of risk for the company

- Issues in policy data can lead to various kinds of risks for the company which in turn depends upon the use that such data is being put to.
- If the data is being used for carrying out financial reporting (setting supervisory reserves, calculating embedded value, calculating capital requirements etc.) then issues in the data can lead to the reporting being incomplete if some of the policies are missing from the data or inaccurate if some of the fields within the data are inaccurate.
- Similarly, if the policy data is being used for carrying out any analysis so as to make strategic decisions e.g. whether to continue selling a particular block or business or close it to new business etc., then incomplete or inaccurate data may lead to incorrect decisions being made.
- Further, the policy data is also used for carrying out experience investigations which form the basis for assumptions setting, therefore inaccurate or incomplete data can lead to inappropriate assumptions being set.
- Similarly, policy data would also be used for calculating and making payments such as reinsurance premiums, distributor remuneration etc and hence any errors in the data could lead to incorrect payments being made.
- If the policyholder data on the system are not correct, this may lead to the policyholders being charged incorrect premiums/charges and may lead to incorrect benefits being paid to the policyholders.

Policy data checks that can be carried out:

- The data should be subject to a movement analysis so as to see that the number of policies etc at the end of the last period of investigation less business going off the books plus new business should be equal to the data at the beginning of the new period of investigation.
- Data completeness should be checked in terms of no of policies, premium amounts, unit reserves (for unit linked policies) etc. from other independent extractions.
- Data accuracy checks can be carried by looking for impossible dates, fields which are outside the product terms boundaries etc.
- Data consistency checks can be carried out to ensure that business characteristics such as average premium etc remain unchanged from the last investigation and appear reasonable
- Spot checks on particular fields should be carried out by comparing these fields from the actual policy documents for sample policies.
- Any unexplained results in the analysis carried out by using the policy data may also suggest issues exist in the data so this should also be kept in mind.

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Solution 6:

a) The following steps will be followed to produce the P & L for the channel;

- Estimation of the volumes of business expected to be sold under this channel over the foreseeable future.
    - This will involve assessing the data of the customers visiting these retail stores across the country and identifying the size of the segment to which you believe that the product will appeal to.
    - In addition, an analysis will also then have to be made on the store branches which will be targeted first and those that will be targeted later so as to assess the growth in the volumes over the projection period.
    - The projection of volumes will also have to take into account the growth in the customer segment of the stores themselves which will then lead to an increase in the customers of the distribution channel.
    - Finally a conversion rate will have to be applied to assess how much of the identifiable customer segment that will be targeted will actually buy the product.
- There will clearly need to be a close partnership with the retail chain in order to get access to the customer data.
- The CEO's previous experience will be very useful in interpreting and analyzing the data. Note that his previous experience is not necessarily in life insurance products.
- Estimate of the costs that would be incurred in setting up of the channel as well as the ongoing running of the channel.
    - This will require understanding the details of the process that will be followed by the company for the procurement and administration of the business sold under this channel.
    - Once the above is known, the costs associated with process will have to be estimated either through previous experience of the company, or the information available in the market or based on the CEO's previous experience of the same in other life insurance markets.
    - The above estimation should take into account a share of the overheads of the company depending upon some allocation measure such as premium income.
- Again the CEO's previous experience may be useful.
- A sample portfolio for this business will have to be derived which will contain all the pieces of information required to value the policies within the business including sum assured, premium payment term, policy term, age/sex/smoker status etc of policyholder.
    - This portfolio needs to take into account the target customer segment for the business which in turn should come from the customer segment of the retail stores.
- In addition, an estimate will have to be made of the premium that the company may be able to charge for a given benefit .

  - This estimation needs to take into account its profitability targets and competitiveness of the product.
- What is the remuneration that is expected to be paid to the retail stores for sourcing the business and whether the same is upfront or over a period of time. Further will there be any provisions of clawing back the commission in case a policy lapses before a certain minimum no of premiums have been paid.
- Cash flows for sample portfolio arising from the term product which will be sold under this channel will also be needed for which the following assumptions will have to be made.
  - Mortality–this information will have to be obtained from either the past experience of the company or of the industry or based on the reinsurance premiums that will be available for this business.
  - Lapses –this information will have to be obtained from either the past experience of the company or of the industry.
  - Interest Rate – This will depend upon the prevailing interest rate environment together with the outlook for what interest rates are likely to be in the future.
- The cash flows from the sample portfolio will be grossed up for the overall volume of this business which together with the costs estimate will give the projection of the P & L account for this channel.
- The P & L as calculated above will be reduced for the tax which the company will have to pay based on the overall tax rate of the company.
- The P & L should be prepared on a best estimate scenario and then on a range of scenarios to assess the impact of the best estimate assumptions not being bourn in practice.
- The key financial information which would be necessary to be included within the information pack would be:
  - Capital needed to run the channel
  - Year on year profit stream of the channel
  - Discrete breakeven year of the channel
  - Cumulative breakeven year of the channel
  - Return on Equity/capital percentage

b) Following are the key risks relating to the launch of the distribution channel which should be put forward in front of the board

- The volumes of the business may turn out to be lower than expected which might result in the company requiring to put in more capital than planned.
- The mix of this business may turn out to be different from the sample portfolio assumed thereby affecting the profitability of this business.
- The costs of setting up the business may turn out to be higher than expected again causing the company to put in more capital than planned.
- Similarly, the costs of running this business may turn out to be higher than expected thereby reducing the profits from this channel .
- The mortality experience of the product may turn out to be worse than expected thereby reducing the profits from the product .

- Similarly the lapse experience of the product may turn out to be worse than expected thereby reducing the profits from the product.
- The investment return may turn out to be lower than expected thereby reducing the profits from the business although this is not likely to have major impact on the profitability of this business .
- The competitors may end up launching cheaper versions of the product which might require the company to reduce its premiums thereby affecting profits .
- The regulator may object to an insurance product being sold through retail stores on the ground of lack of enough advise being provided to customers through this channel .
- There is a risk that selling the product in such a manner may contravene any professional guidelines, legal requirements etc.
- There could be complications associated with the process of selling and administering this product due to lack of synergies between the systems of the retail stores and that of the insurance company .
- This could be further worsened if the training provided to the personnel of the retail stores who are meant to sell these policies is not effective and as such they are unable to follow the process of selling as prescribed to them.
- There is a possibility that this channel sales cannibalize the existing sales of the company thereby resulting in not enough increase in the overall business of the company.
- The distributor may realize the worth of this business if it is able to generate significant volumes and may ask for increase in remuneration thereby reducing the profitability of the business if the costs cannot be passed onto the consumers.
- There is also the risk of mis-selling by the distributors in order to maximize revenue which could then have repercussions for the company in form of customer complaints, poor lapses etc.
- There is risk that the reinsurer defaults on claim payments thereby leading to reduced profitability for this business.

c) Following are the other considerations that should be put forward in front of the board:

- How does this channel launch fit with the overall strategy and objectives of the company and does it expedite the achievement of the long term goals of the company .
- How will the competitors view this move of the company and what are the actions that they are likely to take and what will the effect of those actions be on the company .
- Are there any cost efficiencies that the company can achieve through the launch of this channel and how do they improve the overall financial position of the company .

- What are the regulations (both internal to the company and external) pertaining to the launch of the channel which need to be kept in consideration before deciding the viability of the channel .
- Will the company have an exclusive agreement with the retail store chain for selling insurance products and what are the options that the company as well as the stores chain have for getting out of the agreement or not allowing other insurance companies to sell through this stores chain.
- What are the expansion plans vis-à-vis the range of the products that can be sold through this channel or vis-à-vis including other retail store chains for selling this business.
- What are the key parameters against which the success of the channel will be measured and what are the mechanics that will be put in to monitor this.
- What are the levers that the company has to modify and change if the success of the channel does not go as per the original plan.
- What is the process of pulling out of this channel if the company wishes to do so in the future especially if it feels that the channel is not delivering its targets.
- What are the other opportunities that the board has for spending its capital and how do they compare with this opportunity .

[26]

Solution 7 :

Investment Strategy

- The appropriateness of the investment strategy will depend upon the risk versus returns strategy of the insurance company vis-à-vis this business.
- Since the liabilities of this business are fixed in monetary terms, the most suitable match for these liabilities would be fixed income assets such as government bonds and corporate bonds.
- However, if the company is looking to enhance the profitability of this business through maximizing returns, it may want to consider retaining or increasing the equity proportion of the assets underlying the business.
- However, investing in equities will increase the risk of the assets not being able to meet the liabilities;
    - hence the company should consider how much free assets it has and how much of these is it willing to use as a cushion against this risk.
    - This consideration should also involve looking at the other products that the company has and how much risk it has on its books from those businesses.
    - Thus, it should consider which businesses is expected to give the highest level of profitability given the same level of risk before deciding to allocate free assets to this business.
- The company may also use a greater proportion of corporate bonds to back these liabilities instead of using only government bonds keeping in mind the additional

returns that these bonds provided vis-à-vis the additional default risk.

- The company may also consider investing a certain proportion of the fund in index linked assets such as index linked bonds to meet the expenses outgo arising out of this business.
- The company should also ensure that the terms of the fixed income assets is line with the terms of the liabilities and the currency of the assets and liabilities is the same.
- The company should also consider whether it wants to start writing business in this fund again or simply run the fund as a closed book which will affect the liquidity requirements of the fund which need to be taken into account within the investment strategy.
- The company should also adhere to any internal guidelines as well as external regulations pertaining to investments allowed in such policyholder funds such as those pertaining to the kind of assets that can be invested.
- The company should also consider any differences in tax treatment of various assets within the fund and how that might impact the returns of the fund.
- The company may also consider the investment strategy adopted by other players in the market for similar businesses.

Monitoring of asset and liability matching

- The matching of assets and liabilities can be monitored by carrying out projections of assets and liability cashflows at regular intervals.
- The above should be carried out for a range of scenarios using wherever possible, stochastic techniques at least for the assets and potentially some aspects of the liabilities cashflows such as lapses.
- The above scenarios should be used to identify the extent of cash flow and duration mismatch between assets and liabilities and how do they compare to the threshold identified by the company as to the maximum mismatch that the company is willing to accept.
- The same should be used to assess the need to modify the investment strategy by either changing the kind of assets or the terms/currencies of the existing assets.

[10]

[Total Marks – 100]

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