

EXAMINATION

April 2006

Subject ST2 — Life Insurance Specialist Technical

EXAMINERS' REPORT

Introduction

The attached subject report has been written by the Principal Examiner with the aim of helping candidates. The questions and comments are based around Core Reading as the interpretation of the syllabus to which the examiners are working. They have however given credit for any alternative approach or interpretation which they consider to be reasonable.

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Chairman of the Board of Examiners

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Comments

Individual comments are given after each question and within each part question where relevant.

- 1** The cost of the guarantee is such that the insurer will have to meet the difference between the guaranteed maturity value and the unit fund only if the unit fund is less than the guaranteed maturity amount at maturity.

Hence the insurer is trying to measure the likely size of this gap between the guaranteed maturity value and the unit fund and the probability of the unit fund being less than the guaranteed maturity value.

The unit fund will need to be projected using best estimate assumptions (e.g. for withdrawals, mortality). The modelling may use appropriate model points that represent the existing business.

The insurer will need to use a stochastic model to simulate the likely behaviour of the investments underlying the unit fund.

Care must be taken in setting up the model to ensure that it reflects the likely behaviour of the investments underlying the unit fund and also that the assumptions made in constructing the model also reflect the company's investment strategy.

A large number of simulations will be carried out so that a distribution of the likely outcomes at the maturity date is created.

For each simulation the present value of the liability can be determined by taking the difference between the guaranteed maturity amount and the expected fund size and, if bigger than zero, discounting it back at a suitable rate to the start date of the policy.

The repeated simulations allow the company to create a probability distribution of the cost of the option.

The company will then set the charge for this guarantee having a present value that ensures that the expected present value of the average cost of the option is covered with an appropriate probability level.

Comments on question 1: Candidates generally answered this question satisfactorily. However many candidates failed to explain what the cost of the guarantee to the insurer would be, and failed to demonstrate adequate knowledge of the process that would be used to calculate the cost of the guarantee.

- 2** (i) In general offering a surrender value may be seen to be in line with treating customers fairly, and matching policyholders reasonable expectations.

In the early years premiums are higher than the cost of life cover. Part of the excess is used to build up a reserve for the later years of the policy when the cost of cover exceeds the level premium. At the limit of life, the reserve will equal the sum assured.

On surrender there will therefore be a release of reserves.

Hence a surrender value can be paid without causing the company financial strain.

Offering a surrender value could be viewed as fair treatment for those clients who exit having paid more in premiums than the value of the benefit they would otherwise receive.

There may be regulations that require a surrender value to be paid.

Competitors are likely to offer surrender values, hence a policy without a surrender value will prove difficult to sell.

- (ii) **Pros**

There may be a benefit from increasing the surrender values in terms of reduced admin costs since less time will be spent dealing with complaints.

If mortality experience has improved since the policies were priced, then it may be possible to increase surrender values whilst maintaining profits at the originally targeted level.

New business levels may increase as a result of higher surrender values and as a result of avoiding bad publicity

Cons

Increasing the surrender values will reduce the profit that the company makes per policy.

It may also lead to an increase in surrender rates.

This is a particular risk if it leads to lapse and re-entry, or to selective withdrawals. This will depend on the premium rates for new business.

This will also act to reduce the profit that the company makes on the business.

Since the death benefits are guaranteed, these cannot be reduced to compensate for the higher amount paid on surrenders.

Despite the survey, there may be little demand for higher surrender values since this will have been sold as a protection rather than a savings product.

The pricing of the product may have balanced a lower surrender value with a higher death benefit.

General comments

Considering the existing business in isolation, the suggestion is unlikely to make sense.

Increasing surrender values may not, by itself, improve surrender rates.

Whilst the surrender values could be increased just for new business to gain this benefit, this may introduce administrative complications and the company may feel that it wants to treat its existing customers consistently with new policyholders.

Given these policies are really sold for protection, the most efficient way to attract new business is likely to be via improving death benefits per unit of premium rather than by increasing surrender values.

It is possible that the beneficial impact on total profits from new business would outweigh any negative impact on existing business profits.

The company will need to consider the reserving implications and whether it can afford to actually increase surrender values without having a material impact on solvency.

If premiums are increased to “pay” for the higher surrender values, the company must consider the implications for the marketability of the product.

Comments on question 2: *In part (i) many candidates failed to explain that significant reserves would be built up under a whole of life contract. Part (ii) was poorly answered.*

3 (i) Design A

- + Can present a higher unit allocation in first year of policy.
- + Impact of charges not as apparent — the capital unit charge emerges through a lower unit fund price.
- + Can use actuarial funding to reduce new business strain (alternatively a disadvantage is that the new business strain is higher unless actuarial funding is used).
- Need to calculate capital unit prices for all funds.
- Client unit statements and systems will have two types of unit.
- Surrender penalties will need to be calculated.
- Design is complex and difficult to understand.
- May not be in line with local regulations or industry standards

Design B

- + Allocation to units is higher in first year than the current product so more marketable.
- + Less likely to require non-unit reserves as margins emerge over the life of policy in line with maintenance costs.
- Although this is only as a result of higher new business strain
- Initial costs not recovered as quickly from policy. This will increase new business strain.
- If a policy stops paying premiums (becomes “paid up”) prior to the full recovery of initial expenses there will be limited future charges from which to cover initial expenses

It may be possible to reduce non-unit supervisory reserves by holding negative non-unit reserves (depending on regulatory regime).

For either design the surrender values will appear inconsistent with policyholders perception of value of the policy.

For either design the balance between marketability and profitability needs to be taken into account, as well as the impact of competitors.

(From the information given in the question it is not possible to make any specific comments on profitability.)

- (ii) Actuarial funding can be used by the company to hold reduced unit reserves in certain circumstances in order to reduce new business strain.

The usual requirements are that there is a unit related charge and a surrender penalty expressed as a percentage of the allocated units.

The unit related charge is required so that, if fewer units are purchased in the early years, then the charge will be exactly sufficient to purchase more units in the later years. Both the price of the units and the amount of the charge will move directly in line with the fund growth.

Design B has future charges that are mainly expressed as a percentage of the premium, which is a monetary amount.

The annual management charge on the accumulation units is only 1% per annum and so actuarial funding of this amount will not materially reduce new business strain.

If fewer units are purchased in the early years and more purchased in later years from the premium charge, then the insurance company will take on more risk.

This is because the charge will not behave in the same way as the cost of unit purchase — the price of the units will rise or fall in line with the fund performance.

The company may have to hold non-unit supervisory reserves to mitigate this risk assuming a prudently high rate of future unit growth.

The surrender penalty is also expressed as a percentage of a monetary amount.

Therefore, there is an exposure on early surrenders or paid ups, as the units actually held in the unit account may or may not be sufficient to pay the defined encashment value.

Therefore, the company may have to hold additional non-unit supervisory reserves to cover this risk.

Since the two contingencies are mutually exclusive, the additional reserves would be the higher of the amounts obtained from the two calculations.

Holding additional non-unit supervisory reserves would reduce the benefit obtained from actuarial funding (and holding lower unit reserves).

There is also the risk of a real loss arising from the market exposure.

Therefore, this is not a recommended course of action and is probably more appropriate for Design A.

Comments on question 3: This question was poorly answered. In part (i) many candidates failed to understand that the low initial allocation rate in the original contract was designed to meet initial expenses. In part (ii) candidates did not demonstrate an understanding of actuarial funding.

- 4** (i) Underwriting at the new business stage can be used to help protect a company from anti-selection by identifying those lives that are in such poor health that they should be declined and by identifying substandard lives who should be offered special terms, such as charging additional premiums or imposing exclusions.

The underwriting process will help determine the most suitable special terms to be offered to substandard lives and the level of the special terms to be offered.

The underwriting process will therefore help to ensure that all lives are treated fairly and charged for appropriately.

Underwriting will help to ensure that the actual mortality experienced by a company's portfolio of business is not too different from that assumed in the pricing basis.

Financial underwriting can be used to reduce the risk of policyholders over-insuring themselves by ensuring that the cover requested is in line with the policyholders financial situation/requirements.

- (ii) The factors that may have contributed to the mortality experienced on the internet business being lighter than anticipated in the pricing basis include:
- The company may have been very conservative in setting its mortality assumption for the business to be sold through the internet and hence used a heavier mortality assumption than has been experienced in practice. It may have done this due to its inexperience in using simplified underwriting to accept business and hence wanted to build margins into its mortality assumption.
 - The company may have wanted to control the amount of business it wrote through the internet due to uncertainty regarding the experience of the portfolio and hence it may have overpriced the contract initially by assuming a heavier mortality assumption to ensure that it did not write more business than it wanted to.
 - The actual mortality improvements experienced over the past five years may have been greater than those assumed in pricing the internet product.
 - The simplified underwriting process may have been designed so that only those applicants who answer a small number of strict questions on line appropriately are accepted, with any other responses meaning that the request for cover is rejected. Hence the most substandard lives, with health

issues likely to lead to heavier mortality/additions to premiums (if the cover had been taken out using full underwriting) may have simply been excluded from taking out the internet cover. This would lead to lighter mortality for this book of business overall since the worst risks are likely to have been excluded from cover.

- If the company had originally charged the same rates for both IFA and internet business, it may not have appropriately allowed for the different target markets for the internet business (e.g. different age/lifestyle categories).
 - The company may have been more successful than anticipated at targeting these groups, with take up from these groups being higher than expected leading to overall lighter mortality amongst the internet policyholders than expected in the pricing basis.
- (iii) The company may choose to reduce the premium rates on its internet term assurance business if it wishes to write more business through this channel and offer even more competitive premium rates.

This would lead to the company making a lower unit profit on each term assurance policy sold, but it may lead to higher overall profits if the volume of business it sells through this channel increases significantly as a result of reducing premium rates.

If volumes increase dramatically then the company would need to consider the capital requirements as a result of any increased new business strain, and would need to ensure that it was in a position to administer such an increase in new policies.

However, we are told that the company is already the leading provider of internet term assurance business, so it may be that volumes will not significantly increase if it reduces premium rates across the board and so profits may not increase if it cuts rates. Hence one option is to leave the premium rates unchanged.

Another option is for the company to analyse the particular age bands/genders/segments of the population where it currently doesn't write as much business as it would like and make selective decreases in premium rates to increase business volumes in those segments.

For example, it may be that one of the company's competitors particularly targets women of certain age groups and the company could therefore look at reducing its premium rates to women in the same age categories to win a greater market share, whilst still remaining profitable.

The company may decide to relax its underwriting policy and accept more substandard lives if it feels it can do this profitably. For example, rather than rejecting those lives that answer any of the simplified underwriting questions

negatively, the company may request the proposer to fill in a more detailed questionnaire on line and then accept the life at a higher premium.

If the internet term product overall is very profitable, due to low mortality and low expenses (e.g. due to on-line applications/low admin costs and low underwriting costs) and the mortality experienced on the adviser business is heavy/unprofitable then the company may decide to withdraw from the adviser market and choose to continue solely marketing its term product through the internet.

However, this may be unlikely since companies may need to offer a term assurance contract via IFAs (even one that is uncompetitively priced) to show that they offer the full suite of insurance products in the adviser market. They may also not want to alienate IFAs .

The company may, however, increase the rates on its adviser term business to encourage more potential policyholders to apply on line rather than taking out the cover through an adviser.

The company may remove some of the terms and conditions it imposed on the internet contract, in order to make it more attractive (which may slightly worsen profitability but should increase volumes) e.g. removing any waiting period before cover is effective, removing some exclusion clauses and so on.

The company will need to ensure that whatever action it takes in this regard, that it does not become vulnerable to anti-selection.

The company may decide that its mortality experience is not long enough/of sufficient volume to be able to draw any firm conclusions and may decide to keep monitoring its experience but make no changes to its rates.

The company's experience may encourage it to offer other on-line contracts.

The company would need to look at all other experience investigations (e.g. withdrawals, expenses) before deciding to change any product pricing.

The company may wish to review its reinsurance policy in light of the mortality experience of this line of business

The company may wish to review the mortality assumptions used within its reserving basis for the internet business

Comments on question 4: Whilst part (i) was generally well answered, a number of candidates did not apply their knowledge to the question and simply repeated the bookwork on the process of underwriting. In part (ii) candidates did not appear to understand simplified underwriting, and its subsequent impact on mortality experience. Part (iii) required a breadth of points relating to actions the company might take — many candidates failed to recognise this, and consequently did not score well on this part of the question.

5 (i) *Standard bookwork, credit was given for either definition.*

Key investment principle is to select investments that are appropriate to nature, term and currency of liabilities.

Investments should be selected to maximise overall return.

The extent of any departure from above will depend on level of free assets.

[Or — Company should invest so as to maximise the overall return on the assets, subject to the risk being taken on being within financial resources available to it.]

(ii) **Appropriate Asset Mix**

Conventional With Profits Business

Reserves only cover guaranteed benefits (basic sums assured and declared reversionary bonuses).

Need to provide match for these — most likely match being portfolio of fixed interest of appropriate term

Split likely between government and corporate bonds.

If sufficient surplus assets then may be able to invest some in “real assets”, as long as probability of insolvency kept at acceptable level.

Term Assurance

Term assurance benefits are guaranteed in money terms.

There is a need to match this liability profile with suitable fixed interest stocks.

Annuities in payment

Conventional Annuities — benefits fixed in money terms and very long term.

Best match is fixed interest stocks.

To obtain a higher yield, and hence better pricing terms within the market, may want to invest significant proportion in corporate bonds.

Index Linked Annuities benefits guaranteed in terms of price index.

Likely to match with index linked govt stocks if available.

Unit-Linked

Liabilities in respect of internal linked funds should be matched with assets in same funds.

Non-unit Reserves likely to be in respect of mortality benefits and future expenses.

Hence portfolio of conventional fixed interest and index linked appropriate.

Solvency Requirement

Solvency requirement could be calculated as a percentage of liabilities, therefore investment would follow overall asset split for liabilities. In general it is likely this would be matched by low risk investments.

Surplus Assets

Surplus Assets also to be used to support any future discretionary benefits (e.g. future reversionary and terminal bonuses).

Need to consider policyholder expectations and literature at start of policy.

They may expect reversionary bonus to at least remain at current level, if not increase.

This would suggest some holdings in fixed interest.

Depending on literature given at outset, policyholder will expect terminal bonus.

The surplus assets will generally comprise a higher proportion of “real assets”, especially if the percentage of total payouts made up of terminal bonus is high.

The surplus assets may be needed to finance new business strain, and hence assets would need to be readily available to cover initial expenses.

General Points

Future administration expenses will be matched with index linked/real assets.

Need to have regard for any regulatory requirements.

Need to consider tax position of company, and any tax implications of investing in certain asset classes.

Need to consider liquidity/cashflow requirements, ensuring there are very liquid assets available to pay day to day expenses.

- (iii) *Candidates were given credit for sensible arguments and discussion relating to the matching of assets and liabilities.*

Linked assets matched by internal linked liabilities so OK.

Index Linked bonds needed to match index linked annuities and part of non-unit reserve — currently only £250k in index linked bonds compared to around £1m required. (£500k for annuities and part of non-unit reserves]

It therefore ought to increase the percentage of assets held in index linked bonds.

Other Fixed Interest is £14.75m compared to requirement to hold £11.5m in respect of immediate annuities, £3m in respect of Non Profit term, £3m for with profits business, and part of non-unit reserve and solvency requirement — hence need around £18m.

Similarly, real assets of equities/property amount to £7m and these are required to match majority of free assets (£5.25m).

Hence company must be matching some other liabilities (probably a significant proportion of with profits guaranteed liabilities) by equities.

So ought to consider selling some equities or property and investing the proceeds in fixed interest.

Cash holdings could be included in fixed interest — but overall seems 10% in cash would appear to be too much.

So may want to invest some of cash in fixed interest stocks, without compromising need for short-term liquidity.

Company has high level of investment in direct property — for a relatively small fund may want to consider investing indirectly in property (e.g. investment trusts) to achieve exposure.

£7m held in corporate bonds compared with £11.5m annuity liabilities. Whether this is reasonable likely to depend on whether can offer marketable product and whether credit risk felt to be acceptable.

25% of equities are overseas. Appropriate to hold some overseas for diversification of risk but need to consider whether currency risk is reasonable in context of level of free assets.

Comments on question 5: *All parts of this question were generally well answered. Candidates gave well structured answers, particularly for part (ii).*

6 (i) Internal rate of return. (IRR)

This is the rate of return earned on initial capital invested in writing the policy.

It is calculated as the rate of interest at which the value of discounted future profits equals the value of any initial outlay.

IRR may not exist or may not have a unique value for certain policies, for example single premium policies.

IRR shows the return earned on capital invested so it is a useful measure when capital is scarce.

Discounted Payback period. (DPP)

This is the length of time it takes for any initial capital outlay to be repaid.

In the calculation future cashflows are discounted at a chosen risk discount rate.

IRR and DPP do not show anything about monetary profit levels or about future cashflow profiles.

DPP is useful as it will demonstrate when scarce capital is fully repaid.

Net present value of profit. (NPV)

- This represents the monetary value of future profits from the contract discounted back to the start date of the contract at a chosen risk discount rate.

The NPV is often expressed as a percentage of premium income or initial commission

The NPV shows total profit levels achieved. Economic theory states that an investor would choose the option which gives the highest NPV.

The NPV is subject to the law of diminishing returns. If it were not then a company that could sell one policy with a positive NPV could sell an unlimited number of policies and increase the company value without limit.

However, NPV does not indicate anything about how effectively any initial capital required has been used.

In practice, a combination of targets and other criteria is often used.

(ii) **Current funds**

The company would need to consider the period of time over which performance had been poor and whether this was likely to influence the future

sales or retention of its current business. It may be this was a small blip or the savings market is not that sensitive to past performance.

The most important aspect of the company's funds performance is performance relative to its competitors.

It may be that the investment markets in general have fallen and the companies fund performance is not poor relative to these. Alternatively it may be that the investment managers were constrained by a benchmark they were given and this impacted on their performance e.g. they may be marketed as low risk funds investing in lower yielding assets

It would also need to think about the impact on the brand of the group if it used an external company and whether it had any detrimental impact on group profits if this led to reduced attractiveness of the groups investment capability in the eyes of external investors

Profits could also be reduced if it led to reduced economies of scale in the investment management company

New Funds

- If launching new funds it would need to consider the profitability of new funds.
- The charges for fund management may be higher than the cost of the company's internal fund managers. If so the company would need to market these funds with higher annual management charges than its existing funds or accept a lower level of profitability.

In making this decision it would need to consider the attractiveness of funds with higher charges

Marketability

The company needs to consider the marketability issues, and consider whether this move is in line with competitor actions.

It would need to consider whether the historic investment performance was any better for these funds making them more attractive

Would the funds be suitable for its target market? It is likely that a similar range of asset classes are available but the risk profile of the funds may be quite different.

The company would also need to consider whether the sales channels it distributes through were comfortable selling these funds and were suitably trained to be able to explain their features.

Marketing literature, sales aids etc would all need to be developed to explain the new funds.

Using external fund managers provides access to expertise that the company currently does not have in-house

Systems

The administration systems would need to be amended to enable choices of other funds to be made.

The company would need to set up links to enable appropriate cash movements to be made on a daily basis in line with movements in policyholder monies.

In addition their administration systems would need to have links created with the external fund prices.

Also, if the annual management charge is changed this will lead to further changes being required e.g. to quotation systems.

This is likely to have significant cost attaching which would need to be factored into any business case.

General

The company would also need to consider whether to offer the new funds to both new and existing customers. This could create lapse and re-entry issues.

Doing so may generate further administrative costs through switching activity.

However this may help the persistency of the business by offering more investment choice or better performance records.

The company would need to consider any regulatory issues and any restrictions that may be applied to using external fund managers

The company should consider any additional operational risks that it will be exposed to as a result of using third party fund managers, and the potential loss of control that may arise.

Comments on question 6: Part (i) was standard bookwork, and was well answered. Part (ii) required candidates to consider a wide variety of issues. Many candidates concentrated only on cost related issues and therefore failed to score well.

7 (i) The risks are:

- The assumptions chosen do not reflect adequately the class of lives insured.
- The assumptions chosen do not reflect adequately the expected future trend in mortality improvements.
- Even if the assumptions chosen are appropriate, the company is still at risk from random fluctuations.

For this specific product, the key risk is that actual mortality will be lighter than expected.

However, if options are offered that accelerate benefits (e.g. through guaranteed periods) then this introduces a different type of mortality risk, which might to some extent offset the longevity risk.

The extent of the first risk depends on the reliability and applicability of any existing data.

As the company has been selling large volumes for several years, it may have credible internal data.

However, the first two risks cannot be eliminated, as the future can never be predicted with certainty.

The third risk will also be reduced as a result of the large volumes of in-force business, but cannot be removed entirely.

(ii) **Mortality by class of life**

The company should perform detailed experience analyses in order to set its pricing assumptions appropriately.

It should include adequate margins for risk in the mortality rates it uses in its pricing assumptions.

The company might decide to introduce differential annuity rates to allow for the expected mortality of lives e.g. in different states of health, different regions, different socio-economic group. They could then manage this particular risk using underwriting.

Future mortality improvements

The company should include appropriate allowance for future mortality improvements in its assumptions.

It should keep up to date with industry analyses and research.

The company could consider using mortality derivatives to reduce the risk of future mortality improvements

The company could sell lower volumes, thus reducing its exposure to future mortality improvements.

It could do this by withdrawing from the market, or by reducing its rates to a less competitive level.

Random fluctuations

It could try to sell even higher volumes in order to reduce its exposure to random fluctuations.

General

The company could take out reinsurance or use co-insurance. For example, on original terms, or the reinsurer could pay all annuity payments beyond a certain age, or beyond the age at which the policyholder is expected to live on a specified mortality basis.

If the risk is currently borne fully by the shareholders of the company, then they could reduce this risk by writing the annuities into a with profits fund (if there is one) in order to share the risk with the with profits policyholders. This would depend on the relative appetites for risk of shareholders and policyholders.

Alternatively, the company could change the product design to with profits rather than without profits immediate annuities, and share the mortality risk with the annuitants through the bonus declarations.

It could launch or sell more products that have synergy with immediate annuities, i.e. they generate higher profits if mortality rates reduce. For example, term assurance written at similar ages.

(iii) **Other risks are:**

Mismatching and reinvestment risk: investment risk arising from imprecise matching of assets and liabilities.

Default risk on corporate bonds if these are used to back the liabilities. This is likely given that the company is a leading provider and so must be pricing competitively.

Market risk for the period between the issuing of the guaranteed quotation of the annuity rate and the investment of the premium

Renewal expenses being higher than expected.

Expense inflation being higher than expected.

Volumes sold being lower than expected, leading to a lower contribution to overheads and other fixed expenses.

Volumes sold being higher than expected, potentially leading to new business strains (e.g. reserving strains) that exceed available capital.

Volumes sold being higher than expected, leading to strain on administrative processes.

Change in mix of new business by size, i.e. more small policies.

Change in mix of new business by source, if assumption differences (e.g. commission, mortality) are not reflected in differential annuity rates.

Anti-selection risk, particularly if this company offers only one set of annuity rates and other companies introduce annuities targeted towards lives in poorer health.

Inaccurate or incomplete data.

Fraudulent claims, e.g. not notifying the company of the death of the annuitant.

If reinsurance is used, failure of a reinsurer.

Changes to the legal, fiscal or regulatory environment.

Changes in volumes and mix of business can be influenced by competitor actions (e.g. a new company entering the market, or targeting a different market) and can be influenced by management actions (e.g. incorrect decisions regarding annuity pricing).

- (iv) For new business, there is some truth in this comment because the impact of mortality improvements would be discounted for a reasonably long period.

However, the overall financial impact on the company could be significant given that they sell a large volume of new business.

There is also likely to be a large in-force portfolio, and the impact on existing business could also be considerable.

In particular, reserves must reflect a prudent expectation of future mortality. If the rate of future mortality improvements is reassessed as being higher than previously expected, then reserves would have to be increased to reflect this.

This could cause solvency problems, depending on how well capitalised the company is.

If the portfolio is cashflow matched, then unanticipated mortality improvements could result in mismatching losses, or would require rebalancing of the assets, which could be costly.

The problems are exacerbated if further expected mortality improvements are identified on a regular basis.

If the company writes escalating annuities, then the potential cost is greater than if level annuities.

If the company writes impaired life annuities, then the impact of mortality improvements within this class of life is proportionately of greater significance.

Overall, the company therefore should manage this risk carefully.

Comments on question 7: Surprisingly parts (i) and (ii) were not well answered, with many candidates identifying longevity as the only mortality risk the company faced. However parts (iii) and (iv) were relatively well answered.

END OF EXAMINERS' REPORT