

November 2024

**Subject F207|B200 — Banking  
Fellowship Applications**

## QUESTION 1

Generative Artificial Intelligence, or GAI, is a branch of AI that focuses on creating new content from training data. GAI systems can learn from data and generate outputs that are novel, realistic, and diverse, without requiring explicit supervision or labels. Examples of ways in which GAI can be used include text generation, synthesis of images from text, voice synthesis and generation of code from natural language.

Yellow Bank is a large, multi-national bank that provides a full suite of banking services to wholesale and retail customers. The executive team at Yellow Bank is excited about the potential for GAI to create significant efficiencies across its banking operations.

- i. Outline potential risks specific to the use of GAI within the bank and suggest ways in which these risks can be mitigated.

[5]

Performance on this question was fair, with a clear split in results between candidates that were familiar with the concept of GAI and those that were not.

Poorer candidates provided generic outlines of risks and mitigation measures relevant to AI in general and not specific to GAI. In these cases, credit was not given as the requirement was to outline risks specific to GAI.

Some candidates outlined risks but did not discuss potential mitigants, and therefore only scored part marks.

### **Regulatory and compliance risk:**

- Regulation regarding AI in general and GAI in particular is still developing. This regulatory uncertainty introduces the risk that regulatory requirements could change after solutions are implemented, requiring changes to approach.
- The bank should involve regulatory experts that stay abreast of relevant developments in the development and deployment of GAI solutions and in associated governance and sign-off processes.
- The bank should also engage with regulators, policymakers, or industry associations to advocate for clear, consistent, and appropriate regulations and standards for GAI, and to demonstrate its compliance and accountability.

### **Data privacy and security risk:**

- GAI may access, process, or store sensitive customer or employee data. There is a risk of data breaches or misuse of this data, especially where GAI solutions make use of third-party large language models (LLMs).
- The risk of data privacy and security breaches resulting from passing through of data to third party LLMs can be mitigated by implementing private instances of these models.

### **Third party dependency risk:**

- Where GAI makes use of third party LLMs, this can pose risks related to service disruptions, changes in pricing or availability of operational support.

- This risk can be mitigated through conducting robust third-party due diligence processes, and through implementing private instances of models in a way that reduces the degree of third-party dependence.
- This risk can further be mitigated through clear contracting with third parties ensuring viable mitigating re-course in event of performance failure.

**Risk of model hallucination:**

- There is a risk that GAI models can hallucinate, producing false or misleading information, which could lead to misleading insights or customer miscommunication.
- These risks can be mitigated by incorporating human oversight and review into processes that make use of generative AI.
- The risks can also be mitigated by implementing continuous monitoring and feedback mechanisms which solicit feedback from users and stakeholders to identify potential issues and improve model performance.

**Organisational/human resource risk:**

- GAI could change the nature, scope or skills of the bank's workforce, particularly where solutions are used to generate written or visual content traditionally produced by subject matter experts. This could lead to resistance, conflict or uncertainty among employees.
- To mitigate these risks, the bank should communicate and consult with its employees, managers, and leaders about the benefits, challenges, and implications of GAI for their roles, responsibilities, and expectations.
- The bank should also provide adequate training, education, or support for its employees, managers, and leaders to acquire the necessary skills, knowledge, or competencies to work with or alongside GAI.

Organisations can create bespoke GAI solutions tailored to specific use cases by procuring an appropriate foundational large language model (LLM) from a third party, training this model on a curated dataset that represents the context and scope of the use case, and performing iterative testing and validation to ensure the model produces accurate and reliable results.

- ii. Describe three ways in which GAI can be used within the bank to improve efficiency, such as credit origination, customer service and financial crime risk management.

For each use case described, include:

- An overview of the use case
- How GAI can be trained on relevant data and incorporated into the associated process
- How incorporation of GAI would improve efficiency

[8]

Performance on this question was fair.

Most candidates were able to define suitable use cases, describe how the models would be trained, and explain how use of the models would improve efficiency.

Several candidates identified use cases which would make use of traditional analytical AI and not generative AI. Credit was not given in these cases, unless the specific role of generative AI in addressing the use case was adequately explained.

Some candidates did not explain how the models would be incorporated into existing processes as required by the question, and lost marks as a result.

### Wholesale credit approval

- In wholesale credit approval processes, decisions are made through credit committees based on comprehensive reports created by credit analysts.
- In preparing these reports, credit analysts perform extensive research into the counterparty, its operations and management structures, financial information, and information regarding the counterparty's industry.
- Generative AI, trained on data related to counterparties, financial statement data, industry data and reports historically submitted to credit committees, can be leveraged to create a first draft of these reports, which can then be reviewed and edited by credit analysts before inclusion in committee packs.
- This would improve efficiency by significantly reducing the amount of time spent by analysts in performing research and drafting reports, resulting in quicker submissions, quicker decisions on credit applications and an ability to consider more applications.
- Committee members should also experience improved efficiency in preparing for meetings if use of GAI could lead to better standardization of the reports produced and highlighting summarised key metrics more prominently.

### Customer service chatbots

- Customers with questions regarding banking products or processes typically have multiple options for obtaining answers to such questions, including online research, call centres or existing chat-bots which are programmed with fixed responses to common questions.
- A GAI-based chatbot can be trained on the bank's customer-facing documentation, customer contracts and prior questions and answers to provide robust responses to customer questions.
- This chatbot can be made available to customers through mobile apps and online portals, and to potential customers via the bank's website. It can also be made available to staff that need to respond to customer questions, such as call centre staff.
- This would improve efficiency by enabling customers to obtain answers to a wide range of questions without needing to engage with call centre agents or other employees.
- Where the customer's preference is to engage with a person rather than with a chatbot, efficiency can be improved by providing these employees access to the GAI solution, reducing the time taken to find the required information to answer the customer's questions.

## Risk management and compliance

- Banks typically have various internal risk frameworks and policies that need to be complied with. Risk, compliance and HR staff typically need to access many internal documents to advise internal customers on actions that are required to comply with various requirements.
  - A GAI-based tool can be trained on internal frameworks and policies and can be made available to all staff. Staff can then access this tool to ask questions related to framework and policy requirements and can obtain an answer to the question as well as a reference and a link to the relevant policy.
  - This will improve efficiency within the risk, compliance, and HR communities by providing staff with the opportunity to obtain reliable responses to questions without having to engage with the relevant subject matter experts.
  - This will also improve efficiency for staff who do not have to spend time working through full documents to find the applicable sections to answer their questions.
- iii. Outline potential practical challenges associated with the GAI use cases described and suggest ways in which these challenges can be addressed to ensure that implementation and adoption is successful.

[12]

Performance on this question was poor, with most candidates failing to generate sufficient points for the marks allocated.

Some candidates discussed challenges in general and not practical challenges associated with the use cases described. These candidates generated general rather than specific points and, while some credit was given, performance for these candidates was poor.

Some candidates discussed risks and mitigants rather than practical challenges and scored poorly as a result.

Better candidates outlined specific practical challenges associated with each use case and suggested sensible ways in which these challenges could be addressed to aid implementation and adoption.

## Wholesale credit approval

- Wholesale credit data may be complex and unstructured, and comes from multiple sources, making it challenging to collect and pre-process data for training GAI models.
- Work will need to be done to standardise and enrich training data to ensure that it is fit for purpose. This could involve introducing a standard structure, such as a specific format for financial information, into training data, and converting historical credit analyst reports into a standard format to use for training.
- On application, available data regarding wholesale counterparties may be inaccurate, contradictory or out of date.
- Processes should be put into place to ensure that any external data referenced by the model is from reliable sources and is the latest available information, to avoid reports being produced based on inaccurate or out-of-date information.

- Production and consumption of credit analyst reports for wholesale credit exposures typically involves deep subject matter expertise and a high degree of judgement. GAI models may struggle to capture nuanced insights and thus not be fit-for-purpose.
- Domain experts should be involved in the development and validation of models to ensure their relevance and accuracy. Outputs should also be reviewed and enhanced or edited by domain experts before consumption.
- There could be resistance from Subject Matter Experts (SMEs) with respect to adoption of the GAI tools if they feel that their expertise is being undermined.
- There should be collaboration between data scientists, credit analysts and other stakeholders to create GAI solutions that are tailored to the specific needs of the end users. Training and education programmes should be implemented to enhance understanding and adoption of GAI.

### **Customer service chatbots**

- The chatbot may not be able to handle complex or uncommon customer queries that require human expertise or judgment.
- To address this challenge, the GAI chatbots should have a mechanism to identify such queries and escalate them to human agents, who can provide more accurate and personalized responses.
- Additionally, the GAI chatbots should be able to learn from the feedback and interactions of the human agents and improve their knowledge and skills over time.
- The GAI chatbots may not be able to understand the nuances and preferences of different customers, such as their tone, mood, or level of satisfaction.
- To address this challenge, the GAI chatbots should be able to analyse the sentiment and emotion of the customer messages and adapt their responses accordingly. For example, the GAI chatbots could use more empathetic and polite language for dissatisfied or frustrated customers, or offer more options and recommendations for indecisive or curious customers.
- The GAI chatbots should also be able to personalize their responses based on the customer profile and history, such as their preferred products, channels, or languages.
- The GAI models may face technical or operational issues, such as scalability problems, that could affect their reliability and efficiency.
- To address this challenge, the GAI models should be built on robust platforms and architectures and should be stress tested prior to roll-out to ensure they can manage higher than expected loads.

### **Risk management and compliance**

- Queries and documents may contain complex, technical, or ambiguous terms and expressions that can pose difficulties for GAI to interpret and respond correctly.
- The bank will need to use domain-specific natural language processing techniques and tools, such as ontologies, taxonomies, and knowledge graphs, that can capture the meaning and context of the risk, compliance and HR domains and enhance the natural language understanding capabilities of GAI.

- The quality of the responses produced by the GAI tool will be correlated to the quality of the underlying frameworks and policies on which the tool is trained and applied. This can introduce challenges if the policies themselves are ambiguous or if there are overlapping and contradictory requirements between policies.
- These challenges can be addressed by performing a thorough review of the policy universe to ensure that issues such as ambiguity and contradictions are addressed before the model is trained.
- Frameworks and policies can be subject to frequent updates, which could make it challenging for the tool to remain up to date and accurately reflect the latest requirements.
- This can be addressed by ensuring that proper version control is implemented, that any approved new versions are immediately made available within the tool, and that the GAI is built to reference the latest version when responding to queries about current requirements.
- Implementation of framework and policy requirements may, in some cases, require a degree of human judgement to be applied, especially in making high-risk decisions. Challenges can arise where full reliance is placed on the tool to decide on a course of action in such cases.
- High-risk cases or cases that require judgement and interpretation should be defined upfront by SMEs, and a mechanism built into the tool to refer questions related to such cases to the relevant experts for consultation rather than providing a response.

## QUESTION 2

You are the new executive head of Retail Unsecured Loans for a bank based in Watopia. The bank is the 3<sup>rd</sup> largest provider of unsecured loans within the region. You have been provided with summary financial and statistical information for the last 3 financial years. The portfolio seeks to achieve an ROE of at least 30% through the cycle.

| Income Statement             |        |        |        |
|------------------------------|--------|--------|--------|
| Income statement item:       | FY '21 | FY '22 | FY '23 |
| Interest income (\$'m)       | 5,600  | 7,245  | 9,248  |
| Cost of funds (\$'m)         | 2,400  | 3,700  | 5,300  |
| Fee income (\$'m)            | 740    | 765    | 800    |
| Total running costs (\$'m)   | 850    | 780    | 730    |
| Impairment charge (\$'m)     | 1,925  | 2,250  | 3,397  |
| Total profits pre-tax (\$'m) | 1,165  | 1,280  | 622    |

| Balance sheet for each financial year (FY) |        |         |         |         |
|--------------------------------------------|--------|---------|---------|---------|
| Balance sheet item:                        | FY '20 | FY '21  | FY '22  | FY '23  |
| Total loan balances (At FY end) (\$'m)     | 32,174 | 37,000  | 42,550  | 48,933  |
| Average loan balances for the FY (\$'m)    |        | 35,000  | 40,250  | 46,288  |
| Average number of loans on book            |        | 623,000 | 641,690 | 673,775 |
| Average loan size (\$)                     |        | 56,180  | 62,725  | 68,699  |
| Overlays held (At FY End) (\$'m)           | 700    | 600     | 300     | 50      |
| Average capital held (\$'m)                |        | 3,500   | 4,629   | 5,555   |

Your assistant has provided you with a few high level ratios:

| Income statement items as % of average loan balances |        |        |        |
|------------------------------------------------------|--------|--------|--------|
| Income statement item:                               | FY '21 | FY '22 | FY '23 |
| Interest income                                      | 16.0%  | 18.0%  | 20.0%  |
| Cost of funds                                        | 6.9%   | 9.2%   | 11.5%  |
| Impairment charge                                    | 5.5%   | 5.6%   | 7.3%   |
| Total profits                                        | 3.3%   | 3.2%   | 1.3%   |

- i. Calculate further key ratios and comment on trends in these ratios.

[15]

Performance on this question was fair.

Most candidates were able to calculate a suitable set of ratios to reference, and to capture valid observations regarding the trends in these ratios over time.

Poorer candidates captured relevant observations but failed to generate higher-order insights.



Better candidates compared the movements in different figures/ratios and generated higher-order insights based on these comparisons, with emphasis on interaction between measures

Better candidates also proposed multiple possible explanations for trends observed and referenced real-world economic circumstances in their responses.

Solution:

Some informative ratios that should be calculated by the candidate to allow the candidate to evaluate important trends:

**I/S Items As % Of Average Balances**

| Income Statement Item: | FY '21 | FY '22 | FY '23 |
|------------------------|--------|--------|--------|
| Interest Income        | 16.0%  | 18.0%  | 20.0%  |
| Cost Of Funds          | 6.9%   | 9.2%   | 11.5%  |
| Fee Income             | 2.1%   | 1.9%   | 1.7%   |
| Total Running Costs    | 2.4%   | 1.9%   | 1.6%   |
| Impairment Charge      | 5.5%   | 5.6%   | 7.3%   |
| Total Profits          | 3.3%   | 3.2%   | 1.3%   |

| Other Useful Values & Ratios       |        |        |        |
|------------------------------------|--------|--------|--------|
|                                    | FY '21 | FY '22 | FY '23 |
| NIM (\$ 'm)                        | 3,200  | 3,545  | 3,948  |
| NIM As % Average Balances          | 9.1%   | 8.8%   | 8.5%   |
| Capital As % Average Balances      | 10.0%  | 11.5%  | 12.0%  |
| ROE %                              | 33.3%  | 27.7%  | 11.2%  |
| Balance Sheet Growth               | 15%    | 15%    | 15%    |
| Profits Excluding Overlay Releases | 1,065  | 980    | 372    |
| Profits As % Of Average Balances   | 3.0%   | 2.4%   | 0.8%   |
| Pre-tax ROE % (Net of Overlays)    | 30.4%  | 21.2%  | 6.7%   |

Points worth noting:

NIM:

- The book seems to be a variable rate book – as both COF and interest rates are shown to increase over time
- The interest charged has increased from 16% on average to 20% on average seemingly pointing to either increases in pricing or an increasing interest rate cycle
- The COF have increased similarly from 6.9% to 11.5% on average – pointing to increasing base rates in Watopia

- However, something important to note is that the COF is increasing at a faster rate than the interest charged which is causing a margin squeeze on the portfolio (less margin available to cover other business elements). This will result in reduced profitability of the portfolio over time

#### Fees:

- The fees earned are increasing in absolute terms, but at a slower rate than the growth in the book size overall
- Fees earned as a % of the book are steadily decreasing – possibly due to increasing average loan sizes
- Average fee charged per loan on balance sheet appears to be around \$100 pm

#### Costs:

- The running costs in absolute terms are decreasing steadily over the period
- Costs as a % of the book are decreasing too (at an even faster rate than the fee income as a % of the book)
- The running costs in absolute terms have now in fact decreased below that of the fees earned each year, resulting in the fee income covering all the running costs which is very positive for the income statement

#### Impairment charge:

- The bad debt charge has been increasing over time in absolute terms, however the jump in '23 is significant when compared to that of '22
- The bad debt charge as a % of average balances has grown from 5.5% in '21, to 5.6% in '22, to a much higher 7.3% in '23
- This is a concerning trend as this will significantly impact the profitability of the book and it would be very important to understand the reasons for this trend and if there are any mitigations required from the business
- What is more concerning is that the bad debt charge is increasing significantly despite the business releasing overlays over this same period.
- The risks that the overlay impairments were held for need to be understood, their emergence relative the release pattern, and the size of the residual risk relative to the R50m held at end to inform any further insight
- If one calculates the bad debt charge excluding the impact of releasing these overlays, the resulting charge per each year increases from 6% to 6.5% to 7.9% over the period which is significant and in fact shows the trend started in '22 already

## Profitability & ROE

- Profits are increasing in absolute terms from '21 to '22, but decrease significantly from '22 to '23
- Profits as a % of the advances book are decreasing throughout the period down from 3.3% in '21, to 3.2% in '22, to 1.3% in '23
- What is more concerning though is that these profits are boosted due to overlay releases that have taken place – especially in '22 and '23. If the impact of the overlay releases is removed the profits drop quite a bit and in fact show a significant decline in absolute terms in '22 and '23. Profit as a % of the portfolio is only 0.8% after removing impact of overlays for '23
- There is a similar trend for the ROE % as a decrease in profits will result in reduced ROE's (unless the underlying capital required reduces over time)
- The ROE dropped from 33% in '21 (above the targeted TTC ROE of 30%) to 27.7% in '22 and 11.2% in '23 (now well below target).
- This might not be a cause for concern if the bank is comfortable for ROEs to dip below the target during an economic downturn however the result for '23 is at a level that must surely raise some concerns
- This outcome is worse after removing the impact of the overlay releases where the ROE for '23 is then only 6.7% net of the releases
- This was exacerbated by the fact that the capital required to be held as a % of the book increased from 10% in '21 to 11.5% in '22 and 12% in '23

From a profitability and ROE perspective there are quite a few challenges apparent in the book that the business will need to better understand (and where possible correct or make allowances for) to return the profits to a more reasonable and stable level

- Adding pre provision view could also be useful as this shows profit stability at 8.7-8.8% across the 3years other than the earnings volatility that the impairments brought about.
- Further investigation needed on the impairment line in terms of quality of business written as this is likely not due to stage1 ECL given that growth is consistent at 15%
- An important ratio to consider will be a “cost to income” ratio.
- One calculation shows a steady increase of cost to income: 51%, 56%, 60%]

In addition to the financials above, you have also been provided with the pricing model currently in place. This is the model as it has been implemented and these are the averages priced for in each financial year for the loans disbursed over the last 3 years.

| Pricing Model - Pricing expectations for new business written |  |         |         |         |
|---------------------------------------------------------------|--|---------|---------|---------|
|                                                               |  | FY '21  | FY '22  | FY '23  |
| Interest income                                               |  | 16.0%   | 18.0%   | 20.0%   |
| Cost of funding                                               |  | 7.0%    | 9.0%    | 11.0%   |
| Average Annual PD                                             |  | 7.0%    | 7.0%    | 7.0%    |
| Average Annual LGD                                            |  | 80.0%   | 80.0%   | 80.0%   |
| Monthly fee per loan (no initiation fees) (\$)                |  | 100     | 100     | 100     |
| Average running cost per loan per month (\$)                  |  | 120     | 110     | 100     |
| Required capital holding                                      |  | 10%     | 10%     | 10%     |
|                                                               |  |         |         |         |
| Total loan value disbursed (\$'m)                             |  | 7,656   | 8,875   | 10,488  |
| Total number of new loans disbursed                           |  | 116,000 | 125,000 | 138,000 |

- ii. Comment on the pricing model and detail any concerns you identify, specifically when compared to the other financials provided.

[10]

Performance on this question was poor.

In general, candidates did not generate sufficient content for the marks allocated to the question.

Very few candidates commented directly on the differences between actual and expected, or calculated expected values implied by the pricing model.

Candidates did not comment on dynamic between through-the-cycle pricing vs. a point-in-time pricing basis.

Candidates did not pick up that the values provided were averages across the portfolio, with some explicitly assuming pricing is the same across the portfolio and not differentiated by risk bands.

Overall, the responses to this question implied a general lack of understanding of the fundamentals of pricing credit products.

**Solution:**

| Useful Values & Ratios        |        |        |        |
|-------------------------------|--------|--------|--------|
|                               | FY '21 | FY '22 | FY '23 |
| NIM %                         | 9.0%   | 9.0%   | 9.0%   |
| Expected credit loss          | 5.6%   | 5.6%   | 5.6%   |
| Expected Average % Fee Income | 1.8%   | 1.7%   | 1.6%   |
| Expected Average % Costs      | 2.2%   | 1.9%   | 1.6%   |
| Expected Profitability %      | 3.0%   | 3.2%   | 3.4%   |
| Expected ROE                  | 30.4%  | 32.3%  | 34.0%  |

|                         |        |        |        |
|-------------------------|--------|--------|--------|
| Average Loan Sizes (\$) | 66,000 | 71,000 | 76,000 |
|-------------------------|--------|--------|--------|

Points worth noting:

Overall, one would expect the pricing model and the financials to display similar results and be largely aligned. Some figures may differ slightly due to volatility in the business and economy but overall, there should be close alignment between the two otherwise there would be concerns as actual experience has departed from expected, potentially highlighting business execution and risk management concerns.

The details given within the pricing model are for the entire portfolio of new business written each year, however it would be useful to see this broken down into more granular detail (perhaps split into high level risk bands, high level loan sizes and tenures) as this will allow a more detailed understanding to be obtained and a more thorough analysis and set of comments to be given.

Expected Profitability & ROE:

- The expected profits as a % of the exposures can be estimated and this looks reasonable and decent based on the pricing model itself
- The same could be said for the ROE as on face value the business is pricing in an ROE that is just a little bit above the required 30% TTC
- The assumed required amount of capital to be held is sitting on 10% within the pricing model, however in the actual capital holding has recently increased to 12%. If this is a new norm, the pricing model will need to be adjusted for this going forward
- The biggest concern here is that what the pricing model is expecting overall and what is playing out in the financials is significantly different and it would be very important to resolve this discrepancy to ensure the model is in fact realistic and correct

NIM:

- The interest rates priced for and earned on book are closely aligned
- However, the COF that is priced for is understated and this understatement is growing over time (0.5% at the end of '23)
- This will result in the NIM % being lower than expected resulting in potential under-pricing of the portfolio

Fees & Costs

- The fee income as a % of the portfolio is quite closely aligned with that of the actual financials and the average monthly fee charged is in line with the \$100 quoted
  - It is worth noting that the average loan sizes are increasing however which results in the fee being a smaller % of the loan size – this may have implications for the portfolio overall depending on how deliberate this change in portfolio mix is
- The running costs are pricing in a decrease in costs per loan and the cost as a percentage of the loan exposure, and to date this is playing out in reality

Expected credit losses:

- The model is pricing in a total bad debt of 5.6% which is lower than what is being experienced in the later years. This is a large concern as the difference is sizeable
- On face value there is not enough detail to show if the PD or the LGD has been underestimated (or is out of line) or if there are other elements at play that need to be considered before reviewing or adjusting the pricing model
- There is also no indication as to whether the model is pricing in a TTC view of the bad debts and whether it is sensitive to changes in economic factors (does it automatically adjust for risk changes or does business need to make changes to risk cut-offs to allow for economic challenges)
- The model provided is shown at an overall aggregated level and one would assume that different pricing is applied to different risk bands. It would be valuable to analyse the pricing model at a more granular level to see where there is under pricing and then look to adjust those portions of the model only (to remain competitive in the low risk and stable portions of the business and to only price up on the volatile portions of the business)

- iii. Based on the information provided give recommendations that you would make to the business to improve the financial results (focus on funding and impairment shortcomings). Detail additional information that might inform your recommendations.

[12]

[Total 37]

Performance on this question was poor, with passing candidates performing materially better.

Few candidates generated sufficient points to have scored well.

Most candidates were able to generate sensible suggestions for addressing cost of funding challenges.

Few candidates covered potential drivers of the increased impairment charge in sufficient detail.

Few candidates provided sufficient coverage of additional information that could be requested to inform their views.

Better candidates noted that the increased impairment charge would be driven by a combination of interest rate increases and the quality of new credit granted and shaped their responses accordingly.

Impairment charge:

- One really needs to understand what is happening with respect to the bad debt charge being experienced currently in the financials and understand how this links to the new business being written
- There is a distinct possibility the poor bad debt experience is related to the rate hiking cycle (interest rates spiked by 4% over the period), and no doubt it will be creating financial pressure on customers. However, it is important to understand how much of this change is driven by economics and how much is because of other factors (internal to the bank as well as external)
- Once an analysis of the additional information has been performed one will then be able to determine possible strategies to rectify the financial situation. This could include increasing

pricing in certain risk bands, reducing loan sizes or volumes in certain unprofitable risk bands, focussed collections strategies for specific portions of the book, and perhaps reversing recent strategic decisions that are yielding poor results

#### Additional Information Required:

- Default vintages over the last few years – this will help determine if the recent blow out in bad debts is because of a deterioration of experience across all vintages or just specific tranches of business written. Ideally it will be useful to see this view split across different business channels, loan sizes, tenures, and risk bands
  - This will allow us to determine which lines of business to reduce and which ones to focus on retaining. It will also guide us with respect to pricing for the different risk bands and how this might need to change
- Actual defaults per expected risk band (comparing actuals to scorecard expected) so that one can see if there is incorrect pricing in certain risk bands and to see if a scorecard recalibration is required
- Gini and other scorecard accuracy measures should be obtained to see if there is a need for a scorecard rebuild (we may find the scorecard is incorrectly rating for risk and as such we are mispricing many loans)
- Historical information (both vintages and actuals vs expected outcomes) over previous rate hiking cycles to determine if the current experience is like previous downturns (and how quickly the experience improves after rate cuts)
- Model monitoring pack critical but also need to investigate data quality measures as any deterioration here could flow through to model implementation environment and reporting process
- Details of the overlays that have been created in the past and why they are being released now. Is this release linked to model shortcomings that have been slowly rectified over time (which is contributing to the worsening experience) or have the releases been made to try to soften the financial results (which might be concerning if the original reason for creating the overlays has not been addressed). This information will contribute to the strategic decisions to be made
- A detailed breakdown of the bad debt charge and what is contributing to the numbers overall. So, what is coming from new business strain, back book deterioration, any once offs that have occurred during the period, post write-off recoveries, movements in loans across the different stages, roll rates across the book. This detail will hopefully allow the business to pinpoint specific areas experiencing challenges and one can look to address these directly
  - Are there any strategic decisions that have been made recently that might be impacting the results – new channels, scorecard cut-offs, lead generating campaigns, sales incentives etc that might be playing a part in the poor results
- Details of any provisioning changes that have been made over the period as these will directly impact the provisions (staging rules, write-off rules, forward looking PD models, etc)
- Ideally a peer comparison would be useful to see if our experience is aligned to what is being experienced overall in the market, both in unsecured loans as well as the lending market in general. It will also be useful to see how performance compares to peers (if there are). This alone does not repair the financials, but it does at least allow us to understand if this is a widespread industry or bank specific issue

#### Funding Costs:

- The cost of funding has been gradually increasing over the last 2 financial years and it would be key to understand what is driving this change and if it is a long-term change (and if it will go up even further)
  - Can the bank pass this cost onto customers or not? (is there an ability to price up on certain loans or on all loans of all tenures if required)
- If there is a possibility of charging different rates for different loan tenures this should be considered, even if the split is only high level (short vs longer terms)

#### Additional Information Required:

- It would be very useful to understand exactly how the FTP is calculated and charged for this product and pushed to the income statement. Is there a central treasury function running these calculations and if so, have there been any changes to the models as they have been applied or any assumed loan amortisations (behaviour and contractual).
- If there are changes, are they correct and are they short term or long-term changes that will be sustained (this will determine our response)
- The average loan sizes have been increasing significantly, and thus presumably at least the contractual loan terms; is this a big driver of the FTP changes?
- We should ensure that the behavioural amortisation of loans is considered as this might help to reduce the FTP charge
- What portion of the book is fixed rate and how much is variable rate lending? On face value it looks like the book is predominantly variable however there may be fixed rate lending too and how this proportion is moving and how this portion of the book is priced would be useful to understand
- There may be opportunities to write a different mix of fixed rate business or change the pricing for this business depending on the outcome of the analysis and extra info provided
- How is the book funded (deposits etc) and how has this changed over the recent years. Although it is not our function to manage it would be good to understand what is happening and possible current and future implications so that we can try to allow for this in our pricing. In addition, if we find that we cannot price sufficiently for these changes we need to ensure that this is communicated in governance process to ensure awareness of how these changes are impacting the asset side of the book and its profitability

#### Overall Recommendations:

The business needs to identify areas of the business where loans can no longer be profitably written given the current pricing model. Whether this is because of the movements in bad debts or because of the changes in the funding profile of the organisation, there will potentially be a need to change the loans offered (based on term, size, risk mix) and the pricing thereof (increase rates and fees where reasonably possible given competition (we are the 3<sup>rd</sup> largest bank in the market)) to achieve the required ROE's.



### QUESTION 3

Access Finance is a new market entrant that aims to provide access to secured and unsecured credit to individuals and small business owners with no credit history. The country in which Access Finance intends to operate has a mature economy and a well-developed financial services industry. Access Finance plans to use alternative data sources in addition to income and credit bureau data to assess creditworthiness and affordability for applicants.

- i. Suggest types of alternative data that Access Finance could consider using, suggest ways in which such data could be sourced, and explain the potential relevance of such data in assessing creditworthiness or affordability.

[12]

Performance on this question was poor overall, with a clear distinction between candidates that scored well and those that did not.

Better candidates were able to suggest a range of potential alternative data sources, and to highlight where such data could be obtained and why it would be relevant.

Poorer candidates discussed data that is traditionally used in credit scoring, rather than alternative sources of data. Poorer candidates also focused responded on individual demographic data fields rather than on broader data sources, as required by the question.

Although the question stated that Access Finance is a new market entrant, many candidates suggested that internal spend data could be used to assess credit.

Many candidates did not answer all aspects of the question (type of data, source and relevance) and scored poorly as a result.

Few candidates generated sufficient content for the marks allocated to the question.

#### Social media data

- Data regarding social media activity could be used for both individuals and business owners.
- Access Finance could source this data by asking applicants to provide access to their social media profiles or by using web scraping tools to collect public information.
- For individuals, social media data can provide information on personal and professional networks, which can be used to infer likely credit performance (assuming people in the same networks have similar degrees of financial literacy).
- For businesses, positive reviews, endorsements, or ratings on platforms like Facebook, LinkedIn, or Yelp can signal credibility and reliability.

#### Mobile phone usage data

- Mobile phone data, such as call patterns and recharge frequency can be used to assess likely credit performance for individuals.
- Such data can reveal the behavioural patterns, preferences, and communication history of applicants. For example, the frequency and duration of calls, texts, and mobile data usage can indicate the stability and regularity of one's income and expenses.

- The type and number of apps installed, and the locations visited can indicate the lifestyle and financial needs of an applicant.
- Access Finance could source this data by partnering with mobile network operators and app developers or by asking applicants to install an app that tracks their mobile phone usage.

#### **Transaction data from digital wallets**

- Information regarding mobile money transactions can also be used in assessing affordability for individuals and small businesses.
- Such data can provide a granular view of spending patterns, income sources and financial habits for individuals, which can be used to assess affordability and repayment capacity.
- For small businesses, income received through digital wallets can be considered in determining whether income is sufficient to afford loan repayments.
- Access Finance can partner with digital wallet companies or payment processors to obtain such data, with the consent of applicants.

#### **Retailer spending data**

- Data regarding spending at retailers can be used to assess creditworthiness of individuals.
- Such data could indicate the income level, consumption patterns, and financial stability of credit applicants.
- For example, spending data can show how much and how frequently an applicant spends on different categories of goods and services. This can help to estimate their disposable income, budgeting skills, and spending habits, which in turn can reflect their ability and willingness to repay loans.
- Spending data can also show how an applicant responds to economic shocks, such as income loss, price changes, or emergencies, and whether they have sufficient savings or buffers to cope with unexpected expenses.
- Access Finance could partner with retailers or other companies that offer loyalty cards or rewards programmes to their customers and obtain the spending data of applicants who are members of these programmes, with their consent. This data can show the frequency, volume, and type of purchases made by the applicant at specific retailers or categories, as well as their loyalty points or rewards earned or redeemed.

#### **Rental and utility payment history**

- Rental and utility payment history could be sourced for both individuals and businesses.
- Timely payments demonstrate a consistent history of meeting financial obligations, indicating creditworthiness.
- Rental payment data could also be used to assess affordability for secured property loans if rental payments will no longer be necessary when a property has been purchased.
- Access finance can partner with landlords, property management companies and utility providers to access this data.

### Geolocation data

- Data regarding the location of small businesses, other businesses in the same area and potential customers in the area can be used to assess the viability of small business applicants.
  - Such data can provide information about the market size, demand, competition, and trends in their area.
  - For example, geolocation data can reveal how many potential customers are within a certain radius of the business, how often they visit the business or similar businesses, how much they spend, and what their preferences are.
  - By analysing this data, Access Finance can evaluate the profitability, growth potential, and risk level of small business applicants, and accordingly assign them a credit score.
  - Such data can be obtained using mobile phone data, which can track the location, movement, and behaviour of users through GPS, Wi-Fi, Bluetooth, or cellular signals. Mobile phone data can be obtained from network operators, app developers, or third-party aggregators, with the consent of the users.
  - Data can also be obtained using online platforms, such as social media, e-commerce, or search engines, which can collect the location, activity, and interests of users through IP addresses, cookies, or web beacons. Online platform data can be obtained from the platform owners, advertisers, or analytics providers, with the consent of the users.
- ii. Outline risks associated with the use of alternative data in credit assessment and suggest ways in which these risks can be mitigated.
- [6]

Performance on this question was above average, with most candidates able to identify a good range of relevant risks and mitigation measures.

Some candidates failed to consider that Access Finance is a new market entrant and raised points that were not relevant as a result.

Some candidates outlined risks, but not ways in which these risks could be mitigated, and only scored part marks as a result.

- The collection and use of alternative data may infringe on the privacy and security of credit applicants, especially if they are not aware of or consent to the data collection, or if the data is sensitive, personal, or confidential.
- Access Finance could mitigate this risk by ensuring that the data collection and use comply with the relevant laws and regulations and by implementing adequate security measures, such as encryption, anonymization, or authentication, to protect the data from unauthorized access, use, or disclosure.
- Access Finance could be exposed to reputational risk if applicants are not comfortable with or do not understand the way in which alternative data is used in credit assessment.

- Access Finance should be fully transparent regarding the types of alternative data it will use and how this data will be used and obtain explicit consent from applicants for the use of such data.
  - The use of alternative data may introduce or reinforce bias and discrimination in credit assessment, especially if the data is not representative, reliable, or relevant, or if the algorithms or models used to analyse the data are not transparent, fair, or accountable.
  - Access Finance could mitigate this risk by ensuring that the data and the algorithms or models used to analyse the data are validated, verified, and audited for quality, accuracy, and fairness, and by providing clear and reasonable explanations, criteria, and feedback to the credit applicants and the regulators.
  - Alternative data may contain outdated information, inaccuracies, or inconsistencies, which could lead to poor credit decisions or unfair treatment of applicants.
  - Robust procedures for validation of the accuracy and reliability of data sources should be implemented, including ongoing monitoring and regular audits.
  - Compliance with data protection regulations and fair lending laws can be challenging when making use of untested types of alternative data.
  - A comprehensive compliance framework should be established and embedded and should address regulatory requirements and guidelines governing collection, processing, and use of alternative data in credit scoring.
  - In making use of third-party providers of alternative data, Access Finance is exposed to the risk that data provision is not in line with expectations. This could include data not being timely, accurate or complete, or processes for provision of data breaking down.
  - This risk can be mitigated by implementing robust third-party risk management policies and processes, such as making sure appropriate SLAs are in place and performance against SLAs is monitored, and robust due diligence is performed before entering arrangements with third party data providers.
- iii. Outline, using examples, additional ways in which Access Finance could use the alternative data obtained.

[5]

Performance on this question was below average, with several candidates not attempting the question.

Most candidates that did attempt the question were able to outline potential additional uses for alternative data, but did not generate sufficient content to have scored well.

Better candidates were typically those that were able to identify suitable alternative data sources in part i of the question and were thus able to generate good insights regarding other ways in which these data sources could be used.

#### **Customer segmentation and targeting**

- Access Finance could use the alternative data to segment and target its potential customers based on their characteristics, behaviours, or preferences.
- Customer segmentation can then be used to offer them tailored products, services, or promotions that suit their needs, expectations, or goals.

### **Customer retention and loyalty**

- Access Finance could use the alternative data to retain and enhance its relationship with its existing customers by monitoring their satisfaction, engagement, or feedback, and by providing them with timely, personalized / contextual, or proactive support, assistance, or rewards.
- For example, using one's social media or mobile phone data could reveal their sentiments, opinions, or complaints about Access Finance or its competitors, which could help Access Finance to address their issues, concerns, or expectations, and to improve its reputation, trust, or loyalty.

### **Marketing and customer relationship management:**

- The alternative data could help Access Finance segment, target, and personalize its marketing campaigns and marketing channels, and customer service based on the credit applicants' characteristics, preferences, and needs.
- For example, using one's social media or mobile phone data could reveal their interests, hobbies, or lifestyle, which could be used to offer relevant products, services, or discounts, or to communicate through their preferred channels, such as email, SMS, or chatbots.

### **Fraud detection and prevention**

- The alternative data could help Access Finance identify, monitor, and prevent fraudulent or suspicious activities or behaviours related to the credit applications or repayments.
- For example, using one's social media or mobile phone data could detect any inconsistencies, anomalies, or changes in user or user identity, location, or network, which could indicate identity theft, impersonation, or collusion.

### **Product development and innovation:**

- The alternative data could help Access Finance design, test, and improve its products, services, reward programmes or processes based on the feedback, satisfaction, or performance of the credit applicants.
- For example, using one's social media or mobile phone data could measure the impact, reach, or effectiveness of the marketing campaigns or customer service, and identify any gaps, opportunities, or improvements.

## **QUESTION 4**

You are the Impairment modelling lead for CDG Bank based in the Eurozone. You have recently taken over from the previous lead and are reviewing the impairment policy and models currently in place at CDG. Below are details of macroeconomic linkage models that are in place and that have been developed to allow for forward looking economic expectations for PD (probability of default) and LGD (loss given default).

$$\text{PD mortgages} = 0.02 - 0.05 \times \Delta \text{GDP} + 0.0001 \times \Delta \text{UE} + 0.06 \times \text{Lag}(\text{Interest Rates}) + \xi$$

$$\text{LGD mortgages} = 0.2 - 0.7 \times \text{PPI Inflation} + 0.2 \times \text{Lag}(\text{Interest Rates}) + \xi$$

$$\text{PD unsecured loans} = -0.05 + 3 \times \text{UE} - 2 \times \Delta \text{GDP} - 0.1 \times \text{Lag}(\text{Interest Rates}) + \xi$$

The following variables have been used within the model:

PD mortgages is the expected probability of default for a forward-looking period

LGD mortgages is the expected loss given default for a forward-looking period

PD unsecured loans is the expected probability of default for a forward-looking period

GDP Growth the annualised change in nominal GDP period on period in the region

$\Delta$ GDP is the change in the GDP Growth quarter on quarter in the region

UE is the unemployment rate in the region

$\Delta$ UE is the change in the unemployment rate quarter on quarter in the region

PPI Inflation is the property price index inflation for the region

$\xi$  is an error term

Lag(Interest Rates) is the one quarter lag of the interest rates (base rates from the central bank) for the region

- i. Comment on the appropriateness of the 3 models that have been developed for CDG Bank [8]

Performance on this question was good, with most candidates capturing sufficient relevant observations to have scored well.

Most candidates commented on the appropriateness of factors included and the intuitiveness of the signs of coefficients.

Better candidates also commented on the magnitude of the coefficients and the implications thereof.

#### Mortgage PD Model:

- The model is driven by the change in GDP, change in unemployment rates and a lagged interest rate feature
- For a mortgage PD model these appear to be appropriate to include
- An increase in GDP results in a decreasing PD, which is sensible
- An increase in unemployment results in an increasing PD, which is sensible. However, the coefficient for this feature is extremely low and as a result it adds little value to the model outputs themselves and could be removed or recalibrated
- An increase in the interest rate will result in a higher PD, which is sensible
- The lag of the interest rates has been used which could be sensible as higher rates at a point in time will potentially lead to higher defaults later as client's disposable income gets squeezed
- The effect of the lagged interest rates should be higher than that of the change in GDP and change in unemployment as the absolute value and not the "change in" feature is being used within the model

#### Mortgage LGD Model:

- The model is driven by the property price index and the lagged interest rate features
- For a mortgage LGD model these appear to be appropriate to include
- An increase in PPI results in a decreasing LGD, which is sensible
- An increase in the interest rate will result in a higher LGD, which is sensible

- The lag of the interest rates has been used which could be sensible as higher rates at a point in time will squeeze client's disposable income resulting in lower affordability for property and thus will likely reduce demand for properties. Whether a lag or a lead is more appropriate could be debated
- The effect of the PPI feature is likely to be higher than that of the lagged interest rates as the coefficient of the feature is much higher. Both features are modelled using the absolute values of the features. However, it will depend on the relative size of the underlying value and how much it varies through time

#### Unsecured Loans PD Model:

- The model is driven by the change in GDP, unemployment rates and a lagged interest rate feature
- For an unsecured PD model these appear to be appropriate to include
- An increase in GDP results in a decreasing PD, which is sensible
- An increase in unemployment results in an increasing PD, which is sensible
- An increase in the interest rate will result in a lower PD, which does not sound sensible as this would be the opposite of what one would expect. It is either an error or should be removed and the other coefficients recalibrated
- The effect of the different features on the PD model output are varying. The lagged interest rate coefficient is small relative to the others and could likely be removed. The unemployment coefficient is largest in absolute terms and likely has the biggest impact, but it would depend on the relative absolute values of unemployment and GDP growth within the region. The volatility of the features will have an impact too
- An additional point to note on this model is the fact that the intercept is -0.05. This means that, depending on the values input for the features it is possible to obtain a PD that is negative (which is impossible). This is something worth testing within the model to ensure that the features are unlikely to attain these values that would result in a negative PD output
- All the models would only give sensible results within a range of macro-factor outcomes; any extreme values would distort results and render the model unusable. As such, these models should be used with extreme caution when evaluating extreme scenarios

The business has supplied you with the following model input data (used previously) as well as some of the forward-looking assumptions to be used within these models:

| <b>Feature</b>    | <b>Long Run</b> | <b>Q3 - Actual</b> | <b>Q4 - Forecast</b> | <b>Q1 - Forecast</b> | <b>Q2 – Forecast</b> |
|-------------------|-----------------|--------------------|----------------------|----------------------|----------------------|
| GDP Growth        | 2.00%           | 0.50%              | 0.25%                | -0.25%               | -0.50%               |
| Inflation         | 2.50%           | 3.50%              | 5.00%                | 6.50%                | 4.50%                |
| Interest Rates    | 1.00%           | 1.00%              | 1.50%                | 2.00%                | 2.25%                |
| Unemployment rate | 5.00%           | 5.50%              | 5.75%                | 6.00%                | 6.50%                |
| PPI Inflation     | 8%              | 10%                | 8%                   | 4%                   | 0%                   |

Your assistant has partially complete tabled the table below.

|                             | Long Run  | Q3 - Actual | Q4 - Forecast | Q1 - Forecast | Q2 - Forecast |
|-----------------------------|-----------|-------------|---------------|---------------|---------------|
| <b>Δ GDP</b>                | -         | -           | -0.25%        | -0.50%        | -0.25%        |
| <b>Δ Unemployment</b>       | -         | -           | 0.25%         | 0.25%         | 0.50%         |
| <b>Lag Interest Rates</b>   | -         | -           | 1.00%         | 1.50%         | 2.00%         |
| <b>PD (Mortgages)</b>       | Calculate |             | 2.07%         | 2.12%         | 2.13%         |
| <b>LGD (Mortgages)</b>      | Calculate |             | 14.60%        | 17.50%        | 20.40%        |
| <b>PD (Unsecured Loans)</b> | Calculate |             | Calculate     | Calculate     | Calculate     |

- ii Calculate the outstanding estimates and comment on the inputs and model outputs for the long run and next 3 quarters [7]

Performance on this question was poor, largely due to many candidates not completing the question.

Of the candidates that did complete the question, those that scored well performed the required calculations correctly and captured sensible commentary regarding the inputs and outputs of the models.

Several candidates did not perform the unsecured PD calculations correctly and performed poorly as a result.

The inputs for the model for the coming 3 quarters all point towards an economic environment that is deteriorating and that is generally significantly worse than what is experienced in the long run

As such it is expected that the PD and LGD outputs for the coming 3 quarters should be significantly worse than the long run values

In addition to that they should be gradually deteriorating further over the period as the underlying economic factors continue to deteriorate over the period

Mortgages PD Model:

- The long run average PD comes out at 2% which is probably reasonable for a mortgages book
- The model outputs for the coming 3 quarters are worse than the long run average and are also deteriorating over the period which seems sensible given the direction in which all the economic indicators are moving over the period
- A concern might be the fact that the relative expected PD has deteriorated in this economic scenario but not significantly so relative to the long run average. It seems as if the model is possibly not sensitive enough to the underlying features that have been used within the model. This might also explain the relatively low coefficients for the features included within the model



#### Mortgages LGD Model:

- The long run average LGD comes out at 14.4% which sounds reasonable (possibly slightly low) for a retail mortgages portfolio
- The model outputs for the coming 3 quarters are worse than the long run average and in fact deteriorate significantly over the coming 3 quarters which is sensible given the economic outlook
- Q4 is only slightly worse than the long run average, but Q1 and Q2 deteriorate significantly largely due to the big drop in the forecasted PPI inflation over the coming quarters. This is clearly the biggest driver in the model outputs
- Correlations between PD and LGD is lower than one would normally expect.

#### Unsecured Loans PD Model:

- The long run average PD comes out at 10% which seems reasonable for an unsecured loans portfolio (this is much higher than the mortgages PD which sounds correct)
- The model outputs for the coming 3 quarters are all significantly worse than the long-term average which makes sense given the economic outlook, in addition the expected experience deteriorates over the quarters too
- The relative level of the deterioration looks sensible given the movement in the underlying features and although the increased expected PD is significant, it does directionally align with how bad the economic outlook is for the period

[Total 15]