

EXAMINERS' REPORT

May 2019

**Subject F206 – Banking
Specialist Applications**

QUESTION 1

This question expected candidates to touch on all the considerations involved in a strategic acquisition international acquisition. In general, the question was well answered with many candidates covering nearly all considerations. Best candidates gave answers structured around affected stakeholders and their considerations.

Bank A is an international bank headquartered in South Africa and offers only Corporate products. Bank A is looking to expand its product offerings to include Retail products in the rest of Africa.

Bank B is an international bank headquartered in Nigeria and currently offers both Retail and Corporate Banking products in several countries around the rest of Africa.

Bank A is considering purchasing Bank B's rest of Africa business. Management of Bank A is concerned that it would need to be able to ensure that its financial statements, as well as its capital submissions to the South African Reserve Bank, are compliant with South African regulations.

Discuss the key considerations for Bank A in determining whether to go ahead with this transaction.

Strategy and Risk appetite

- *The strategic imperative for Bank A to expand its business lines into other African countries needs to be evaluated in context of the additional risks introduced by these activities.*
- *Specifically:*
 - *The growth strategy of Bank A as endorsed by its Board of Directors*
 - *the extent of currency and political risks that would be added needs to be evaluated and within acceptable ranges*
 - *The availability of funding sources for ongoing retail lending activities in the different territories*

Capital and risk management

- *Consideration should be given to the governance / oversight structures of Bank B. Who has the decision-making powers and how are they held accountable? Potential lack of Retail expertise can be countered by having strong monitoring packs and review forums to assess the quality of the business being written.*
- *Bank A will need to consider the regulatory differences in capital and provision requirements between Bank A and Bank B's African subsidiaries. South African Bank's currently follow IFRS 9 for credit provisioning purposes and Basel 2 or subsequent updates for capital purposes. Other African countries may follow different (and less sophisticated) accounting and capital requirements.*

- *Bank A will need to consider the potential complexity of aggregating financial statements across different countries, and implementing a consistent view on risk. For example, many African countries may not have data collected to allow for more complex credit risk models to be built (which would be consistent with South Africa). Management in Bank A will need to develop new methodologies for quantifying risk. This will need to consider local regulatory requirements as well as the risk appetite of the group.*
- *Bank A can investigate how Bank B aggregated financial results to a group level as Nigeria would also require IFRS reporting. Bank A would need to investigate if the method currently used by Bank B would be acceptable to the South African regulator before leveraging existing methods.*
- *Bank A will need to investigate and understand capital and risk management approach for Retail products, which is significantly different to Corporate products. Issues that could emerge are:*
 - *Significantly more default and loss data (compared to Corporate portfolio) for Retail products to build granular models*
 - *May need to build more advanced models rather than rely on external rating agency benchmarked models*
 - *New methods of tracking and monitoring credit risk, such as using credit rating changes, driven by underlying risk drivers such as LTV, Utilisation etc.*

Price

- *Bank A will need to consider the purchase price of Bank B's rest of Africa business. This will generally be made up of the Net Asset value of Bank B's rest of Africa business, plus any associated goodwill and other intangibles. This price can be determined in one of the following ways:*
 - *Performing a detailed technical valuation of Bank B, using discounted cashflow models, business projections, and expert input*
 - *Considering the market value of the Bank (if its publicly listed)*
 - *The maximum funds available after allowance for minimum capital requirements from Bank A for this transaction would be an upper limit on the deal.*
- *Bank A is likely to perform a detailed Due Diligence on Bank B's rest of Africa business, particularly on the credit portfolio. This will aim to assess the quality of the loan portfolio, the adequacy of provisions set aside for bad debts, and any negative trends in the business which could result in a purchase price adjustment. This would also include consideration of the transactional franchise and the capacity that it provides the bank to facilitate any lending activity.*
- *The price of Bank B's rest of Africa business will also be affected by the market perception of this Bank. It may be viewed as a highly sophisticated Bank, with strong financial performance. This could drive up the price over and above the net asset value.*
- *Potential changes in funding costs, as the corporate bank may have more different funding costs. Specifically, sources of matched currency funding in the different*

countries are of critical importance.

- *Consideration should be given to the Bank's minimum capital ratios after the transaction.*
- *Consideration should be given to the respective Banks' price to earnings ratios and the impact of the transaction on these. Generally, a high P/E ratio indicates that investors are anticipating higher growth in future. It should therefore be expected that Bank B's P/E ratios are relatively higher to help justify this transaction.*

Data and systems

- *Bank A would need to consider whether their existing systems can deal with Bank B's data. Where the Banks are on different data and administrative systems, the Bank would need to plan on how to effectively integrate these, or how to manage two separate sets of systems.*
- *This is likely to be a significant challenge as Bank B's data may not be maintained in a single data warehouse and may be spread across multiple countries. The data in each local territory may also not be consistently captured (same fields across same period). Where new data warehouses or systems are required, Bank A will need to consider the cost associated with the integration.*
- *Consideration should be given to BCBS 239 / RDARR regulatory requirements as this provides a good framework to assess data lineage (metadata, data quality etc.) of the new Bank, especially with respect to all the Retail data that will be in play.*

Competition

- *Bank A will need to consider the competitive landscape in which it operates, and whether any other major Corporate Banks have performed a similar transaction before.*
 - *This could give them insight into whether such a transaction is feasible, through consideration of the outcomes of previous transactions which are similar. For example, if another Bank had previously acquired a Retail Bank (like Bank B), and subsequently performed poorly in this area (retail banking), it could highlight certain challenges. Retail expertise in Bank B is crucial as it's likely that Bank A management would have limited Retail banking experience.*
 - *Conversely, where successful transactions have happened, it could indicate that this is something worth pursuing.*
 - *Consideration could also be given to the likelihood of success once the bank is acquired. How does Bank B fare in the market from a profitability and market share perspective and is there room for growth?*
- *Bank A will also need to consider whether it will face any competition in attempting to acquire Bank B. If the deal is announced publicly, it may be that other Banks are also interested in Bank B. This could drive up the price, or result in a lengthy bid process. Where the potential transaction can be kept confidential, Bank A has a better chance of securing the deal. Bank B is also likely to try and maximise the value of this deal and*

would want to involve multiple parties to get a better deal.

Market perception

- *Bank A will need to consider whether this is viewed as a hostile takeover or friendly acquisition. In the case of a hostile takeover, Bank A will need to consider the extent to which negative market perceptions can be managed. Bank A could be viewed as looking to exploit the business of Bank B, and hence lose its own customers / investors. The staff of Bank B may also feel threatened, and depart from the Bank, resulting in a loss of knowledge to Bank A.*
- *Change management and staff impact is considered important – synergies between the business must make sense, and the reasoning for why these Banks are better placed for the future if they are combined needs to be clear.*
- *Consideration should also be given to the reason for performing this transaction in the first instance. What are the potential synergies in the businesses, is it a strategic market play to further enter the other African markets? Are competitors of Bank A executing similar transactions? Is the South African market becoming saturated to the extent that Bank A is looking for growth? Did Bank B indicate publicly that it's looking to dispose of part of its business or looking for international strategic partners?*

Senior management & Staff integration

- *Bank A will need to make decisions on the whether to keep in place senior management from Bank B upon transition, or whether to replace them with Bank A management (or external staff). It will be preferable to transfer as many of the existing senior stakeholders to Bank A to maintain the knowledge built up by these staff members over time. It would be difficult (and expensive) for Bank A to replace key senior management and specialist staff from Bank B in a short amount of time (while at the same time trying to run a joint organization).*
- *Consideration should also be given to whether Bank B senior management will want to move across to Bank A or depart to another organisation (regardless of Bank A's intentions). It may involve lengthy and complex discussions to keep key stakeholders of Bank B. Where Bank A decides to let go of staff currently employed by Bank B, there would need to be consideration of the any severance arrangements. These could be costly to Bank A, and failure to offer fair severance deals could result in Bank A being viewed negatively in the market.*

Existing processes

- *Bank A would need to consider to what extent Bank B's business can be integrated into its existing processes.*
 - *For example, the underwriting, loan origination and loan approval processes would need to be considered. Retail and Corporate banking have very different loan origination criteria, and the underwriting processes would need to allow for this. Consideration should also be given to the extent of manual intervention in the origination of loans and any automated processing.*

- Consideration would also need to be given to the process used to manage delinquent loans – ongoing risk management (early arrears), collections and write-offs etc. – as this differs significant between Retail banking (which tends to be managed on a portfolio basis) and Corporate banking (which tends to be managed on a customer basis).
- Consideration should also be given to processes around people, such as recruitment, training, on-boarding, and other HR matters. It is likely that the two organisations have very different existing processes and so integration of these is likely to be a challenge.
- The Banks may follow different risk management processes and have different committees in place. For example, model approval and maintenance may be done as part of different processes and committees in the different banks. Alignment of these will be important for a successful integration. The Banks would also need to consider the fact that some of these may need to be harmonised to avoid duplication, and so some may no longer be required which would affect the people required as well.

Customers

- Bank A needs to consider the impact of the move on its own customers. They may view this as a move to strengthen their Bank (profitability and sustainability) and it may therefore be perceived as a positive change. This could result in additional new business volumes on the Corporate side of their business.
 - Conversely, Bank A's customers may see this as a strategic move away from Bank A's core business (Corporate Banking), and could perceive this as introducing additional risk to Bank A. Thus, customers may look to bank elsewhere, or to limit any additional investment into Bank A until such a time that it is proven that the acquisition has not negatively affected Bank A's business.
 - Bank B's customers may have concerns regarding Bank A's ability to manage the business effectively and may withdraw their relationships with the Bank. This is less of a risk for Retail Banking, where customers are managed on a portfolio and not individual relationship basis.

Expertise

- Bank A will need to assess whether it has the requisite expertise to run the business offering of Bank B.
 - This is particularly true for areas such as loan origination, pricing, risk rating, monitoring, collections process, risk mitigations.
 - This risk is exacerbated where Bank A is unable to retain key staff from Bank B who were previously responsible for these processes.

Costs

- There is likely to be substantial costs involved in such a transaction.
 - Administrative costs to obtain the necessary approvals from regulators and other bodies. This will require time, people, as well as costs associated with any fees or applications

- *The Banks would need to decide whether any rebranding is required and how to go about this. This would also have an impact on the total costs of the transaction especially where external marketing on TV / Radio / Billboards is required. In addition, and corporate office branding changes would also have cost implications.*
- *System and data harmonisation could incur significant costs. It is likely that the two banks are on entirely different systems and it may not be possible to integrate into a single system. In this case, it may be possible to use a work around, which would also involve additional costs around reconciliation and manual processes. Alternatively, the systems could be harmonised, however this will be expensive and potentially risky as well.*
- *There would be costs around customer engagement, specifically for the non-retail portfolio where customers tend to be managed on a relationship basis. This would involve explanations of what is happening as well as time and effort spent to address any concerns.*
- *Because of the acquisition there may be staff redundancy. This could be expensive, especially where senior staff are made redundant. These staff could also decide to move to a competitor taking other talented staff with them and therefore having a cost in terms of replacement as well as potential lost revenue*
- *It could also be the case that following the acquisition key talent gaps are identified, requiring the recruitment of new staff. For example, a single head of rest of Africa business may be required.*
- *Finally, there may be a cost associated with additional capital and other risk charges.*

Tax

- *Consideration should be given to potential tax implications of the transaction. There could be additional tax liabilities due in different countries and different tax regimes.*
- *There may be new types of tax such as withholding and other taxes that Bank A previously did not have to deal with.*
- *This could also result in additional capabilities required internally to be able to understand all the tax implications.*
- *As well as different processes to ensure that taxes are recorded and paid as necessary under the different local tax regimes.*

Regulatory approval

- *Before the transaction can go ahead, the Banks will need to notify the regulator of their intentions and obtain approval in writing (provided they have agreed on commercial terms for this transaction). This will include the South African regulator (SARB) as well as the local regulators in each of the territories in which Bank B operates. The Banks will need to produce a document laying out their plans and demonstrating that the transaction will not negatively affect their existing customers.*

Consideration needs to be given to whether this constitutes an application to be made under Section 52 of the Bank's Act.

From the Act:

"It is important to determine whether "an interest" should be regarded as a direct or an indirect interest. In the interests of regulatory certainty and efficiency, this Office has interpreted "an interest" as a direct interest acquired by a bank or controlling company in an undertaking that is situated outside the RSA. Therefore, only the first line of acquisitions that a bank or controlling company obtains directly in an undertaking situated outside the RSA would be regarded as a direct interest and, hence, subject to the provisions of section 52(1)(c) of the Banks Act. "

- *If these Banks are listed, the transaction would also be subject to adherence to local and foreign stock exchange requirements.*
- *The regulator will also need to be satisfied that the transaction will not result in excessive concentration risk, or in anti-competitive outcomes (such as Bank A becoming the dominant market player) for the market in which they operate.*
- *This is unlikely given that Bank A is an international bank in South Africa with only Corporate exposures.*
- *Consideration should also be given to the Nigerian regulations and position of the regulator. It may be that there are specific requirements in Nigeria, in addition to the SARB requirements, for the approval for such a transaction, including the timing over which such a deal could be completed.*

QUESTION 2

The development of cryptocurrencies has led to debate around the potential benefits that these currencies hold to society.

- i. Describe what crypto currencies are, the technology that enables them and explain some of the potential risks and benefits of cryptocurrencies to both customers and banks.

This question expected candidates to demonstrate a working knowledge of the distributed ledger (block-chain), describe crypto currencies and highlight the potential of these currencies. Candidates answered this question well with fair insight into the workings and potential of cryptocurrencies.

- *A cryptocurrency is a digital currency or asset that can be used by individuals or businesses as an alternative to traditional currencies (like the dollar for example). These currencies or virtual coins are traded online and are stored / housed in virtual wallets. There are many different currencies available to investors, some are used as a pure store of value (like traditional currencies) while others serve as options for the use of specific services or shares of value in the future (effectively pre-paying for future potential services).*

- *The development of blockchain technology has created the opportunity for such digital currencies to be created. It allows for transactions to be securely created, validated and stored across a decentralised peer to peer network. The chain is a growing list of blocks (records of transactions) that are linked using cryptography and are validated and stored across the distributed network. Once a record is created it cannot be altered without altering all subsequent records in the chain This creates the audit trail of transactions made and ensures that double spending does not occur.*
- *These currencies could be used as a full alternative to traditional currencies and could effectively be used to replace many of the typical transactions performed by banks (replacing debit orders, EFT's, forex, many Card purchases, payroll services). This would only occur if providers and the users of the currencies (or a select few currencies) believe that they are safe to trade and will retain their value (or increase in value) over time and hence are a viable alternative to standard currencies in the market.*
- *For this to become a reality some of these currencies would have to become widely adopted across both corporate and retail customers alike.*
- *Cryptocurrencies can already be used to pay for items in certain jurisdictions, but only a select few currencies and only in specific jurisdictions and on selected platforms.*
- *If banks are bypassed to effect payments, on the transactional side of banking (both as a receiver and the distributor of the funds), this would pose a revenue loss for banks.*
- *Although there will be some level of trading fees possibly between wallets and for trades made cross cryptocurrency – these may be lower than for many banking transactions.*
- *Especially for less liquid currencies the cost of currency conversion may far outweigh the transaction costs of crypto-currencies.*
- *Cryptocurrencies could also become the more widely used format for making savings and investments which would significantly reduce the deposit books of banks (although at this stage these currencies are generally purely traded in the market and hence there is no basic guaranteed interest receivable).*
- *Provision of credit denominated in these currencies would be dependent on developing a market for deposits and/or other investment products also denominated such. The price volatility of these currencies would make any unmatched positions risky and hence capital intensive.*
- *There is currently very little regulation around cryptocurrencies. This includes the development and creation of new cryptocurrencies as well as how they are traded between interested parties. There is also very little regulation around the creation of wallets (especially since they could be anonymous) so there is limited tracking of exactly what is occurring on these accounts and portfolios. There are also less overall system checks from a security and audit perspective. Therefore, at this stage, while little of these*

regulations and checks are in place, there are some added risks that crypto currency holders expose themselves to (unlike traditional banks that are well regulated). Customers have great flexibility but are exposing themselves to other risks at this stage.

- *Cryptocurrencies are currently exposed to a large risk of enabling money laundering and terrorist funding because of their structure. They are generally traded between anonymously owned wallets and these trades run across borders, cross currency, without any specific tracking of the trades in terms of the volumes, source of funds, and ultimate use of the funds. While the technology is arguably secure from a tracking and settlement of payment point of view, the anonymity of the trades and the lack of tracking and checks and balances for large trades (by size or volume) exposes the platforms to abuse and allows criminals to bypass banking systems, checks and balances.*
- *Countries across the world are starting to develop some levels of regulation for these platforms and currencies but many of these are still in their infancy. Once in place these may help to secure the crypto platforms, however depending on the levels of regulation put in place this may remove many of the current benefits of these platforms (for example many countries are requiring tax to be paid on gains made while trading).*

The cash investment division of your bank (JHB Bank) has proposed creating a platform for customers of the bank to trade in two Cryptocurrencies: BitCoin and Ethereum. The head of that division believes this will grow the overall investment book of the. He also believes it would grow deposits with the bank (both crypto and standard currencies) which would thus enhance the funding position of the bank.

ii. Explain how this could be done operationally and highlight the risks involved for the bank.

This question expected candidates to reflect on how an in-house cryptocurrency trading desk would be created or, as an alternative, how the banking systems would be integrated with an existing third-party cryptocurrency trading platform, highlighting risks that needs to be managed. Candidates who identified this as the core question scored considerably better.

- *The bank would need to decide how it goes about enabling the investment into Cryptocurrencies and how it manages the portfolio and reporting thereof.*
- *Potential option: The bank could simply allow clients to make purchases of these currencies via one or two online platforms that are identified as trustworthy wallet providers within the industry. The bank can then purely look to facilitate the purchases via:*
 - *Integrating technology with the identified platforms.*
 - *Allowing card payments / online transfers / direct payments to the platforms or wallets.*
 - *Creating flexible functionality to allow the customer to seamlessly transfer money between traditional and crypto currencies.*

- *JHB could also opt for internal software and systems to manage and physically purchase coins directly and place them into wallets linked to its customers, creating a bank branded wallet on existing third-party technology.*
- *The bank would need to ensure that the chosen provider is trustworthy and has levels of system security that the bank is comfortable with. The bank will not want to risk advising clients to make use of any platforms that will in any way tarnish the reputation of the bank – as customers will often assume that if the bank has selected a provider then the bank has in fact endorsed the provider.*
- *This approach could reduce much of the reporting and tracking requirements that would be placed on the bank itself however the bank will still have all the transaction details that took place between the bank and the other platform.*
- *Another option would be for the bank to house the wallets and coins itself, with the bank quoting own bid/offer prices, while maintaining its own inventory of coins and managing its net positions according to its own risk limits.*
 - *Currently wallets are created mostly anonymously (for example there are no FICA requirements). However, if this is done via the bank the bank will need to be able to properly track what is taking place on the accounts held. From both an AML and FIC point of view these wallets and crypto portfolios must be treated as strictly as any other investment / deposit held with the bank.*
 - *This would allow easier reporting of the value of the wallets held (both at a customer and bank wide level), and allow the bank to more effectively monitor and report on the returns made on the portfolios held by the customers.*
 - *The bank would need to have an integrated system that links external wallet and can track all purchases and sales that are made so that the net bank position can be tracked and managed.*
 - *The internal wallets can be added to online / branch client profiles allowing the total combined wealth of customers to be reported on more seamlessly.*
 - *The bank would have to decide in this instance if it allows free trading or if it will charge a fee for trading (by taking either a percentage for the trade, a flat fee, or both). There will already be a fee payable to this provider of the bank's store.*
 - *The bank must also decide if it will allow customers to draw “cash” directly from wallets owned by them (for example at ATM's, if they can use coins to make purchases (online etc) by immediately converting the coins into local currency*

and facilitating the transaction), and into what currencies this will be allowed. The bank must also decide what fees will be charged for these services (as it will need to be somewhat competitive relative to the market) as there could potentially be significant system development and integration to facilitate this.

- *The bank will also need to decide if it allows customers to make purchases on different platforms (online purchases, card purchases) using the coins themselves and if these can be converted to local currency on demand.*
- *The bank will potentially also need to closely track trades and the total value thereof for the purposes of reporting foreign currency flows to the SARB. Annual limits and other regulatory requirements will likely still be enforced for banking purposes (as the trades are taking place via a formalised bank the standard reporting requirements and limits will likely exist).*
- *The bank must decide if it will allow its wallet to seamlessly connect with other wallets on other platforms (potentially allowing the easy and free flow of funds across platforms, currencies and countries).*
- *A large risk that the bank exposes itself to here is that the actual wallets and currency is held outside of the banks systems and as such the bank has limited control over external system risks:*
 - *If the main wallet is hacked externally the entire store could be lost.*
 - *Fraud perpetuated on the wallet would be very challenging to track and it would be near impossible to trace and recover any lost currency that has been traded between or out of these external wallets. Especially in the instance where the wallets are held externally at customer level.*
 - *Errors made by customers or on behalf of customers (for example by branch staff) which results in incorrect amounts or wallets being used for transfers will be difficult to reverse, if not impossible to do so. At least the bank will have to rely on 3rd parties to return the funds, the bank will not be able to force this to occur. This would include the banks systems themselves making the error.*
 - *There is also a risk that the bank exposes itself to around the settlements of payments or transfers of the currencies between wallets and even more so when converting between digital and standard currencies. There will be timing delays between the banks systems and external wallets which may expose the bank to trading risk off the back of foreign exchange transactions made. By the time the settlements take place the bank may be left with a shortfall to fund.*

- *Downtime within the currency exchanges or a breakdown of the communications between the banks systems and the external wallets would exacerbate the settlement and transaction risks and would prevent customers from trading, making payments or purchases. Again, the ability for the bank to control this risk is limited.*
- *The bank will potentially need to set up a trading desk to facilitate trades and manage the risks associated with such trading activities:*
 - *If the bank chooses to facilitate trades itself and develops a trading platform inhouse then there are quite a few more considerations and risks to mitigate:*
 - *There will be timing differences between when instructions to trade are received and when they can ultimately be fulfilled by the bank. Irrespective of the trading platform selected and the near real-time nature of the trades, there will still be a risk that there is a shortfall of funds at the point when the actual settlement takes place between the banks and especially any external exchanges or other banks and institutions.*
 - *Ideally the trading platform would allow trades to be as near real time as possible however how feasible this is versus the relative costs of system integration and capabilities may mean that the bank ultimately must weigh up the costs of the systems versus the relative settlement risks it is exposed to for less than real time trading and settlements.*
 - *The bank would need to determine bid/offer spreads for the relevant currencies (that will need to be competitive relative to external exchanges but also will cover the bank for both the settlement risk it is exposed to as well as allow it to make some small margins for the facility provided to the customers).*
 - *The liquidity of the crypto currencies that can be traded as well as the relative volatility of their prices would also determine the level of risk that the bank is exposed to with respect to making trades on behalf of customers and how wide these spreads may have to be to mitigate and compensate the bank for the settlement risk. Currently these currencies and their values can change rapidly and hence the risks here are larger than for traditional currency trading.*
 - *The bank will need to ensure that the selected trading platform integrates seamlessly with the required internal reporting and product systems as well as with external platforms housed by exchanges (especially important for near real-time trading).*

- *Settlement agreements will need to be drafted and SLA's agreed between the bank and the relevant exchanges (and possibly other banks) with respect to the timing of the settlements and how they will be facilitated between the institutions. Depending on the agreements reached the institutions may agree for ultimate settlements and balancing of the books to take place for example at the close of business each day.*

iii. Describe possible advantages and disadvantages of allowing this functionality within the bank.

Candidates answered this question well, generating a wide range of logical ideas.

Advantages:

- *Cryptocurrencies are currently seen as a potential investment medium for investors and an alternative store of value. By allowing clients to more seamlessly invest in these currencies it is likely that this additional functionality will encourage some clients to switch to the bank, or at least encourage some customers to stay with the bank and make more use of the banks platforms for investment purposes.*
- *It allows the bank to keep in touch with the technology and digital changes taking place in the industry possibly reducing the risk of the bank being left behind as the technology evolves.*
- *Trading/ service revenue opportunity.*

Disadvantages:

- *The bank may see some reductions in other investment portfolios and possibly even in their standard cash portfolios. If funds are transferred to crypto currencies these are unlikely to be allowable within the liquidity requirements of the bank as there would be a significant mismatch of these funds once converted to a crypto currency of sorts (especially since these "currencies" are seen more as assets or investments rather than traditional currency). These currencies will differ both by term and nature of the asset compared to the credit assets of the bank. In addition – the current volatility of the value of cryptocurrencies means their contribution to the ALM position can change rapidly.*
- *The bank is only opening the optionality for investing in 2 currencies, however these are hundreds more available online. The bank may need to allow further currencies or enable the ability for further trading of these currencies to make this offering more compelling to attract customers.*
- *If the bank starts allowing clients to invest directly in crypto currencies there is a risk that clients assume the banks are endorsing these as viable and safe investments. Customers may*

be less sceptical of the investment risk currently associated with these investments. The bank will need to ensure that customers are very aware of the current risk and volatility involved with investing in Cryptocurrencies. The bank will need to develop fact sheets for this added product line.

- *There is limited regulatory oversight in the rest of the industry with respect to Cryptocurrencies, however within the bank itself it is likely that much of the usual regulatory reporting on standard investments will be required in these investments. As a result, the relative costs involved in the management of these assets may be higher for the bank than competitors on digital platforms.*
- *In addition, depending on the fee structure implemented for the trade of these currencies, the bank will cannibalise some of its own revenue sources (and the added retention of customers is unlikely to outweigh the loss of revenue from transactions and investments made by customers).*

QUESTION 3

A large South African bank is currently operating under the Advanced Measurement Approach for the calculation of Operational Risk Capital (under Basel II). It currently offers a wide range of lending products; however, its primary exposure is to Retail exposures. The Bank currently only operates in South Africa.

- i. Briefly explain the AMA approach for calculating Operational Risk capital under Basel II.

Bookwork question that candidates answered well.

- i. *There are 3 main approaches for calculating Operational Risk capital under Basel II requirements:*
 - *The basic indicator approach (BIA);*
 - *The standardized approach (TSA); and*
 - *The advanced measurement approach (AMA).*

The Advanced Measurement Approach

- *Most advanced of the three approaches, and requires the Bank to have its own internal models for frequency and severity of operational risk losses*
- *Banks can use this approach only subject to approval from their local regulators. Once a bank has been approved to adopt AMA, it cannot revert to a simpler approach without supervisory approval.*

- *Capital results are dependent on the actual riskiness of the exposures underlying them, as opposed to being based on standardized risk weights.*
- *To use the “AMA” approach, a bank must ensure:*
 - *Its board of directors and senior management, as appropriate, must be actively involved in the oversight of the operational risk management framework;*
 - *It has an operational risk management system that is conceptually sound and is implemented with integrity; and*
 - *It has enough resources dedicated in the use of the approach in the major business lines as well as the control and audit areas.*

The Bank’s CFO has recently read articles and publications on Basel IV, and is concerned with the capital implications of moving back to a more simplified approach. She has asked you to provide her with more information on the Standardised and Basic Indicator Approaches and potential implications of the change to the Bank. She has specifically requested a brief report discussing the main advantages and disadvantages of the current Advanced Measurement Approach compared to the more simplified approaches (Standardised or Basic Indicator Approach).

- ii. Discuss the points you would make in your report, making a comparison between the Basic Indicator Approach and Standardised Approach, and the current Advanced Measurement Approach.

Bookwork aspects were well answered but most candidates failed to highlight the inherent risk management and accurate capital allocation benefits of the AMA approach.

Overall points for consideration:

- *As with most requirements under Basel, adopting more advanced approaches is a sign of a Bank’s sophistication and provides an indication of better risk management.*
- *This is mainly because of the additional insights gained into the underlying risks and how these are allowed for in capital calculations under advanced approaches. Banks under advanced approaches should therefore be able to better measure, manage and quantify the risks that they are exposed to, reducing risk to the overall banking system, and hence attracting more appropriate capital charges.*
- *Therefore, despite changes suggesting the advanced approach may no longer be used for capital purposes, banks may still maintain this as part of their own internal governance and risk management policies.*
- *Obtaining and maintaining advanced accreditation does however require significant time and effort from a people, systems and process point of view, and so may not always be worth the effort, especially for simpler banks.*

- *People – specific skill sets are required to estimate the different components of an advanced approach, as well as to maintain and report the results in the required format to the regulator.*
 - *Process – this includes the establishment of expert committees as well as the time and people effort required to complete the necessary submission.*
 - *Systems – there is incremental effort in ensuring that the systems can perform the necessary calculations and reporting.*
- *Operational Risk is a more subjective risk to quantify in general as Bank's are not in the business of taking on Operational Risk (whereas they are for Credit and Market). This means that data limitations are significantly more apparent, and that the methods used to estimate losses often rely on significant expert judgement and limited underlying actual loss data.*
 - *Many of the costs in obtaining AMA have already been incurred, so may as well keep these processes in place as part of governance.*

The advantages and disadvantages of the BIA, Standardised and AMA approaches are now discussed in turn below.

Basic Indicator Approach

- *Most simplistic of the three approaches and does not require the Bank to have its own internal models for Operational Risk. This could therefore be a significant reduction in effort if the bank moves back to this.*
- *The BIA has been recommended for banks without significant international operations.*
- *This sets the operational risk capital equal to the bank's average annual gross income over the last three years multiplied by 0.15.*
- *Figures for any year in which annual gross income is negative or zero should be excluded from both the numerator and denominator when calculating the average.*
- *This method requires more limited investment in systems and controls and hence may appear to be a step backward from this point of view. However, the SARB would have been expected to fully endorse updated Basel regulation, and this is also likely to result in more conservative Operational Risk Capital.*

The Standardised Approach

- *This approach is more advanced than BIA, but less advanced than AMA.*
- *Under the Standardised Approach, banks' activities are divided into eight business lines: corporate finance, trading & sales, retail banking, commercial banking, payment & settlement, agency services, asset management, and retail brokerage.*

- *This would then require that the Bank is able to classify its data into these categories if it does not already do so. This could involve time and effort and there may be some data errors that take time to resolve.*
- *Within each business line, gross income is a broad indicator that serves as a proxy for the scale of business operations and thus the likely scale of operational risk exposure within each of these business lines. This is a significant assumption of this approach and therefore this approach also generally results in more conservative Operational Risk Capital than the AMA approach.*
- *The capital charge for each business line is calculated by multiplying gross income by a factor (denoted beta) assigned to that business line.*
- *Beta serves as a proxy for the industry-wide relationship between the operational risk loss experience for a given business line and the aggregate level of gross income for that business line.*
- *The total capital charge is calculated as the three-year average of the simple summation of the regulatory capital charges across each of the business lines in each year.*
- *In any given year, negative capital charges (resulting from negative gross income) in any business line may offset positive capital charges in other business lines without limit.*

Advantages of the current AMA:

- *There is a potential lower capital requirement for Banks who are under the AMA approach (compared to the BIA or Standardised Approach). Hence, any move away from the AMA approach is likely to result in an increase in capital allocated to the Bank's Operational Risk.*
- *The reason is that the internal estimates are supposed to be a more accurate reflection of the Bank's Operational Risk, and therefore lower than the more prudent standardized Risk Weights. Therefore, the Rand value of required capital may be lower under an AMA approach.*
- *Having AMA systems / models in place also generally means that a Bank's Operational Risk Management is better and therefore they should continue to benefit from these even if more punitive capital requirements are coming. AMA is not just about capital benefits, but also about better risk management. A step away from AMA from a capital calculation point of view may not mean that the operational risk management needs to be simplified.*
- *This approach allows the Bank to allocate appropriate amounts of capital to business units. This allocation will be a more accurate reflection of the riskiness of the different business units, and therefore reward / penalize good / bad behaviours. This contrasts with SA where the capital allocation is only dependent on the business line and specified risk weights.*

- *For example, the Bank may find that certain portfolios are capital consumers, whilst others contribute relatively little to the Bank's overall capital requirement. Thus, the Bank may wish to write more business which does not require significant amounts of capital. Conversely, the Bank may wish to reduce its exposure to portfolios which consume large amounts of capital without commensurate returns.*
- *The Bank can use the results of the AMA models to make strategic decisions on portfolio growth and direction. Parts of the business that attract relatively lower Operational Risk Capital under the AMA could be considered for further growth and expansion. This would however now need to be contrasted against the capital allocated under a simpler approach i.e. AMA may allocate low capital but BIA allocate high capital. Therefore, although the Bank identifies that part of the business as low risk, regulatory capital would not reflect this. The bank may consider an optimization exercise to allow for this.*
- *The model parameters (frequency and severity) also give the Bank insight into the effectiveness of its risk management and control processes.*
- *Banks which have good controls and risk management procedures in place, will generally have low loss frequencies. Similarly, where the Bank has put in place procedures to limit losses, or identify them quickly, loss severities will be relatively lower.*
- *By producing internal estimates of frequency and severity, the Bank can take corrective action faster than under the BIA approach.*
- *Under AMA, the Bank is required to monitor and validate its model, and hence will be more aware of operational risk deterioration. Capital will also automatically take account of any deterioration in the riskiness the underlying businesses. Under the BIA, the Bank's capital does not change as the underlying riskiness of the business changes. There is also likely less complicated validation required of the capital calculation under BIA and SA approaches.*
- *AMA rated banks can raise additional capital easier, and at more affordable rates. This is because AMA accredited banks are viewed as more sophisticated takers of risk, by credit agencies such as Moody's and S&P. This advantage may disappear with the removal of this approach to a more simplified approach.*
- *To produce internal estimates of frequency and severity, the Bank would have invested in their systems and processes (data and risk), which means that the Bank will have in place a better risk governance framework, reducing overall risk to the organization arising because of operational risks. These investments will no longer yield capital benefits but may still benefit the bank from an overall risk management point of view.*

Disadvantages of the current AMA

- *The Bank will have had to develop its own estimates of frequency and severity, which required investment in people, systems and data. Obtaining AMA accreditation would have therefore been an expensive and time-consuming exercise, often requiring significant expenditure in data and specialist skills (operational risk modelers, consultants, validators etc.). This would no longer be required if the Bank moves to a more simplified approach and it may be able to cut down on some of the costs associated with its Operational Risk Capital Calculation.*
- *Under the BIA and TSA, the bank is only required to be able to produce the estimates of gross income under the relevant business lines, and apply the standardized factors.*
- *As the Bank obtains a more accurate reflection of its underlying operational risk under the AMA approach, it may be the case that there is a higher capital requirement under the AMA approach. The bank may therefore benefit from a more simplistic measurement approach. This should however be balanced against the consideration as to whether holding less capital when additional risk is identified is sensible.*
- *For some business lines, the Bank's own experience may be significantly worse than that implied by the BIA or TSA. In addition, the Bank would have invested significant resources in obtaining AMA accreditation resulting in increased capital cost in addition to the investment made.*
- *Furthermore, a Bank is not able to choose whether some business units remain on AMA. Once AMA is sought, the Bank needs to be able to produce internal estimates of capital for each of its business units. Moving to a more simplistic Operational Risk Capital calculation regime removes this challenge.*
- *AMA accreditation requires significant additional documentation – both in terms of models and processes. This is now a sunk cost. However, some costs can be reduced in terms of on-going validation and requiring sizeable modelling teams. This cost may also be offset by the benefit of having generally better internal risk management under the AMA approach.*
- *To remain AMA accredited, the Bank is required to perform annual validation of its models and estimates. This process is expensive and time consuming, often requiring the establishment to set up a separate model validation unit or relying on the use of external consultants. This process would no longer be required, therefore saving the bank money and time.*
- *Even after significant investment in the development of models, systems and processes, their Models may not be approved. Banks that are AMA accredited may have taken several years to achieve this, and hence there is a risk that the benefits associated with AMA accreditation may not have been realized if this move back to a more simplified approach is sooner than expected.*

- *The Bank would not have sufficient data available to develop accurate model estimates and so would have had to establish scenarios and management committees to discuss and agree these. This would not be a concern on the more simplified approaches.*
- *AMA accreditation requires the Bank to make use of internal loss data. This is an onerous requirement and many Banks have been unable to meet this requirement due to system and process changes. This would no longer be required.*

QUESTION 4

A large South African bank has successfully implemented IFRS 9 for the calculation of its credit risk provisions for financial reporting purposes. It currently offers both Retail and Wholesale lending products, and its key exposure is to Retail Mortgages and Credit Cards. The Bank also has existing Basel models in place and is currently AIRB accredited.

The bank has recently completed its annual monitoring exercise and you have produced the following table illustrating the breakdown of exposure by stage. The analysis below shows the actual development of the portfolio that was in force at Q1 2018.

Most candidates

Portfolio	Stage	Q1 2018	Q2 2018	Q3 2018	Q4 2018
Mortgages	Stage 1	800,000	750,000	725,000	700,000
	Stage 2	150,000	200,000	200,000	225,000
	Stage 3	100,000	100,000	125,000	125,000
	Total	1,050,000	1,050,000	1,050,000	1,050,000
Cards	Stage 1	400,000	350,000	300,000	250,000
	Stage 2	100,000	150,000	200,000	250,000
	Stage 3	50,000	50,000	50,000	50,000
	Total	550,000	550,000	550,000	550,000
Wholesale	Stage 1	2,000,000	1,800,000	1,900,000	1,700,000
	Stage 2	300,000	500,000	400,000	550,000
	Stage 3	50,000	50,000	50,000	100,000
	Total	2,350,000	2,350,000	2,350,000	2,350,000

- i. Analyse and comment and on the results.

- *Candidates should produce a table showing the relative proportions in each stage over time:*

<i>Portfolio</i>	<i>Stage</i>	<i>Q1 2018</i>	<i>Q2 2018</i>	<i>Q3 2018</i>	<i>Q4 2018</i>
<i>Mortgages</i>	<i>Stage 1</i>	76%	71%	69%	67%
	<i>Stage 2</i>	14%	19%	19%	21%
	<i>Stage 3</i>	10%	10%	12%	12%
	<i>Total</i>	100%	100%	100%	100%
<i>Cards</i>	<i>Stage 1</i>	73%	64%	55%	45%
	<i>Stage 2</i>	18%	27%	36%	45%
	<i>Stage 3</i>	9%	9%	9%	9%
	<i>Total</i>	100%	100%	100%	100%
<i>Wholesale</i>	<i>Stage 1</i>	85%	77%	81%	72%
	<i>Stage 2</i>	13%	21%	17%	23%
	<i>Stage 3</i>	2%	2%	2%	4%
	<i>Total</i>	100%	100%	100%	100%

[1]

- *Considering the Mortgages portfolio*
 - *Stage 1 proportion appears to be steadily declining from 76% to 67% over the year.*
 - *The proportion of Stage 1 to start with is already quite low at 76%, especially when compared to Cards. Usually Mortgage portfolios are lower risk and relatively better quality (i.e. lower default rates).*
 - *Stage 2 increased from 14% to 21% over the year*
 - *This is expected to increase the Bank's provisions given the relatively long maturity of Mortgages (and hence lifetime ECL is required over several years)*
 - *Stage 3 remained relatively flat. This indicates that not many of the additional Stage 2 exposures ended up defaulting*
- *Considering the Cards portfolio*
 - *Stage 1 proportion appears to be have decreased significantly from 73% to 45% over the year.*
 - *At the same time Stage 2 increased significantly from 18% to 45% over the year*
 - *This is expected to have a large impact on the Bank's provision (depending on the remaining lifetime assumed for the Credit Cards portfolio)*

- *Stage 3 did not change over the year which indicates that none of the new Stage 2 customers ended up defaulting*
- *Considering the Wholesale portfolio*
 - *Stage 1 proportion appears to have decreased from 85% to 72% over the year.*
 - *At the same time Stage 2 increased from 13% to 23% over the year*
 - *This is expected to have a relatively smaller impact on the Bank's provision as wholesale customers tend to have shorter tenors and relatively lower loss parameters*
 - *Stage 3 increase from 2% to 4% indicating that some customers defaulted over the year. It's not clear whether these new defaults are from Stage 2 or from Stage 1*
- *The above results may indicate one or more of the following:*
 - *The Bank's staging criteria may not be working correctly. It is unusual for there to be such large changes in stage allocation over a relatively short period.*
 - *Additionally, it does not appear that any of the additional stage 2 customers (i.e. those identified as being higher risk) ended up defaulting*
 - *This is especially true for Retail where the trend has been clearer. For Wholesale, there appears a bit more volatility, which is not unusual. For example, one additional or fewer customer moving into or out of Stage 2 can result in the movements seen above. For Wholesale, the Stage 2 allocation is also likely to involve more manual processes where rules on classification could have been updated during the year (e.g. use of a different watch list trigger)*
 - *The Bank's credit scoring models may need recalibration if the additional stage 2 is because of a deterioration in current PD estimates (without any real change in the underlying customer riskiness)*
 - *This is unlikely as credit scoring models tend to not deteriorate this rapidly*
 - *The increases could be because of macroeconomic conditions worsening over the year, which would indicate that the outputs are potentially correct (if this is a true indication of expected loss)*
 - *Similarly, it's possible that the deterioration could be due to the worsening in the credit quality of the existing book. These customers may have been*

underwritten assuming that they were better quality than they've turned out to be in actuals (ratings assumption mistake).

- *There could be a large increase in the number of customers that have missed payments (30 Days Past Due or more)*
 - *This would be extremely concerning given the significant deterioration over a relatively short period and the relatively long tenor of some of these customers (Mortgages)*
 - *Additional investigation would be required to establish the true reason for the results. An assessment is needed to confirm whether these are real increases in risk or due to issues with parameters or models, or in the underlying production environment, process changes impacting the risk drivers.*
 - *It is recommended that this be carried out as soon as possible given the extent of deterioration. All the changes in stage are considered "net" effects, so there could also have been offsetting movements, which could further mask the extent of underlying issues.*
- ii. The CRO is concerned that, should the staging results be because of issues in the underlying IFRS 9 probability of default models, that a full redevelopment of the banks AIRB models would also be required. Comment on the CRO's concerns.
- *It is generally considered good practice to have alignment between models that intend to capture similar behaviour. This does not necessarily however mean that the models are expected to be identical.*
 - *For example, the PD models for a Mortgage portfolio is likely to have similar segmentation and methodology, irrespective of whether it's for Basel or IFRS 9 purposes*
 - *Basel models are however generally intended to produce more conservative estimates given that they are used for capital calculations. IFRS 9 models on the other hand are intended to be unbiased estimates of loss. Therefore, it may be that the Basel models are still performing adequately despite deterioration in the IFRS 9 models*
 - *This also depends on whether the bank uses Basel or IFRS 9 models as their basis for loan pricing. Should the Basel models be used for this purpose, and the above deterioration is because of changes in the portfolio, it would be advisable to also review the Basel models to ensure they remain appropriate.*

- iii. The Bank has just completed its most recent quarterly reporting exercise and the CFO has indicated that she would like to understand the drivers of their current provisions better, particularly actions that can be taken to optimise the provisions on the Bank's loan portfolio from a strategic point of view.

Discuss the potential ways in which the Bank could manage its IFRS 9 Expected Credit Loss provisions.

- *The Bank can manage its IFRS 9 ECL in the following ways:*
 - *Adjust unutilized limits on Credit Cards, Revolving wholesale, and Revolving type single facility Mortgage products.*
 - *Decreasing limits would reduce provisions to mainly on-balance sheet exposures.*
 - *It could be that the bank has allocated excessive limits which customers do not use and so excessive provisions may be held*
 - *On the other hand, this may have a negative impact on customer perceptions if they like the idea of having a large limit available.*
 - *Similarly, if the Bank has the appetite to take on additional provisions and exposures, it could increase limits to attract more customers or increase lending to existing customers.*
 - *This would also directly affect the Banks capital requirements on these portfolios, so could have a knock-on effect*
 - *Modify the duration / term of mortgage portfolios*
 - *The Bank could aim to reduce the duration / term of mortgage contracts offered as any loans subsequently classified into stage 2 will carry lower provisions*
 - *This may however have impacts on the affordability of the mortgages for customers all else being equal*
 - *This may also have a negative impact on customer perceptions if they like the idea of being able to pay off a Mortgage loan over a longer period*
 - *Conversely, an increase in duration would result in an increase in provisions if customers move to stage 2, however mortgages may be more affordable, and hence the likelihood of deterioration could be less*
 - *Any change in duration would only have a minimal impact on the current provisions (and would be slow to impact over time), as it would only affect newly originated customers.*
 - *The bank will need to balance the above two considerations against competitive pressures, as making significant changes could see a loss of business to competitors, or attraction of significantly more business (which may be of a different quality to the existing portfolio)*

- *Missing payments (30 days past due) is likely to be a large driver of accounts classified into Stage 2, and hence cleaning up arrears can have a significant impact.*
- *This could be done by:*
 - *Calling customers currently in arrears to encourage them to make payments*
 - *Reminding customers of their payments before they become due. The above could be because of many “false triggered” accounts where they roll back to Stage 1 in the following month.*
- *The current PD model calibration may not be appropriately capturing risk. This should include a review of the staging methodology to reduce false positives (Type 1 and Type 2 errors) or at least limit volatility*
 - *The Bank can assess whether a recalibration or rebuild is necessary*
 - *It may not be granular enough to capture true deterioration in credit risk, and so some loans may be classified into Stage 2 when they would be in Stage 1 under a more granular model. Similarly, it may be classifying too many accounts into Stage 1.*
- *If the above trends are because of poor origination practices, new loans originated can be done on stricter basis, hopefully reducing the extent of further deterioration*
 - *Eventually older and riskier loans will run off the balance sheet and so the bank will see a gradual decline in Stage 2 ECL over time.*
 - *Increase collateral requirements for Mortgages and Wholesale, likely reducing LGDs, and improving the distribution of accounts into better LTV buckets.*
 - *The above two points are not immediate fixes, and it will take time for improvements in origination strategy to feed through to the provisioning levels.*
 - *If the Bank wants to increase market share and has the appetite for increased provisions, it could continue its current origination strategy and look to grow its portfolio.*
- *Identify causes of forward-looking impact and act to optimise exposure to these effects.*
 - *For example, property prices in an area may be particularly depressed, and hence the Bank may look to reduce or increase exposure to that area*

To incorporate forward looking information into the provisions, the Bank has developed the following macroeconomic linkage model for Loss Given Default (LGD). (PPI is Property Price Index, GDP is Gross Domestic Product).

$$\text{LGD}_{\text{Mortgages}} \sim 0.45 - 0.05. (\Delta\text{GDP}) - 0.3. (\Delta\text{PPI}) + \varepsilon$$

- iv. Comment on the above relationship, including general best practice in developing statistical models.

Overall equation appears to be linear in nature i.e. a change in a macro-economic variable result in a proportionate response in loss rates

- *This is not usually the case for macro-economic models where loss rates usually follow some sort of non-linear relationship*
- *I.e. Deterioration in MEVs are usually expected to have increasingly worse impacts on loss rates*
- *It would be necessary to review the model fit statistics to comment in detail as to the appropriateness and goodness of fit for this model*
- *It may be that variables demonstrate multicollinearity, or other model fit statistics (VIF, R-squared, etc) show poor fit*
- *It is also recommended that the output are tested over a range of macro-economic conditions to ensure that the outputs perform as expected. Scenario testing can provide valuable insight into what outputs would look like under forward-looking conditions.*
 - *Mainly driven by changes in Property Prices (looking at the relatively large Beta for this variable). This is as expected for a Mortgage LGD model as the main source of recovery is the collateral price*
 - *It may be that the model needs to be segmented by Loan To Value bands as different bands may show different responsiveness to changes in MEVs*
 - *The relationship to GDP does not look very strong (looking at the relatively small Beta).*
 - *No change in GDP or PPI would imply and LGD of approximately 45%, which does not appear unreasonable for a Mortgages portfolio*
 - *The signs of the relationships appear intuitive. Increase in GDP and PPI would result in lower losses*
 - *It is possible that a two factor model is not necessary for the Mortgages portfolio. It could be that a one factor model is sufficient (given the large beta for property prices) or that more factors should be considered.*
 - *It is possible that other variables or transforms need to be considered to obtain a more robust model*

- v. Describe the steps the Bank would have taken in developing this model.
- *The first step is to source observed loss rate data over a period that represents an economic cycle. A longer period of data is preferable to a shorter period*
 - *This data should be reviewed for outliers. As the Bank is trying to model changes in loss rates against changes in macroeconomic conditions, outliers may bias the results*
 - *Identify any periods that may be affected by changes in policy decisions / underwriting / management actions as this may bias the results*
 - *Ensure portfolios remains representative over the period (i.e. no other changes in product mix, new products etc, that may bias the time series)*
 - *The second step is to source a long list of macro-economic variables*
 - *This data should cover the same period as the Loss Rate data so that a relationship between the two can be developed*
 - *The bank should be able to forecast these variables going forward. As the ECL is intended to be forward looking, the Bank should exclude any macroeconomic variables that it can't forecast (as then the model won't be able to be used)*
 - *The next step is to perform transformations of the macroeconomic variables. Transformations are required to ensure that models are robust and spurious relationships are not identified*
 - *Common transformations are (lags, lead, log, difference etc.)*
 - *After the above transformations are completed, univariate regression analysis is performed to determine which variables show:*
 - *The aim is to shortlist variables that demonstrate a strong relationship with the loss rate. Limiting the number of variables reduces the number of combinations of multivariate models that are produced*
 - *Variables should have an intuitive sign. For example, as property prices increase, it is expected that loss rates for mortgages will decrease. Non-intuitive results would lead to the exclusion of the variable else nonsensical results may be obtained when forecasting ECL.*
 - *The variable should make business sense. For example, it's not intuitive that loss rates on a Credit Card portfolio be affected by a foreign country's GDP (despite there being correlation, this doesn't indicate causation)*

- *Once the long list of variables has been shortlisted, the next step is to perform multivariate regression*
 - *Limit number of factors to 3-4 (to ensure a parsimonious model). Too many factors may result in spurious models that are complex to maintain and interpret.*
 - *Variables should have an intuitive sign in multivariate space. It may be that due to interactions between multiple variables, signs become non-intuitive during multivariate regress. These should be avoided.*
 - *The shortlisted multivariate models should go through a process of statistical validation. This is to ensure that the models are robust and fit-for-purpose.*
 - *Sample tests to include are autocorrelation, goodness of fit tests, and normality of residuals etc.*
 - *Following statistical validation, the remaining models are presented to representatives from the business and portfolio teams to perform business validation of models*
 - *An independent validation is also generally considered good practice.*
 - *The final models should also go through a process of scenario and sensitivity testing to ensure that they work under a range of conditions*
 - *Results are intuitive. When downturn conditions are forecasted, loss rates should increase, and vice versa. The relationships should be checked with the Bank's economic team.*
 - *The chosen model should not be overly sensitive to changes in macroeconomic conditions else it will introduce significant volatility into the ECL results.*
 - *Similarly, the model should be sufficiently sensitive to changes in macroeconomic conditions. A model that does not respond to changes in conditions will not meet the requirement of producing forward looking ECL results.*
- vi. The CRO and CFO have decided that it is not possible to capture all possible risks in the underlying models, and so are looking to hold specific management overlays over and above the base provisions. Discuss the concept of management overlays and the process to be followed in establishing these.
- *The first way to identify whether risk is not being captured in the models is to perform detailed model monitoring. In this way the Bank can identify whether changes in*

provisions are because of model parameters changing over time, or because of external factors. It is important that overlays do not result in a misstatement of the Bank's financial position and can be supported by data and adequate governance.

- *Where changes are because of trend in underlying risk drivers, the bank can frequently recalibrate its model parameters. In doing so, it can minimize any mismatch between what the model is estimating, and what actual loss experience shows. In this case, minimum overlay would be required*
- *Where the models are not adequately capturing risks, the Bank can develop an overlay framework to adjust ECL outputs. The Bank should also consider any implicit overlays in the models as these may come about due to judgment applied in the model build process.*
 - *The bank may find that some factors cannot be captured in a statistical manner, or that the data used to develop the models doesn't capture more recent experience.*
 - *For example, some locations in which it has property loans may be exhibiting higher loss rates than other areas. However, it may be that there is no reliable property price index available for that area.*
 - *In these instances, the Bank may decide to use a judgmental expert judgment approach to adjust ECL's up or down to account for this risk.*
 - *As these adjustments are not model driven, the Bank will need a well-documented process that explains how this adjustment is quantified.*
 - *This process would also require rigours debate and sign off by relevant committees in the bank as well as clearance by the bank's external auditors.*
 - *Overlays should be based on quantitative analysis where possible. If for example, PDs are increasing over the past 6 months but the model averages over a 24-month period, the Bank can consider making an adjustment to reflect this deterioration while the model calibration takes time to catch up.*
 - *These adjustments are not expected to be permanent. This adjustment must be removed over time as the model catches up, or as the experience reverts to "normal"*
 - *The Bank will need to frequently re-assess the need for these overlays, and document how they plan to release them over time.*
 - *Overlays may also be used to cater for extra model uncertainty or perhaps the use of an outdated model which has not been refreshed/recalibrated.*