**One difficult I encountered during the internship**

Customer behavior modelling for individual and small business customers

**How to deal with hardship**

Customer behavior modelling for individual and small business customers

Hardship: not familiar with SAS; challenge from my manager

**How to get along with colleagues**

Self-introduction

Nice to meet you Gemini, it is of greater pleasure to receive this interview from you. My name is Xinwei Long, Jason, currently a senior student at Hong Kong Baptist University, majoring in Finance and minoring in Applied Math. I have been developing great interest in risk management since I took the FRM exams and transferring the knowledge into practice during 2 internships. Also, I am continuously enhancing skills required by risk and business analytics, try to learn the analytic tools commonly applied in risk measurement, and keeping abreast with risk management practice and current issues related to risk management. During the internship at Credit Risk Analytics team at HSBC, I was involved in PD model redevelopment, regional stress testing, data supplier review and model governance projects, in which I quickly picked up analytics skills and tools and firmly kept in track with these projects. While participated in risk advisory project at KPMG this summer, I improved my competencies in interest rate products pricing, risk modelling, teamwork and business communication thrught the cooperation with team members and client’s personnel to provide consulting services. We successfully help the client deliver risk reporting complying with the updated HKMA IRRBB regulations.

Therefore, I have an outmost passion in Financial Risk Management team at KPMG, I believe my knowledge and experience will make a difference for the team by providing value-added services to the clients. I also believe on the platform that KPMG offers, I will achieve substantial growth on my career path.

**Why Big 4:**

1. International companies, give graduates more **opportunities to learn and practice**
2. Big 4s are known to have mature **training system**

**Why KPMG**

**Mission Statement:**

Turn **knowledge** and understanding of information, industries and business trends into **value** for our firms; clients, our people and the capital markets. The statement clearly states what the company seeks to implement while at the same time having the interests of its clients and the sector it operates in at heart. Based on this, the following characteristics can be associated with the mission statement

**Vision Statement:**

Distinguished by the **learning opportunities** offered, through a platform which shares the expertise, knowledge and experience of professionals across a **global network**. KPMG meets this need by demonstrating through its wide range of activities that it does not just offer routine services. The company has dedicated efforts towards endeavors that generate new strategies, reaches out to institutions.

**Core values:**

**Leading** by example, working**together**, **respecting** individuals, **seeking facts and providing insights**, being openand honest in communications, commitment to communities, and acting withintegrity

-The first one reflects how KPMG strives to stay at the top with excellent services informed by research. It closely relates to the wide network of the company that promotes cooperation with all its network of firms, while emphasizing on respect, and evidence-based progress as shown by its second, third and fourth values.

2. KPMG is most attractive for **financial customers** within Big 4s

**3. Experience**: Worked as a summer intern at Financial Risk Management, feel engaged and motivated, and gained a lot in KPMG, want to start my first full time career at KPMG advisory

**The project involved, what is the take-away**

**Candidate: IRRBB**

Optionality risk valuation: behavior models for individual and small business customers, pricing of embedded options for wholesale customers.

-Support your delivery with evidence, pay attention to details: challenged by managers about the model results and methodology; Eg: SMM results, all equals to 0, validated results with waterfall of deals in each step of data adjustment, no deal qualified for modelling scope after all data adjustment.

-Efficient collaboration and communication with clients is essential to complete the advisory projects: Gave feedback to clients and inform them of the project progress, consecutively inquiring clients for their business and concerns at key steps of the project to better understand their demand and calibrate our process. Eg: UAT

**Why Financial Risk Management (Insights into the department)**

**Interest**: During the process of preparing FRM exam, gain basic knowledge of risk management framework and risk measurement methods that are commonly applied, and update of the industry trend. Develop the interest on the way to pass FRM.

**Practice**: I luckily took part in the risk advisory project this summer. The project is about reporting on the Interest Rate Risk in the Banking Book (IRRBB), in which I could put what I learnt into business practice and improved these skills such as risk modelling with programming languages, business communication with the client, and cooperated with my colleagues. These skills well prepared me for starting full-time job in risk management department

**Platform that KPMG provides**:  Financial Risk Management Department is a perfect place to start and enhance my abilities in providing risk management services by my experience at KPMG.

**Why you (your advantages over other candidates**

**{reference: relevant experience, continuous learning ability, transferring skills (experience)}**

1. **Experience** in risk management team at KPMG & HSBC:

I first came across risk department at HSBC, where I served as an intern in credit risk analytics team. Enriched knowledge in risk modeling and stress testing by being involving in PD model re-development and Singapore and Philippine stress testing. Then, at KPMG, I took part in the IRRBB project. I believe these experiences can help me better involve in the team and make a difference.

1. **Continuously improving skills** and business acumen required by risk advisory: The internship experience at HSBC and KPMG has well training me to pick up and implement new skills at the workplace. At HSBC, I learnt the stress testing process by studying the excel templates and operation manual, and successfully generated parameters as required. At KPMG, I picked up SAS programming skills and VBA skills to deliver the model results to the client. Therefore, I believe I can master the necessary tools and be familiar with advisory business in a short time.
2. Strong **interest in risk management** and desire to learn more: I firstly developed my interest in risk management when I took FRM exam, during preparation for the exam, I have got to have a general view of risk management. Then during the internship, I found myself really enjoying constructed and modified the excel or programming templates to model the risk in portfolios. Also, it was quite inspiring to work with other professional for better measurement of risk embedded in various products. The financial industry is still greedily exploring for better risk management framework, and I definitely want to be a part of it.

**Career plans**

1. Most important is to have **good working and training environment in KPMG**, engage in projects and accumulate **my experience and strive to learn more**
2. I plan to go for **CFA exams** and pass the first 2 levels. I will try to pass first levels within 2 years while develop me professionality in risk advisory. Then finish the final level within 2 years. Or based on my need, I will go for a master’s degree in financial engineering
3. Before 35 years old, I will try my best to gain a senior level position in KPMG
4. The longer-term career path will depend on situations

**Interest**

1. Fitness: enjoy pushing my limits, exploring the techniques and process to formulating a good schedule of workout that can best engagement my body
2. Singing: enter the final round of singing contest in the University

**Current Issues:**

1. **ESG issues impact Company’s risk management framework (regulations, rating agencies: MSCI ESG indexes, asset holders)**
2. **Contraction of Chinese Economy: HSBC Global research**
3. Three why (why company, why this department, why you)
4. Project experience/ intern experience (STAR principal)

**Experience**

**Behavior model:**

S: IRRBB regulations required authorized institutions valuate the optionality risk of individual customers and small business customers. There are generally 2 types of relevant products: term deposits whose remaining balances can be early redeemed; fixed rate loans whose remaining balances can be prepayed.

T: There are 2 candidates model we can build for the client, namely customer behavior model and linear regression model. Since our client is a middle size local bank, we decided to use customer behavior model, with which we generated baselined TDRR and SMM based on client’s internal historical data. I was offered the SAS code serving the same purpose from another client of our team. I think we can leverage on the code and modify the parameters

A: I was not very familiar with SAS programming before I joined the team, but based on my knowledge in R and Python and by quickly reading through SAS guiding book online, I picked up necessary rules in SAS coding. By reviewing the documentation of the code and code itself, I streamlined the logic, listed out the essential database and inputs of the code.

After obtaining the results from modified code, I showed validation of the results by separating the code into multiple pieces and provided the results in each step to my manager. On the other side, my manager challenged my results with her business acumen and experience to encouraged me to better validate the results

To conduct deeper analysis on customer behavior and convince the client of the results, I made tables of waterflow showing how deals change in each step of modeling, grouping the deals information by currency, grouping the balances of relevant products by currency to identify the currencies to disclose by the client.

R: we delivered the results to the client, which are then updated to client’s internal IT systems to conduct further stress testing

**Option pricing**

S: IRRBB regulations required authorized institutions valuate the optionality risk of wholesale customers. There are generally 3 types of relevant products: term deposits whose remaining balances can be early redeemed; fixed rate loans whose remaining balances can be prepayed; Callable bond. We need to price these embedded options in these products under 1 baseline interest rate scenario and 5 stressed interest rate scenarios. The valuation is scheduled to be done on RiskManager, but the system is not available during project period.

T: We decided to use Bloomberg that is available for the client and based on team’s experience of previous projects and similar settings. But to find the best instruments to mimic the optionality embedded is not easy, and I find some settings on Riskmanager are not available on BL. Eg. Cannot freely specify the forward curve used to calculate float leg margin; Cannot directly specify if we allow negative interest rate under stressed interest rate curve;

A: Firstly, I with my team members searched through the Bloomberg terminal and inquiring the live helping desk of Bloomberg to identify the functions and settings used for valuation. Meanwhile, at team’s meeting, I presented my findings to the managers and we discussed the fitness and rational of settings on BL in terms of client’s products. I also leveraged on results of product pricing from other banks for validating the settings, by trail and errors on Bloomberg and compared my output with existing results, I tried to validate the settings.

Finally, we decided to use swaption in Bloomberg to price the flexi deposits and fixed rate loans; cancellable loan to price callable bond. I went through the settings on BL, during which I addressed several technical problems by turning to help desk and documented the these covets and templates for client’s future leverage.

R: Mimic the option in deposits with long swaption that pays fixed leg; Mimic option in loans with long swaption that pays float leg; Price option in callable bond with cancellable bond, obtain option value by subtracting villain bond value by cancellable bond value

**UAT**

S: To finalize the IRRBB reports (12A&12B), we must help the client test the system logic that generates reports and make sure it is in line with the regulation requirement

T:

A: We extracted the raw data from client’s dataset by using Oracle SQL server, to test whether the reporting figures from client’s system are valid, we should replicate the logic and map it to SQL, then obtain the results and compare them with client’s results. If discrepancies are detected, we gave feedback to the client’s and induced the client to communicate with the IT department to correct the system logic

R: The client fixed the logic problem and submit the reports to HKMA before DDL

**Documentation**

S: After punctual IRRBB reporting to HKMA, our team’s focus is to document the methodology, rational and process of modeling; Also, to make sure the client can replicate the process in the future reporting and facilitate their modification, I and team members will make operational manuals. We should also make the format of results from SAS and BL consistent with client’s internal system, so that client’s can input the results into system.

T:

I found out that the format of the behavior modeling output from SAS is not in line with the required format of input into the client’s system, so I needed to do some modifications on the SAS output.

Also, to validate the SAS output, I should record some key information of deals under modelling scope, but the code for checking these items is not available.

Lastly, the tools to conduct pricing of embedded options in client’s products are different from the peers, so I should establish a new documentation of methodology

A:

To convert the format of output from SAS, since the final input to system is on excel spreadsheet, I decide to leverage on VBA to do the conversion instead on SAS code, which is more understandable and clearer for the client and easier for the client to maintain. I firstly obtain the input format into client’s system, then write and test the codes with real and hypothetical results from SAS, finally submit it to my manager to review.

To record the key information of deals under modeling scope, (such as balance of unique deals for each currency, remaining number of deals after each step of data adjustment, the time gap between the first and last deal for each currency) I leverage on the SAS code.

R: I submit the SAS scripts used for documentation and output the results on excel and word for maintenance.

**PD Statistics & Backtesting**

S: PD model in terms of wholesale customer portfolio was re-developed for IFRS9 impairment requirement. When I was involved in the project, the team was integrating the input data and preparing for analyze the statistical testing on candidate models. Afterwards, we backtested the results from models using the excel template provided by the group.

T: To decide the final input data, we had to made decisions on 2 dimensions: which set of macro economics variables to use and how we transferred them with time-series technics. To see the statistical testing, I used R to keep in line with my colleagues.

A: I outputted the statistical testing results with R packages installed on RStudio after coding.

After filtering out candidate models, I tested the performance of the candidate models by inputting the results of PD for different portfolios into excel tools for backtesting, reported the huge discrepancies found.

R:

**Review data supplier**

S: Data supplier of our models is very likely change from Oxford Economics (OE) to Moody’s Analytics (MA), to have a sense of how the probable change will impact our existing models’ performance and prepare for the change, analysis was conducted. Base on the analysis, warnings of possible significant impact from switching the suppliers would by reported to the group

T: To fully review the impact, there are 2 directions we went for. Firstly, we went through the comparisons of raw data and their distortion in each step of time-series transformation of 2 suppliers. Secondly, we input them separately in our PD, LGD and TDR models to capture the discrepancies and analyze the discrepancies with comparisons. Finally, we group the impact by portfolio (portfolios are divided by region, they each refer to different set of variables, different method of transformation)

A: To make sure the modeling logic is right, we first tried to replicate the previous model results with the data provided by existing data supplier.

Then, raw data and their transformation are compared and graphed, I filtered out several variables and their transformation in which huge discrepancies were observed. Then, to rank the severity of the discrepancies in our total portfolios, I weighted the discrepancies by balance of portfolio the variables belong to.

Meanwhile, the data was plugged in model, the discrepancies in model results were also captured and weighted by portfolio balance

The most important thing was the reasons of discrepancies in model results, that is developed the bridge between data comparisons and model results comparisons. To build this bridge, I firstly collected those portfolios where significant discrepancies were detected in model results and data. The sequential impact can be easily explained. The most challenging part is to explain the huge discrepancies in model results for certain portfolio, where data discrepancies may seem not so huge. For those models, I conducted deep investigation into the modelling logic and algorithm, I found out this phenomenal is caused by the functions in certain step of calculation. The small discrepancies in certain variables were exaggerated and some directions of discrepancies are distorted in steps of calculation.

To further quantify the severity of discrepancies in each portfolio. I discussed with my colleague, and we developed some criterial to test the severity (eg. % difference in variable coefficients, % difference in mean value of variable, % difference in R square of model with 2 data suppliers…), those discrepancies not passing the test are signed as warning.

R: After convincing the line manager, we drafted the report to the group with the findings.

**Stress testing**

S: I participated in the Philippine and Singapore stress testing, in which I was responsible for outputting stressed PD parameters for different time intervals. Since there is no PD model available for these regions, their stressed will com from the combination of PDs from other regions that our models have covered

T: The stress testing went through several steps. I believe the primary information I need to understand are the logic flow of the stress testing, templates that map the logic flow, inputs to the template, and sources of cross checking and validating the results.

A: I picked up the steps by reading the operation manuals and investigating the logic flow in each key Excel templates. Through studying the template, I identify the 4 inputs: Baseline PD projections from PD model; Stressed macro economical variable for stressed PD projections calculation; EAD distribution to scale or weight the PD projection; expert opinion on finally scaling the stressed PD parameters.

Firstly, I extracted EAD distribution across time intervals for corporates, banks and sovereigns in a global data set for respective portfolio. The matrix of EAD distribution across different time intervals and customer types are derived. Then I inputted the stress variables, use coefficients in PD model to calculate the stressed PD. The EAD matrix is then scaled stressed PD matrix by summing up the products of the EAD and stressed PD for each customer. After the scaling, I get the initial stressed PD projections for all customer types for each time interval. Then the 1st stage PD was derived: Stressed PD/Baseline PD

Then, by inputting the stressed PD in the templated where expert scaler is inputted, I received the final version of stressed PD projections.

R: I submitted the results to another colleague for double-check, we then submitted the review results to line manager for approval.

**Model governance**

S: One Excel template was developed to document the model problem findings and advice from Independent Model Review team, and for searching and grouping them by different categories. Based on the new requirement of my senior manager, the excel template should be updated to fulfill more information look-up demand.

Also, one Excel template was developed to generate RWA and EAD reports for each model and portfolio on a quarterly basis.

T:

A: In the new excel template, I designed formulas to differentiate findings in terms of IFRS9 issues and stress testing issues.

For RWA/EAD, I developed the R codes to update the figures, which makes the process more automatic and freer from operational risk of mis-manipulating the excel template

R: For RWA/EAD, I developed the R codes to update the figures, which makes the process more automatic and freer from operational risk of mis-manipulating the excel template

**Research on climate-change stress testing**

S:

T:

A:

R:

**Pre-IPO auditing**

S:

T:

A:

R: