

TECHNOLOGY CONSULTING

IN THE GLOBAL COMMUNITY

Final Consulting Report

Palau

Financial Institutions Commission

Laknath Gunathilake

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Carnegie Mellon University



Palau Financial Institutions Commission



Executive Summary

Student Consultant - Laknath Gunathilake

Community Partner - Cjay Shiro

I. About the Organization

The Palau Financial Institutions Commission (FIC) is an independent regulatory agency, and a six member-board governs this organization. The FIC was established in 2002 and is located in Koror. The mission of the organization is as follows.

To establish and maintain a financial regulatory and supervisory system for the Republic of Palau, consistent with international standards, which promotes a stable banking and financial sector that facilitates economic growth and development.

II. Goal 1- Disaggregating the Excel Application

The two excel applications for calculating aggregate banking information and UBPR ratios are large and cumbersome to work with due to their dependencies on previous years.

Outputs

- Created a template that can still conduct calculations without having to rely on eight years worth of previous data
- Trained the Bank Examiner to structure condensed excel templates that are easy to navigate.

Outcomes

- Faster boot time due to smaller file size
- Ability to navigate the excel application without lag

Recommendation

- Disaggregating the excel worksheets is a short-term solution, and as reiterated by the consultants in 2018 and 2019, the FIC should look towards transitioning out of the existing excel frameworks to building an application that can replicate these tasks (One of the goals of my consulting engagement is also to create a roadmap for this, highlighted in goal IV)

III. Goal 2- Creating a SQL Database to Store Prudential Returns Received by the Banks

The FIC does not have a structured place to store and retrieve the Prudential Return (PR) data submitted by the banks. By creating a SQLite database with a graphical user interface, the FIC

now has a place to store and query data and a foundation for building a more robust application to replace the existing excel setup.

Outputs

- Created a SQLite database and migrated all past data from 2012 until the present.
- Created an R script to migrate quarterly data Cjay will receive in the upcoming quarter
- Linked a graphical user interface (GUI) called DB Browser to access and filter tables from the database.
- Trained the Bank Examiner to use the GUI and run R scripts to migrate quarterly data

Outcomes

- Cjay can explore aggregate level data from Banks using various filters using DBbrowser.
- SQL queries could be used to replicate the calculations used in the current excel applications for calculations

Risks to Sustainability

- According to the Bank Examiner, there could be changes to the PR template In the future, and the current data migration scripts would not work correctly if and once these changes go into effect.

IV. Goal 3 - Creating a road map to transition to a more robust application

The objective here is to provide a general outline of the tasks needed to transition out of the current excel-setup and to explore existing solutions used by similar agencies outside of Palau.

Outputs

- A Project specification document to be utilized for project planning

Outcomes

- A high-level assessment of the overall tasks required for completing this project.

V. Goal 4- Automating Report Generation for Annual Banking Reports

Compiling the yearly banking reports often requested by external parties require the bank examiner to open up multiple excel documents and copy-paste values from these. Automating this task has led to the following outputs and outcomes

Outputs

- An R script that automates report generation

Outcomes

- Less overall time spent on creating tables required for this report and validating accuracy

Consulting Partner

bankexaminer@ropfic.org

Cjay Shiro

Financial Institutions Commission

P.O. Box 10243

Koror, Palau 96940

<https://www.ropfic.org/index.html>

About the Consultant

Laknath Gunathilake

lgunathi@andrew.cmu.edu

Laknath is a MS student in

Policy, Management and Data

Analytics at the Heinz College

Facilities

The following describes the physical layout of the FIC. The FIC office is on the second floor of a building in Koror and shared with the Financial Intelligence Unit (FIU)- a government organization that investigates and monitors all financial activity in Palau. In the office, there is a lobby area with a desk where Tikei works.

The Executive Commissioner and the Bank examiner use two office rooms. Both rooms have sufficient lighting, adequate power outlets, and air conditioners, which create a good work environment. The office room where Cjay works has a six-person desk, and it serves as the conference room. The Network Access Storage (NAS) is in this room. The front door and other doors are locked during non-work time to maintain office security. Staff members of the FIU and the FIC are the only people with keys.

Since the 2021 consulting engagement is virtual, I received this information from the FIC report from 2019 and verified it with Cjay.

Programs

The FIC is responsible for the oversight, supervision, and regulation of the Republic of Palau's financial sector. The FIC evaluates proposals for forming new banks on the Island and conducts on-site and off-site monitoring of banks.

The FIC also evaluates quarterly Prudential Returns (PR) submitted by the five banks in Palau. The FIC uses BASEL principles for analyzing the financial health of the banking industry. These are a set of reforms developed by the Basel Committee on Banking Supervision (BCBS) to strengthen regulation, supervision, and risk management within the banking industry.

The key ratios are part of the BASEL framework, and this framework is used in the excel files used for analysis.

Insights from monitoring activities of the banking and finance industry are reported on the FIC website.

The FIC uses the existing information technology resources system for storing and analyzing the prudential returns. Information received from the banks is stored in the Synology Drive-a network access storage (NAS) device and is also a shared drive in the office. The organization also utilizes a MySQL database set up by the FIC consultant in 2019 to store quarterly reports. However, this is no longer in use.

Staff

The FIC currently has three full-time staff members.

Mr. G Semdiu Decherong – Executive Commissioner

In 2002 Mr. Decherong was appointed as the Executive Commissioner. He has a B.B.A in Management and an MBA from the University of Guam. He has prior experience in commercial and consumer lending and is also trained in financial analysis and risk management. His knowledge and expertise also extend to anti-money laundering and counter-terrorism financing.

Mr. Cjay Shiro- Bank Examiner

Mr. Shiro joined the FIC team in March of 2020 as a Bank Examiner. He holds an Associates's Degree in Liberal Arts from Kapiolani Community College and a bachelor in Business Administration and Marketing from the University of Hawaii. He is currently working on his Masters of Science in Finance from the University of Hawaii Manoa. Mr. Shiro has prior experience in commercial insurance and finance. He also has certified training in operational analysis and risk management in anti-money laundering. Mr. Shiro also brings additional management accreditation from his ten-plus years of active-duty service in the United States Military. Mr. Shiro conducts onsite examinations and performs off-site analyses of reporting financial institutions from quarterly prudential returns.

Ms. Valorie Tikei Sbal-Administrative Officer

Ms.Sbal joined the FIC in 2010 as the office manager and in January 2013 became the filing officer for the secured transaction registry for the Republic of Palau. Ms. Sbal is responsible for the maintenance and organization of the FIC’s administrative tasks, duties, and documentation.

Technology Infrastructure

| | |
|-------------------------|---|
| Hardware | <ul style="list-style-type: none">● 5 Desktops● 4 Laptops● 4 Printers● 2 Internal Networks (This includes the Synology Network Access Storage Device) |
| Hardware-Specifications | <ul style="list-style-type: none">● Processecors – All machines have Core i7 processors● Ram-12-16 GB ram● Storage- 9 TB of total storage |
| Software | <ul style="list-style-type: none">● 9- Microsoft Office Licences in 5PC’s and 4 Laptops● 8-Antivirus software packages in 4 PC’s and 4 Laptops● 8 Security Encryption certified-4PC’s/4Laptop’s● 8 Internet Security software installed- 4PC’s and 4Laptop’s |
| Internet connection | Wifi |
| Operating System | All machines have Windows 10 Operating System installed. |

At any given time throughout the day, all components are constantly in operation and in communication with each other with moderate to controlled operation between night time and days out of office.

Technology Management

Cjay has primary responsibility for managing technology within the FIC. He is also responsible for backing up data and for installing new software.

Backups are performed daily from the NAS to a second drive and two USB drive passports. One gets locked in a safe in the office that is fire and weatherproof. Cjay takes the other USB drive with him outside of the office. Before taking these USB drives outside of the building, he records this information in a logbook maintained by the Office manager. It is logged again with the office manager when Cjay brings back these drives to the office each morning. Cjay follows this process every day including weekends.

Since starting work at the FIC, Cjay has purchased licensed Microsoft software. He is also responsible for procuring any hardware they need.

Technology Planning

Technology planning at the FIC is a relatively informal process, and there is no designated budget for IT services. If there is a need for new technology, Cjay gets approval from the Commissioner, and he informs the Office Manager to do a purchase order through the government procurement office.

The FIC also submits three different quotes of the items they need to the Procurement Office. If the item is not available in Palau, they use a service like Amazon to order the required item.

It is important to note that 85 percent of the total budget for the FIC comes from banking fees collected by the FIC.

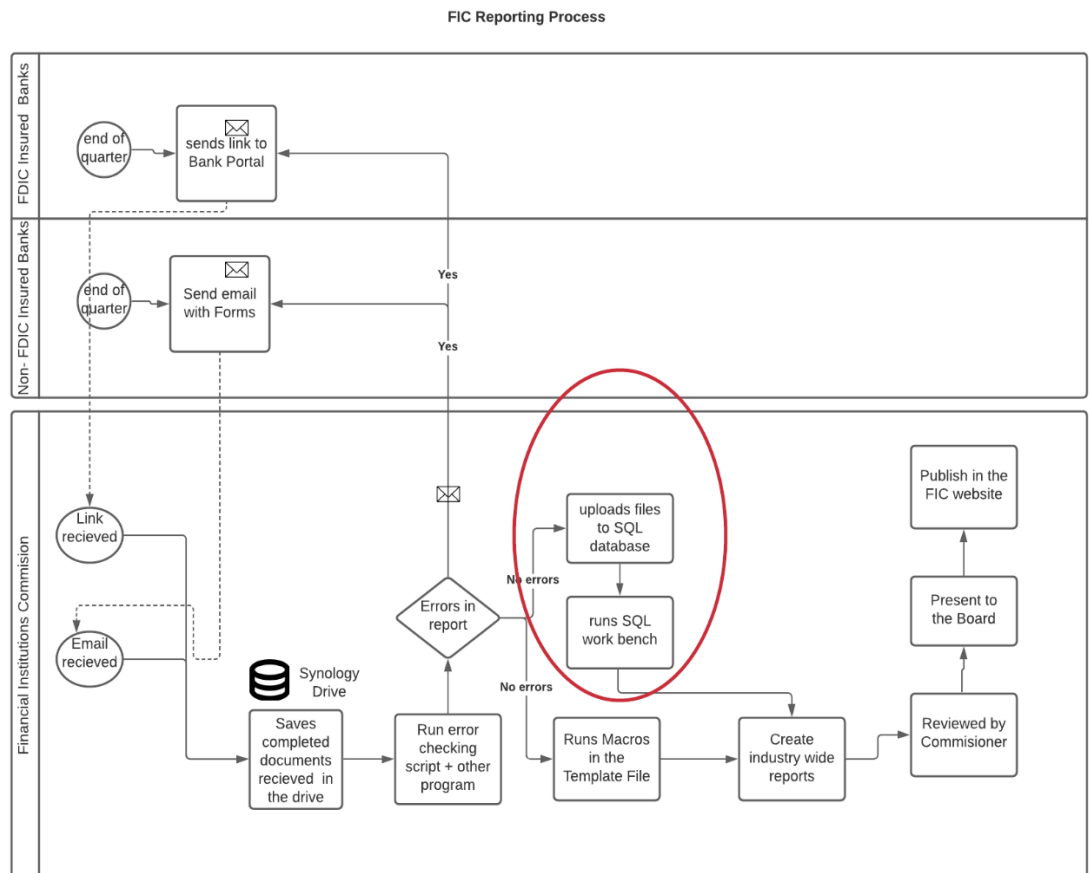
Communication

The FIC uses email and telephone for communication with outside parties and zoom for virtual meetings. They also use email for within-office communication. There are in-person meetings held at FIC's physical office when meeting with the Governing Board.

Files are shared internally using the Synology Network Access Storage (NAS) drive. The Staff has email accounts through the ropfic website, and staff email communication is encrypted. When communicating with Banks, the bank examiner uses encrypted email with the two non-FDIC insured banks and uses a link to a bank portal to access the prudential return forms from the FDIC insured banks.

Information Management

Described below is the information management process.



The most critical information collected by the FIC is prudential return forms submitted by banks every quarter. The process triggers at the end of each quarter, and the banks have 30 days to submit the prudential return forms to the FIC.

The three regulated Banks email a link to a bank portal to Cjay, who then accesses the link to download the prudential return forms. The two unregulated Banks- Palau Investment Bank and Asia Pacific Commercial Bank send these returns through encrypted email to the FIC.

The bank examiner then saves these documents to a folder in the NAS device and runs two python scripts created by the TCinGC consultant in 2018. If there are errors, the error report is sent to the Bank. The Bank would resubmit after correcting the issues.

Once prudential returns have no errors, the excel prudential return file is uploaded into a SQL database created by the TCinGC consultant in 2019. This SQL database is not utilized by the Bank Examiner at present, because it does not work as intended (red circle in process diagram).

Therefore, he uses the process set up by the TcinGC team in 2018, which uses an excel file with a series of Macros to populate the industry-wide report.

Once, the industry-wide report is populated, this report is used as an input for creating the UBPR ratios report. These reports are then reviewed by the Commissioner for any additional concerns. Once approved by the Commissioner, the reports are published on the FIC website and presented to the FIC Board.

Business Systems

The office manager uses Quickbooks pro for book-keeping within the FIC office.

II. Goal 1- Disaggregating the Excel Application

Motivation

Cjay indicated during the meetings that the two excel applications used for calculating aggregate industry data and UBPR ratios are cumbersome to work with due to the large file size. For instance, the DATABASE_Prudential Returns_with macros file is over 24 MB. The file takes a considerable time to boot and is hard to troubleshoot since it has data from 2012 until the present.

Cjay also noted, that during several occasions he spent hours trying to identify errors due to each column being dependent on the previous quarters. These two excel applications are bound to grow as the FIC enters more data each quarter and may become unwieldy to work.

After talking with Cjay and exploring the excel file on my own, it was clear that we had to find a way to break these files into smaller chunks. Furthermore, it was clear that there is no need to keep all past data in an individual worksheet.

We discovered that the DATABASE_Prudential Returns_with macros file requires only five quarters of data at one time and the UBPR ratios file requires only two quarters of the data.

Outcomes

We initially thought it would be impossible to disaggregate this excel worksheet due to time-series like dependencies to previous quarters. However, it became clear that anchoring the root quarter(the first quarter entered in the document) allows us to remove all columns (quarters) in-between.

We performed several tests using simulated data and validated the concept. Since the DATABASE_Prudential Returns with macros file is linked to the UBPR ratio calculation file, we wanted to ensure that the ratios in this file can be calculated using this new template.

Working through these excel documents also provided Cjay a deeper understanding of how the different files are connected, whereas before, Cjay was reluctant to change things on these excel files since he was unsure how changes would impact the integrity of the data.

Knowing how to create these templates on his own is imperative for the Bank Examiner, and I compiled an instruction document detailing the process (see Appendix A).

I completed the following deliverables with regards to this goal

- Created an instructions document – found in Appendix A on how to structure the disaggregated template
- Trained the Bank examiner on how to use this new template.

There were measurable improvements in efficiency as a result of these changes. For instance, the boot time of the original excel file took over half a minute, while the new template opens up in less than 8 seconds on Cjay's computer. Furthermore, there is little to no lag when navigating the new template.

Using this new template would ensure that the Bank Examiner can perform calculations and navigate the workbooks faster and more efficiently while not be concerned about how past data would impact current calculations. Furthermore, with the new knowledge that Cjay has on how these different files are linked, he can troubleshoot issues faster.

Recommendations

The most important recommendation is to follow steps outlined in the instructions document and to consider this document as a resource. Compiling the template each quarter will help the Bank Examiner become familiar with the steps of creating the template.

III. Goal 2- Creating a SQL Database to Store Prudential Returns

Motivation

Currently, the prudential returns submitted by the Banks get stored as excel files in the FIC-E-FILING folder. These documents are the inputs for all subsequent analyses performed by the FIC.

It was clear that data must be stored in a structured manner, especially for any ad-hoc analysis or as a source in a future application that replaces the existing excel application. The TCinGC project in 2019 focused on this objective by moving this data into a MySQL database. However, due to implementation issues, this database is not utilized at the moment.

The two main objectives for creating a database are as follows. The first was to store the quarterly return data as tables to use as a data source for a future application. The second goal was to provide Cjay a graphical user interface (GUI) to interact with this data and conduct ad-hoc analysis.

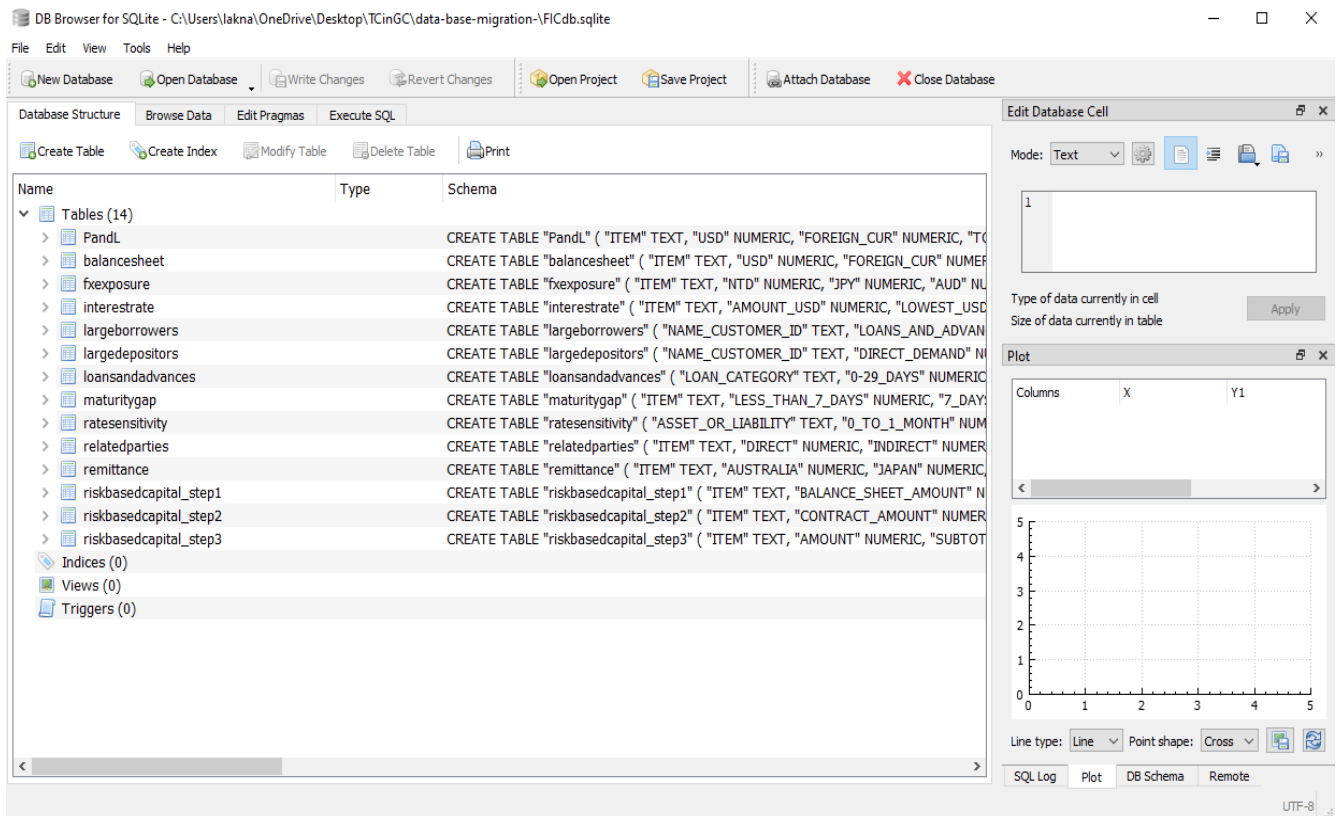
Outcomes

We performed the following activities in regards to this goal. I created a SQLite database, which is a database engine considered “small, fast, self-contained” and

highly reliable¹. Although I was initially looking at a NoSQL solution like MongoDB to store the data, it was evident that the simplicity and portability of the SQLite database better suits the needs of the FIC². It does not necessitate a complex client-server architecture, and the Bank Examiner could simply save the database into a flashdrive or an external drive and the data can be accessed using a graphical interface like DB browser or using a command line interface.

Next, I created an R-Script for data preprocessing and migrated all data from 2013 to 2020 (There are some years with missing data, and I have informed Cjay about the issue). The code for migrating this phase of the project can be found using this [link](#)

Next, I utilized a graphical user interface (GUI) called DB Browser, “an open-source tool to create, design, and edit database files compatible with SQLite” and trained Cjay on how to connect to the SQLite database I created.,

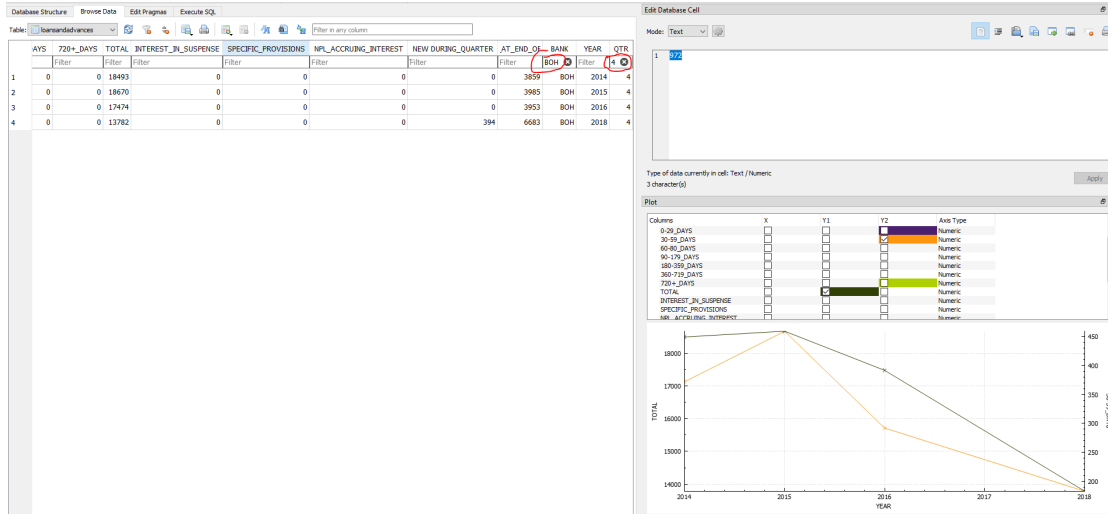


DB Browser Connected to the Database

I also trained Cjay on how to filter data (without having to write any SQL) and create plots in DB browser as shown below

¹ <https://www.sqlite.org/index.html>

² I spoke to Prof. Karyn Moore the day after the MVP presentation, and she noted that SQL databases are still widely used compared to NoSQL, and this would make it easier for individuals to work with this database in the future



Using Filters and Plots with DB Browser

To keep the database up to date, I also created an R script that Cjay can run each quarter to extract out the financial statements from the PR document and created instructional videos on how to update the database with new data each quarter (Appendix B). The code for this script can be found using this [link](#). The following outputs were produced as a result of the activities performed during the 10 weeks.

Outputs Produced

- A SQLite database containing data from 2012 until 2020.
- Installed a GUI called DB browser that connects to this database
- An R script to migrate all the past data
- An R script Cjay can run each quarter to update the database
- Two instructional videos on how to navigate/browse data and update the database

There were directly observable outcomes as a result of these outputs. For instance, the Bank Examiner used this database during the consulting engagement to produce a report to evaluate the bank's risk assessment towards their lending capabilities. According to Cjay, this report usually takes around an hour or two to compile since he has to compare multiple worksheets at once. He can now compile this report in under 5 minutes using the filter capabilities in the DBbrowser and download the required table as a CSV file.

Now that there is a SQL data source, future consultants or developers working with the FIC can directly query the database using the Execute SQL pane. This feature can be utilized to write SQL statements that replicate the various excel formulas used in the Excel Macros file.

The screenshot shows a database browser window with the following SQL query and results:

```

1  SELECT BANK, total
2  FROM PandL
3  WHERE ITEM= "INTEREST INCOME"
4  GROUP BY BANK

```

| | BANK | TOTAL |
|---|------|-------|
| 1 | APCB | 38 |
| 2 | BOG | 2365 |
| 3 | BOH | 2944 |
| 4 | BP | 226 |
| 5 | PCB | 373 |
| 6 | PIB | 432 |

Execution finished without errors.
Result: 6 rows returned in 20ms
At line 1:
SELECT BANK, total
FROM PandL
WHERE ITEM= "INTEREST INCOME"
GROUP BY BANK

SQL Queries Using DB Browser.

Recommendation

The main recommendation is to ensure that the database is updated each quarter using the R script I have provided. Keeping the database up to date is especially important since most analysis requires all quarters and banking entities to be in the database.

I would also encourage the Bank examiner to follow the DB browser resources I have shared in Appendix D. This will increase their knowledge about this tool, as well as help them understand advanced functionality. In general, spending time and interacting with DBbrowser would be highly beneficial for the bank examiner to become more familiar with the application.

IV. Goal - Creating a Road Map to Transition to a More Robust Application

Motivation

The Carnegie Mellon student consultant in 2018 set up the existing excel macros set up as a temporary solution. As noted in their project document, “we finally decided to outsource the FIC’s database to a third-party vendor to build a more advanced and sustainable solution and guarantee the future maintenance and upgrades. At the same time, a temporary approach to reduce Lindsay’s workload during the transition was realized by optimizing the current Excel database for data entry and building two new applications to facilitate data validation”. However, the FIC has continued to use this temporary setup since 2019

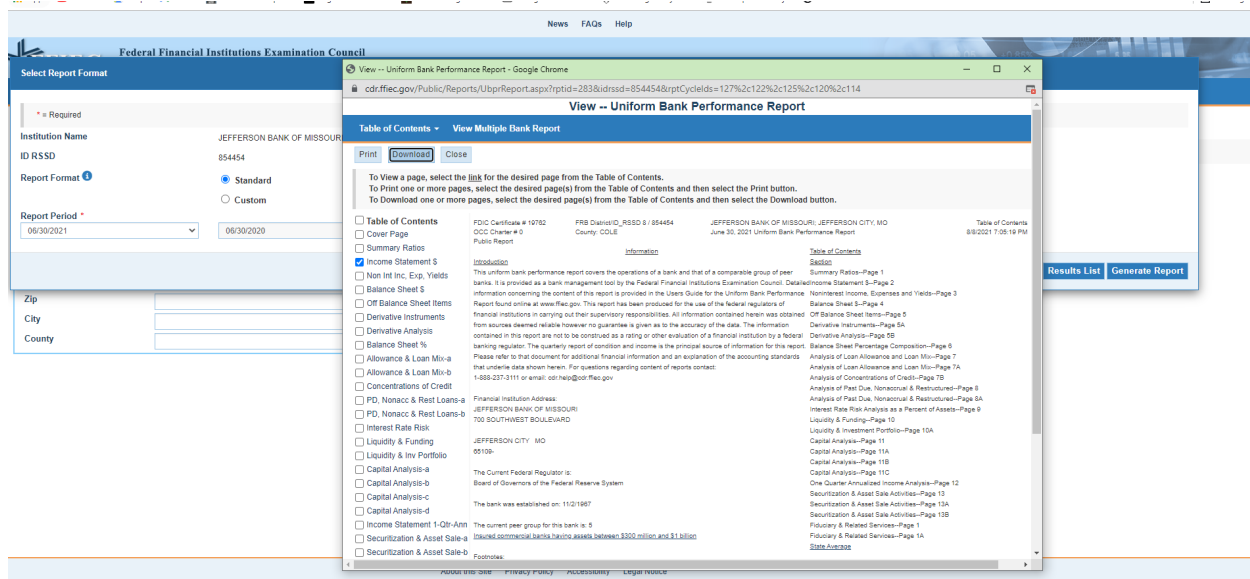
Outcomes

Most of the activities performed during my engagement with the FIC have informed me of the need and potential steps the FIC can take to fulfill this objective. Accordingly, I have produced a specification document outlining the various components required for building an application for replacing the existing Macro's set up (Appendix C)

A future consultant working on this project, a developer, or an outside vendor can use this document to map the components required for replacing the existing process in partnership with the Bank Examiner. Furthermore, they can assess the workload and time it takes to finish each task using it. As noted already in this document, the most time-consuming task would be replicating the formulas used in the two existing excel applications.

Recommendation

The FIC could also speak to some of their counterparts in the region and outside that use the BASL principles to explore solutions they have adopted. The Federal Financial Institutions Councils (FFIC) reporting website is an excellent model of what the FIC's reporting system could look like. Accordingly, the FIC could use this website and the specification document to help scope the development of a solution.



FFIC Reporting System

V. Goal- Automating Report Generation for Annual Banking Reports

Each year the FIC compiles a report titled Annual Report of the Palau Banking Sector, an overview of Palau's Banking sector. The Bank Examiner prepares this report, and he has to

extract specific fields from the Excel Macros file and the UBPR file. Extracting out fields from these documents is time-consuming since it necessitates comparing data between two different years at once. Automating the creation of tables required for this report reduces the time the Bank examiner has to spend copy-pasting values and allows them to focus on performing the actual analysis.

I could not entirely complete the table-creation process for all tables required for this report due to time constraints. However, I created a script to automate the Condensed Income & Expense Statement, one of the three main tables created for this report.

Outcomes

With assistance from Cjay, I identified the specific fields required for creating the Condensed Income & Expense Statement table from the UBPR ratios file. Next, I compiled an R script that uses the UBPR ratios as input and prompts users to enter the two years they want to compare. Once the user enters a value, the script outputs the following table. The Bank Examiner can use this output table in the Annual Report of the Palau Banking Sector instead of having to extract out these values manually.

Palau Banking Sector
Condensed Income & Expense Statement

| Annualized (in U.S. '000s) | CYE2017 | | | CYE2018 | | |
|-----------------------------------|--------------|------------|--------------|--------------|------------|--------------|
| | Insured | Uninsured | All Banks | Insured | Uninsured | All Banks |
| Interest And Fee Income | 6,880 | 574 | 7,454 | 8,049 | 658 | 8,707 |
| Interest Expense | 228 | 6 | 234 | 326 | 0 | 326 |
| NET INTEREST INCOME | 6,652 | 568 | 7,220 | 7,723 | 658 | 8,381 |
| Provisions For Bad Loans Expense | 473 | 3 | 476 | 308 | (12) | 296 |
| NON-INTEREST INCOME | 984 | 2 | 986 | 967 | 9 | 976 |
| NON-INTEREST EXPENSE | 2,474 | 402 | 2,876 | 2,611 | 411 | 3,022 |
| NET INCOME (LOSS) BEFORE TAXES | 4,689 | 165 | 4,854 | 5,771 | 268 | 6,039 |
| Less: Applicable Income Taxes | 174 | 12 | 186 | 217 | 14 | 231 |
| Year-to-date Income (Loss) | 4,515 | 153 | 4,668 | 5,554 | 254 | 5,808 |

Following two outputs were produced concerning this objective

- An Interactive R script that takes “Year” as input from the user and replicates the table above
- An Instructional Video (see Appendix B) that shows the Bank Examiner how to run this script.

Automating the creation of this table has helped partially meet the objective of reducing the manual data extraction work for Cjay (since two other tables still need to be created manually). Although there aren’t specific metrics on how much time it took before, according to Cjay, the script has drastically reduced the time it takes for table creation. Furthermore, this has reduced the chance of errors that may occur as a result of manual data extraction.

Recommendation

The Bank Examiner must perform the tasks outlined in goal 1 to ensure that this script runs correctly since the outputs of that process is an input for creating these tables. See Appendix A for a detailed description of how these two processes are linked.

I would advise the Bank examiner to watch the instructional video before running the R script since this report is compiled once a year.

It would also be worthwhile for a future consultant to look at how they can automate the other two tables listed in this report and complete all tables required for this report.

Appendix A

Steps for Creating the Disaggregated Marco and UBPR template

Step-1

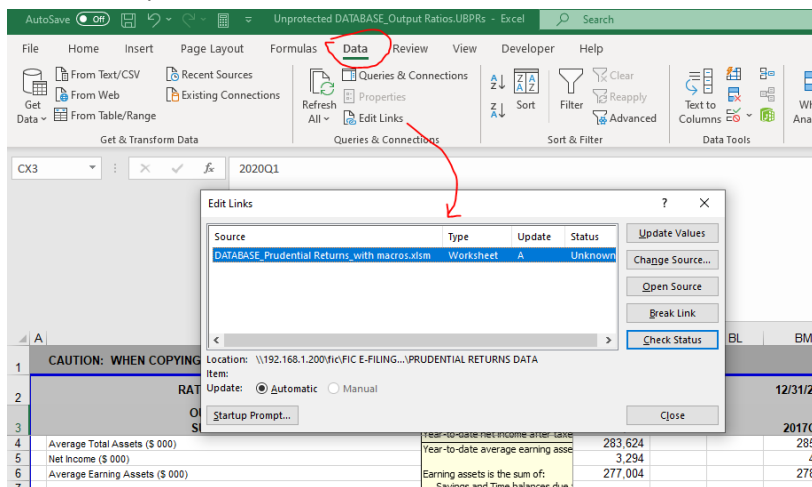
- Find an **Unprotected** outputratios.UBPR file (hereafter referred to as UBPR file) and a Prudential Returns_with marcos file. (hereafter referred to as MACROS file). Also make sure that you have the Database_OutputRatios.UBPR_archive file located (This should be in External Reports>Inputs folder).

Step – 2

- Open up the Macros file and the UBPR file– you will keep both these files open until until the process is complete. Also make sure that you unhide all columns in both files

Step – 3

- In the UPBR file, click on the data edit link tab as shown below, and click on “Change Source”. This will allow you to pick the new file you want to change the links to. Now, change the link to the Prudential Returns_with marcos file. You have to make sure that the MACRO file is open as noted in Step 2



It may take a few minutes to have the two files links up

Step – 4

Next, go to the MACROS sheet and highlight the current quarter and 4 other quarters going back as shown in the picture

| CK | CL | CM | CN | CO | CP | CQ | CR | CS | CT | CU | CV | CW | CX | CY | CZ |
|-----------|-----------------|---------------------|---------|-----------------|---------------------|---------|-----------------|---------------------|---------|-----------------|---------------------|---------|-----------------|---------------------|---------|
| 3/31/2020 | | 6/30/2020 | | | 9/30/2020 | | | 12/31/2020 | | | 3/31/2021 | | | | |
| Total | In U.S. Dollars | In Foreign Currency | Total | In U.S. Dollars | In Foreign Currency | Total | In U.S. Dollars | In Foreign Currency | Total | In U.S. Dollars | In Foreign Currency | Total | In U.S. Dollars | In Foreign Currency | Total |
| (d) | (b) | (c) | (d) | (b) | (c) | (d) | (b) | (c) | (d) | (b) | (c) | (d) | (b) | (c) | (d) |
| 273,073 | 282,957 | 39 | 282,996 | 309,908 | 41 | 309,949 | 330,858 | 50 | 330,908 | 321,540 | 53 | 321,593 | 320,886 | 56 | 320,942 |
| 2,468 | 3,955 | 38 | 3,993 | 4,350 | 40 | 4,390 | 4,439 | 49 | 4,488 | 3,677 | 51 | 3,728 | 4,565 | 56 | 4,621 |
| 229,607 | 238,656 | 1 | 238,657 | 265,539 | 1 | 265,539 | 287,097 | 1 | 287,098 | 279,840 | 2 | 279,842 | 279,079 | 0 | 279,079 |
| 228,840 | 237,683 | 0 | 237,683 | 264,382 | 0 | 264,382 | 285,799 | 0 | 285,799 | 278,814 | 1 | 278,815 | 277,924 | 0 | 277,924 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 228,840 | 237,683 | 0 | 237,683 | 264,382 | 0 | 264,382 | 285,799 | 0 | 285,799 | 278,814 | 1 | 278,815 | 277,924 | 0 | 277,924 |
| 228,756 | 237,616 | 0 | 237,616 | 264,359 | 0 | 264,359 | 285,756 | 0 | 285,756 | 278,762 | 0 | 278,762 | 277,873 | 0 | 277,873 |
| 94 | 67 | 0 | 67 | 23 | 0 | 23 | 43 | 0 | 43 | 52 | 1 | 53 | 51 | 0 | 51 |
| 817 | 973 | 1 | 974 | 947 | 1 | 948 | 1,298 | 1 | 1,299 | 1,026 | 1 | 1,027 | 1,155 | 0 | 1,155 |
| 659 | 838 | 0 | 838 | 793 | 0 | 793 | 1,126 | 0 | 1,126 | 953 | 0 | 953 | 1,082 | 0 | 1,082 |
| 158 | 155 | 1 | 156 | 154 | 1 | 155 | 172 | 1 | 173 | 73 | 1 | 74 | 73 | 0 | 73 |

Step - 5

Color the root quarter (The first quarter in the sheet)

| A | B | C | D | E |
|-------------------------------------|--|------------------------|----------------------------|----------------|
| <i>U.S. Dollar or Equivalent</i> | | | | |
| <i>Amount in Thousands (\$'000)</i> | | 12/31/2012 | | |
| TOTAL INDUSTRY | | In U.S. Dollars | In Foreign Currency | Total |
| | | (b) | (c) | (d) |
| FORM 1 | | | | |
| TOTAL ASSETS | | 143,124 | 54 | 143,178 |
| .1 | CASH (Notes & Coins) | 2,269 | 53 | 2,322 |
| .2 | BALANCES WITH DEPOSITORY INSTITUTIONS | 108,537 | 1 | 108,538 |
| .2.1 | Demand Balances Due From: | 108,088 | 0 | 108,088 |
| .2.1.1 | Depository Institutions Domestic | 0 | 0 | 0 |
| .2.1.2 | Depository Institutions Abroad | 108,088 | 0 | 108,088 |
| .2.1.2.1 | Head Office and Branches | 108,039 | 0 | 108,039 |
| .2.1.2.2 | Other Depository Institutions Abroad | 49 | 0 | 49 |
| .2.2 | Savings Balances Due From: | 449 | 1 | 450 |
| .2.2.1 | Depository Institutions Domestic | 387 | 0 | 387 |
| .2.2.2 | Depository Institutions Abroad | 62 | 1 | 63 |

Step - 6

Delete Everything in between these columns. Once you do that you should see something like this which includes the root quarter and 5 other quarters. The MACROS file should now have only 6 quarters and that's it.

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | | |
|----|-----------|---------------------------------------|---------|---------|-----------------|------------------|-------|-----------------|------------------|-------|-----------------|------------------|-------|-----------------|------------------|---------|-----------------|------------------|-------|-----------------|------------------|-------|
| 1 | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | U.S. Dollar or Equivalent | | | 12/31/2012 | | | 3/31/2020 | | | 6/30/2020 | | | 9/30/2020 | | | 12/31/2020 | | | 3/31/2021 | | |
| 3 | | Amount in Thousands (\$ 000) | | | In U.S. Dollars | Foreign Currency | Total | In U.S. Dollars | Foreign Currency | Total | In U.S. Dollars | Foreign Currency | Total | In U.S. Dollars | Foreign Currency | Total | In U.S. Dollars | Foreign Currency | Total | In U.S. Dollars | Foreign Currency | Total |
| 4 | | TOTAL INDUSTRY | | | (b) | (c) | (d) | (b) | (c) | (d) | (b) | (c) | (d) | (b) | (c) | (d) | (b) | (c) | (d) | (b) | (c) | (d) |
| 5 | | FORM 1 | | | | | | | | | | | | | | | | | | | | |
| 6 | | 143,124 | 54 | 143,178 | ***** | 39 | ***** | ***** | 41 | ***** | ***** | 50 | ***** | 321,540 | 53 | 321,593 | ***** | 56 | ***** | ***** | ***** | |
| 7 | 1.1 | TOTAL ASSETS | 2,283 | 53 | 2,332 | 3,955 | 38 | 3,993 | 4,350 | 40 | 4,390 | 4,433 | 43 | 4,488 | 3,677 | 51 | 3,728 | 4,565 | 56 | 4,621 | ***** | |
| 8 | 1.2 | BALANCES WITH DEPOSITORY INSTITUTIONS | 108,537 | 1 | 108,538 | ***** | 1 | ***** | ***** | 1 | ***** | ***** | 1 | ***** | ***** | 2 | ***** | ***** | 0 | ***** | ***** | |
| 9 | 1.2.1 | Demand Balances Due From: | 108,088 | 0 | 108,088 | ***** | 0 | ***** | ***** | 0 | ***** | ***** | 0 | ***** | 278,814 | 1 | 278,815 | ***** | 0 | ***** | ***** | |
| 10 | 1.2.1.1 | Depository Institutions Domestic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 11 | 1.2.1.2 | Depository Institutions Abroad | 108,088 | 0 | 108,088 | 237,683 | 0 | 237,683 | 264,382 | 0 | 264,382 | 285,739 | 0 | 285,739 | 278,814 | 1 | 278,815 | 277,324 | 0 | 277,324 | 0 | |
| 12 | 1.2.1.2.1 | Head Office and Branches | 108,039 | 0 | 108,039 | 237,616 | 0 | 237,616 | 264,359 | 0 | 264,359 | 285,756 | 0 | 285,756 | 278,762 | 0 | 278,762 | 277,873 | 0 | 277,873 | 0 | |
| 13 | 1.2.1.2.2 | Other Depository Institutions Abroad | 49 | 0 | 49 | 67 | 0 | 67 | 23 | 0 | 23 | 43 | 0 | 43 | 52 | 1 | 53 | 51 | 0 | 51 | 0 | |
| 14 | 1.2.2 | Savings Balances Due From: | 449 | 1 | 450 | 973 | 1 | 974 | 947 | 1 | 948 | 1,298 | 1 | 1,299 | 1,026 | 1 | 1,027 | 1,155 | 0 | 1,155 | 0 | |
| 15 | 1.2.2.1 | Depository Institutions Domestic | 387 | 0 | 387 | 838 | 0 | 838 | 793 | 0 | 793 | 1,126 | 0 | 1,126 | 953 | 0 | 953 | 1,082 | 0 | 1,082 | 0 | |
| 16 | 1.2.2.2 | Depository Institutions Abroad | 62 | 1 | 63 | 135 | 1 | 136 | 154 | 1 | 155 | 172 | 1 | 173 | 73 | 1 | 74 | 73 | 0 | 73 | 0 | |
| 17 | 1.2.2.2.1 | Head Office and Branches | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 18 | 1.2.2.2.2 | Other Depository Institutions Abroad | 62 | 1 | 63 | 135 | 1 | 136 | 154 | 1 | 155 | 172 | 1 | 173 | 73 | 1 | 74 | 73 | 0 | 73 | 0 | |
| 19 | 1.2.3 | Time Balances Due From: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

Step - 7

Go back to the UPBR file (you might have to delete some of those wrong columns that were created at somepoint that messed up the order)

Highlight the current quarter that you are calculating UBPR's for as below

| | A | B | CV | CW | CX | CY | CZ |
|----|---|---|-------|------------|----|-----------|---------|
| 1 | CAUTION: WHEN COPYING FORMULA, COPY ONLY TO | | | | | | |
| 2 | RATIOS & INDICATORS | | | 12/31/2020 | | 3/31/2021 | |
| 3 | OUTPUT REPORT 1 SUMMARY RATIOS | | | 2020Q4 | | 2021Q1 | |
| 4 | Average Total Assets (\$ 000) | | #REF! | | | | 313,278 |
| 5 | Net Income (\$ 000) | | 3,201 | | | | 1,768 |
| 6 | Average Earning Assets (\$ 000) | | #REF! | | | | 302,464 |
| 7 | EARNINGS AND PROFITABILITY ANALYSIS: | | | | | | |
| 8 | Percent of Average Assets: | | | | | | |
| 9 | Interest Income | | #REF! | | | | 0.76 |
| 10 | Less: Interest Expense | | #REF! | | | | 0.02 |
| 11 | Net Interest Income | | #REF! | | | | 0.74 |
| 12 | Plus: Noninterest Income | | #REF! | | | | 0.10 |
| 13 | Less: Noninterest Expense | | #REF! | | | | 0.29 |

Step 8

Delete Everything in between this and the root quarter and this will perform the correct calculation as shown below. You can confirm for e.g by calculating by hand the average total assets

| CAUTION: WHEN COPYING FORMULA, COPY ONLY TO SAME PERIOD - i.e., copy 3/31/2013 only to other future | | | | | | |
|---|--|------------|---------|--|-----------|---------|
| RATIOS & INDICATORS | | 12/31/2012 | | | 3/31/2021 | |
| OUTPUT REPORT 1 SUMMARY RATIOS | | 2012Q4 | | | 2021Q1 | |
| Average Total Assets (\$ 000) | | | 132,130 | | | 313,278 |
| Net Income (\$ 000) | | | 2,157 | | | 1,768 |
| Average Earning Assets (\$ 000) | | | 126,776 | | | 302,464 |
| EARNINGS AND PROFITABILITY ANALYSIS: | | | | | | |
| Percent of Average Assets: | | | | | | |
| Interest Income | | | 3.11 | | | 0.76 |
| Less: Interest Expense | | | 0.20 | | | 0.02 |
| Net Interest Income | | | 2.91 | | | 0.74 |
| Plus: Noninterest Income | | | 0.87 | | | 0.10 |
| Less: Noninterest Expense | | | 1.82 | | | 0.29 |

Step 9.

Now open up the Database_OutputRatios.UBPR_archive file and paste the values you have calculated in the UBPR worksheets (industry, Insured, Uninsured) into the same worksheets in the Database_OutputRatios.UBPR_archive file. This Database_OutputRatios.UBPR_archive file is a place to store calculated values that you get from the condensed reports, and this file will be used as an input for the report generation process described in Goal 4.

| CAUTION: WHEN COPYING FORMULA, COPY ONLY TO SAME PERIOD - i.e., copy 3/31/2013 only to other future March periods, 6/30/2013 only to future June | | | | | | | |
|--|---|--|-----------|-----------|------------|-----------|-----------|
| RATIOS & INDICATORS | | 3/31/2020 | 6/30/2020 | 9/30/2020 | 12/31/2020 | 3/31/2021 | 6/30/2021 |
| OUTPUT REPORT 1 SUMMARY RATIOS | | 2020Q4 | 2021Q1 | | 2021Q2 | | |
| Average Total Assets (\$ 000) | Year-to-date average of total assets calculated from | 303,704 | 313,278 | | 256,678 | | |
| Net Income (\$ 000) | Year-to-date net income after taxes and extraordinary | 3,201 | 1,768 | | 0 | | |
| Average Earning Assets (\$ 000) | Year-to-date average earning assets. | 293,464 | 302,464 | | 247,931 | | |
| EARNINGS AND PROFITABILITY ANALYSIS: | | Earning assets is the sum of: | | | | | |
| Percent of Average Assets: | | Savings and Time balances due from depository institutions as reported in Lines 1, 2, 2 and 1, 2, 3 on | | | | | |
| Interest Income | Total interest income as reported in Form 2, Line 1, | | | | | | |
| Less: Interest Expense | Total interest expense as reported in Form 2, Line 2, | 2.25 | 0.76 | | 0.00 | | |
| Net Interest Income | Total interest income minus total interest expenses as | 0.10 | 0.02 | | 0.00 | | |
| Plus: Noninterest Income | Income derived from bank services and sources other | 2.14 | 0.74 | | 0.00 | | |
| Less: Noninterest Expense | Salaries and employee benefits, expenses on fixed | 0.36 | 0.10 | | 0.00 | | |
| Less: Provisions for Loan Losses | Provisions for bad loans expense as reported in Form 2, | 1.03 | 0.29 | | 0.00 | | |
| Net Operating Profit Before Tax | Net income before taxation as reported in Form 2, Line | 0.37 | (0.02) | | 0.00 | | |
| | Net operating profit after taxation as reported in Form | 1.10 | 0.58 | | 0.00 | | |
| | Adjusted net operating income divided by average total | | | | | | |

Appendix B

Instructional Videos

The screenshot shows a file management interface. At the top right, it says 'File Station'. Below that, there are navigation buttons (back, forward, refresh) and a breadcrumb path 'FIC > Laknath-Instructional Videos'. Below the path are buttons for 'Upload', 'Create folder', 'Action', 'Tools', and 'Settings'. On the left, a sidebar shows a tree view with 'FIC_NAS' expanded to show 'FIC', which contains 'Bank License Applica' and 'BE-Dfiles'. The main area displays a table of files:

| Name | Size |
|--|---------|
| Automating Annual Banking Report Table.mp4 | 9.4 MB |
| Instructional_Video1-Opening sqlite database.mp4 | 8.5 MB |
| Video on updating the database each quarter.mp4 | 16.4 MB |

Appendix C

Project Specification Document

| No | Task | Current Process | Proposed Process |
|----|---------------------|--|--|
| 1 | Data Collection | Banks Email Prudential Return Forms | Develop a front end application (A series of Forms) that Banks can fill out similar to the PR forms |
| 2 | Data Quality Checks | Bank Examiner manually runs a Python Script to identify errors | Link the existing python script to trigger error checks on the data as soon as a user hits the submit button in the form |
| 3 | Data Storage | Use the SQLite database to store the data | Once the error checks are completed, write application code to use the datafields in the forms to update the tables In the SQLite database |

| | | | |
|---|---|---|--|
| 4 | Populating the Industry, Insured and Uninsured worksheets | Using the the Excel Macros worksheet | Create a back end process that uses the Prudential Return data in the SQLite database to query and calculate each item listed in the Macros file |
| 5 | Populating the UBPR ratios worksheet | Using the the UBPR ratios worksheet | Create a back end process that uses data in from the previous step to then calculate the fieds found in the UBPR worksheet |
| 6 | Create A Report Generation Module | The UPBR worksheet also acts as the Report that needs to be published | Develop a front end application similar to the one used by the FFIEC to download data that is already calculated |

It is important to note that steps 4 and 5 are going to take a considerable amount of time. Each cell in the Excel Macros worksheet is interrelated to a large number of cells in the same sheet as well as other sheets, and this would require mapping out the links between each of these sheets. For developing the calculations for the UBPR excel file, there is guidance given in the “A User’s Guide to the Off-site Monitoring Output Reports” that you can request from the Bank examiner

Appendix D

Additional Dbbrowser Resources

Tutorial on creating Plots

<https://github.com/sqlitebrowser/sqlitebrowser/wiki/Plot-Dock>

Using Filters

<https://github.com/sqlitebrowser/sqlitebrowser/wiki/Using-the-Filters>

Deleting Records

https://www.youtube.com/watch?v=czjH44DVc_Y&list=PLU70qqWW4frGdwNh4czgTrCrHvPhyt2aI&index=9

Encrypting the Database

<https://github.com/sqlitebrowser/sqlitebrowser/wiki/Encrypted-Databases>

