



Sri Lanka Institute of Information Technology

**Data Warehousing & Business
Intelligence IT3021**

Assignment 2

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1. Data Source for the Assignment

Here it used the data warehouse of assignment 1 for the assignment 2. Data warehouse name (database name) is `PROJECT_Bank_DW`. It comprises of 5 dimension tables and a fact table connected each other.

1. Dimension Tables

- DimCustomer
- DimDate
- DimLoans
- DimCreditCards
- DimBranch

2. Fact Table

- FactTransactions

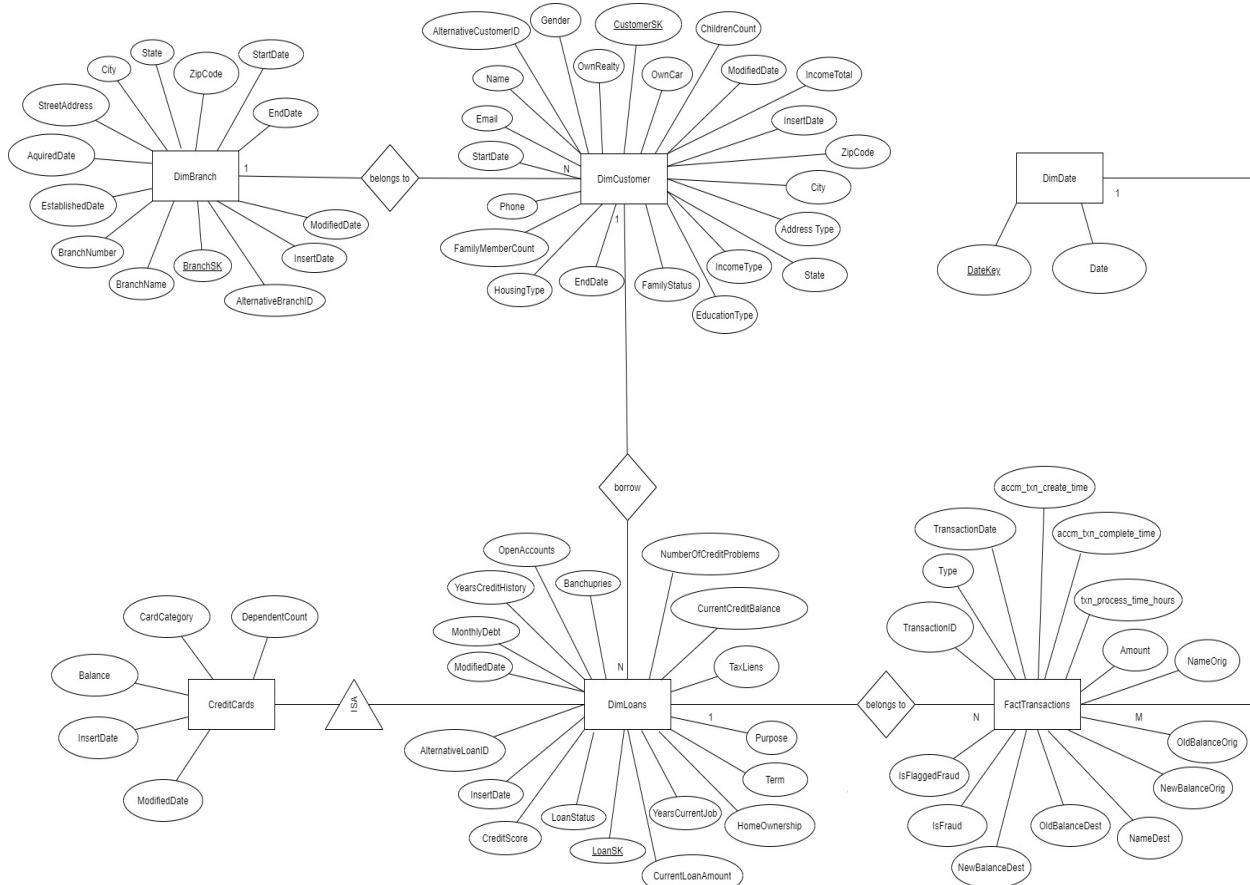
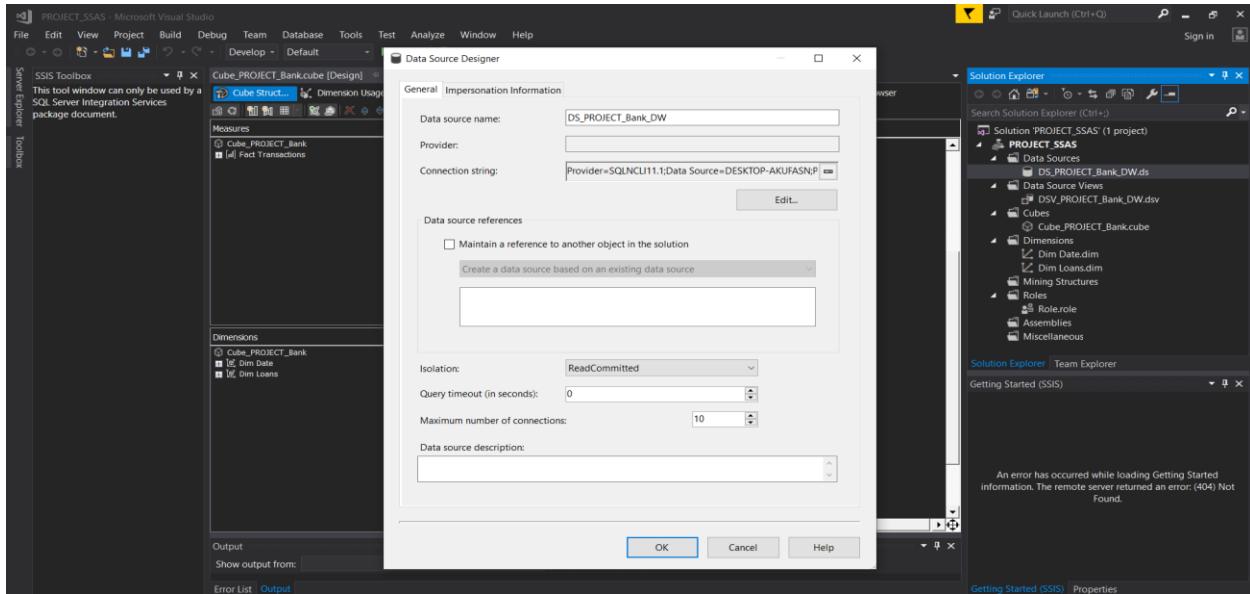


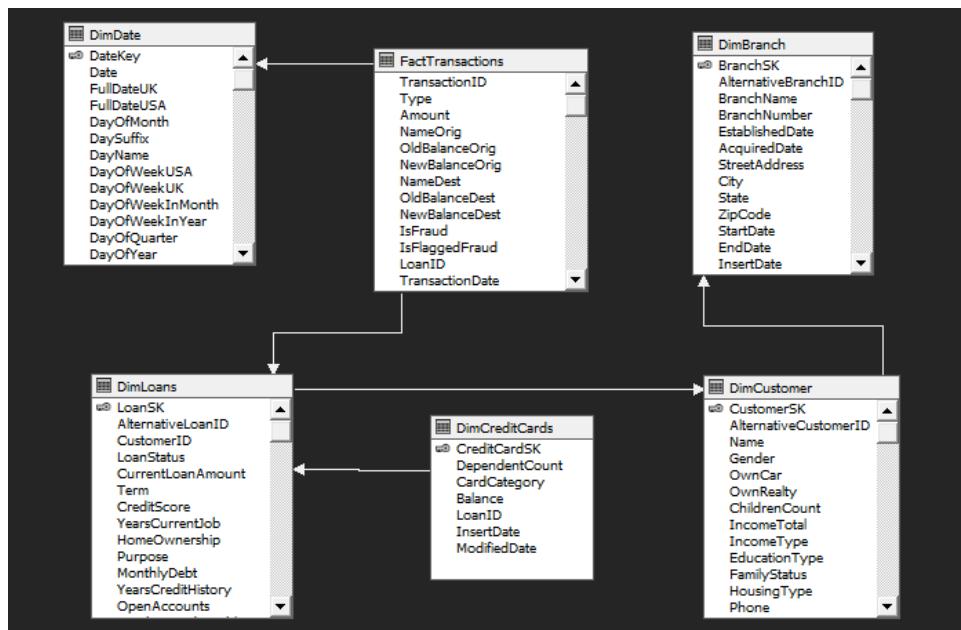
Figure 1: ER Diagram of Data Warehouse

2. SSAS Cube implementation

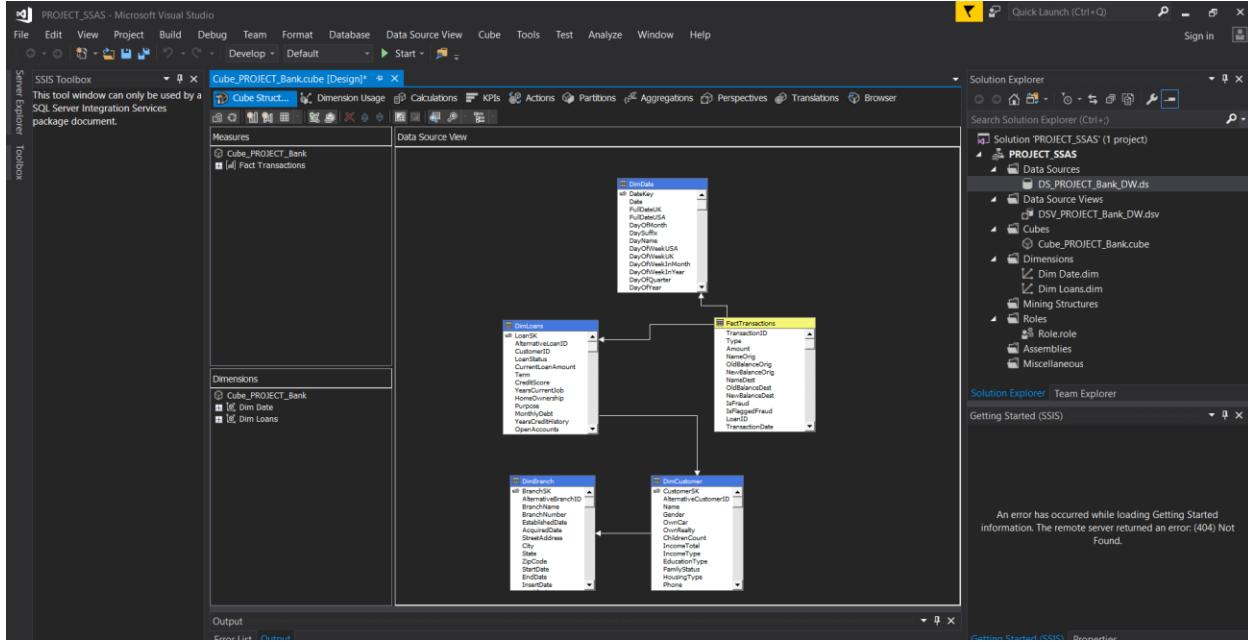
First created a SSAS project in visual studio 2017 and then added a data source to the project called 'DSV_PROJECT_Bank_DW'. Data source is taken as 'PROJECT_Bank_DW' in SSMS (data warehouse).



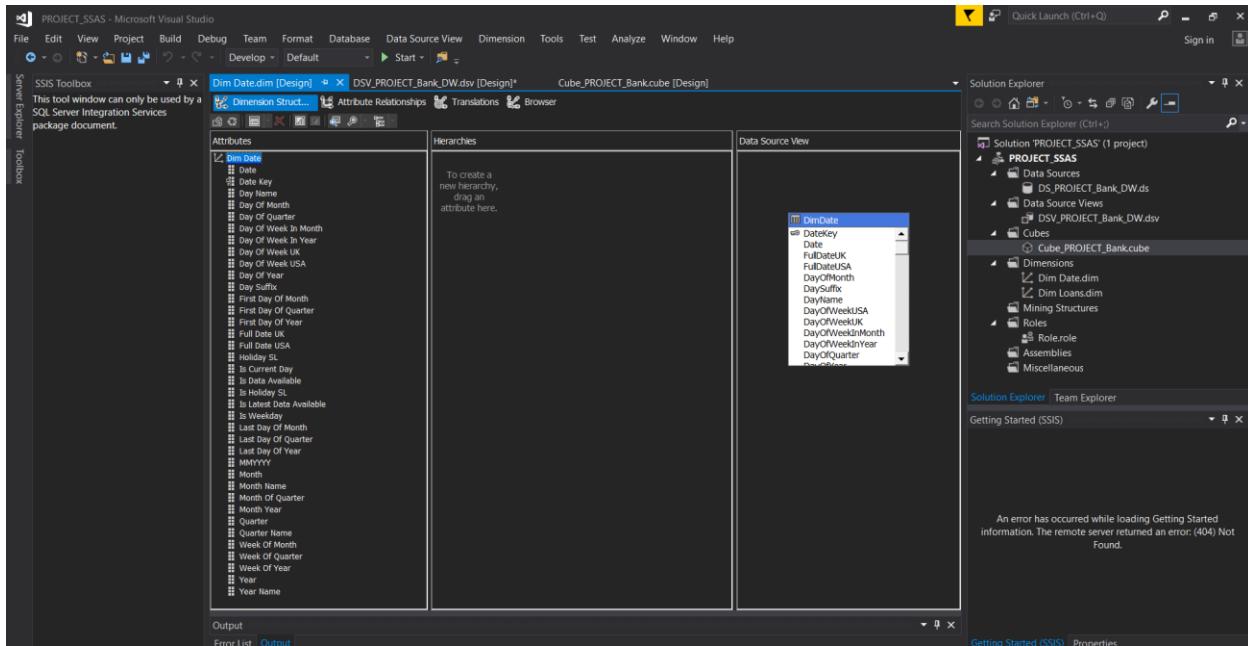
Then added a data source view to the project called 'DSV_PROJECT_Bank_DW'. Then it created a diagram with all dimension tables and fact tables according to the given instructions and commands.



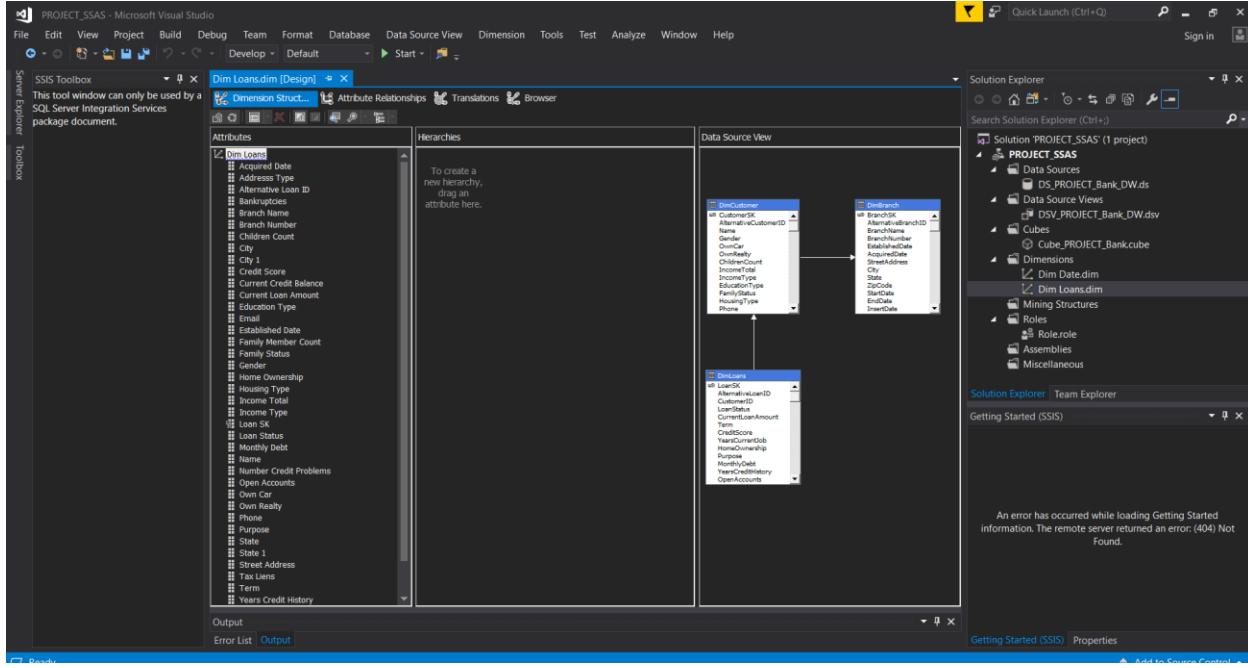
Then created a OLAP cube by using `create a new cube` option. Meanwhile it creates dimension tables as well. Then you should add relevant columns to the dimensions by drag and dropping. Below diagram shows the snowflake schema.



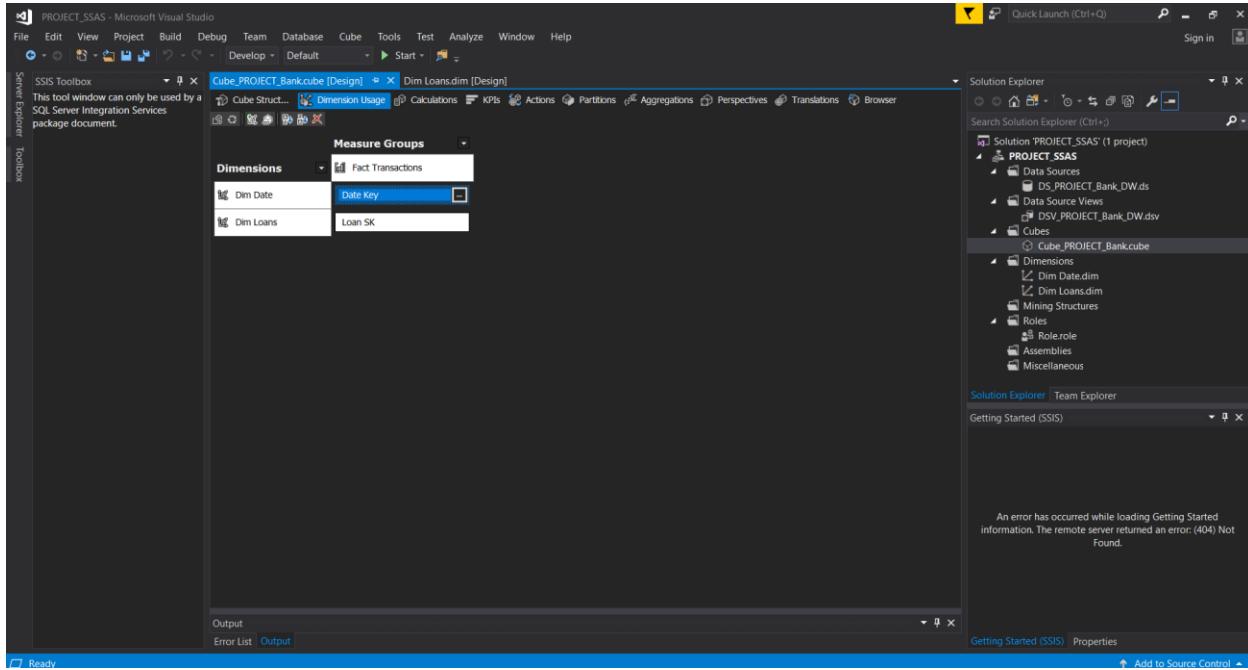
Adding relevant columns to the DimDate dimension.



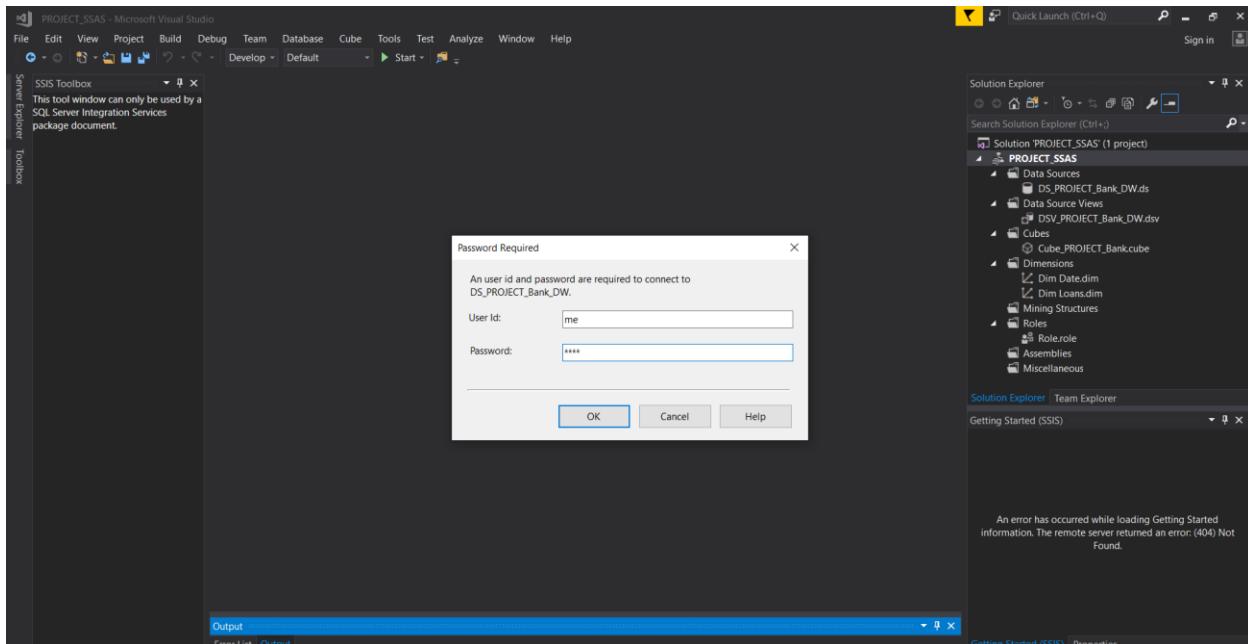
Adding relevant columns to the DimLoan dimension. Make sure to not to select irrelevant columns which are not having business logic.



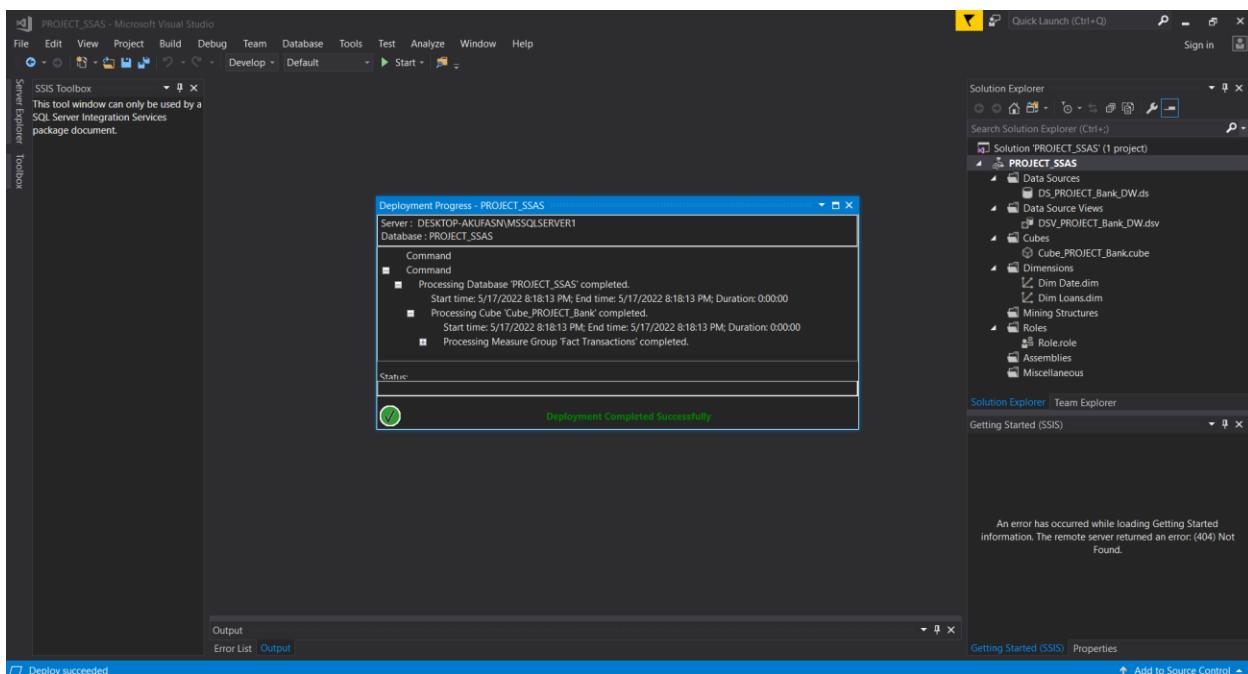
Then checked primary keys whether they have connected or not, if not add them using dimension usage column.



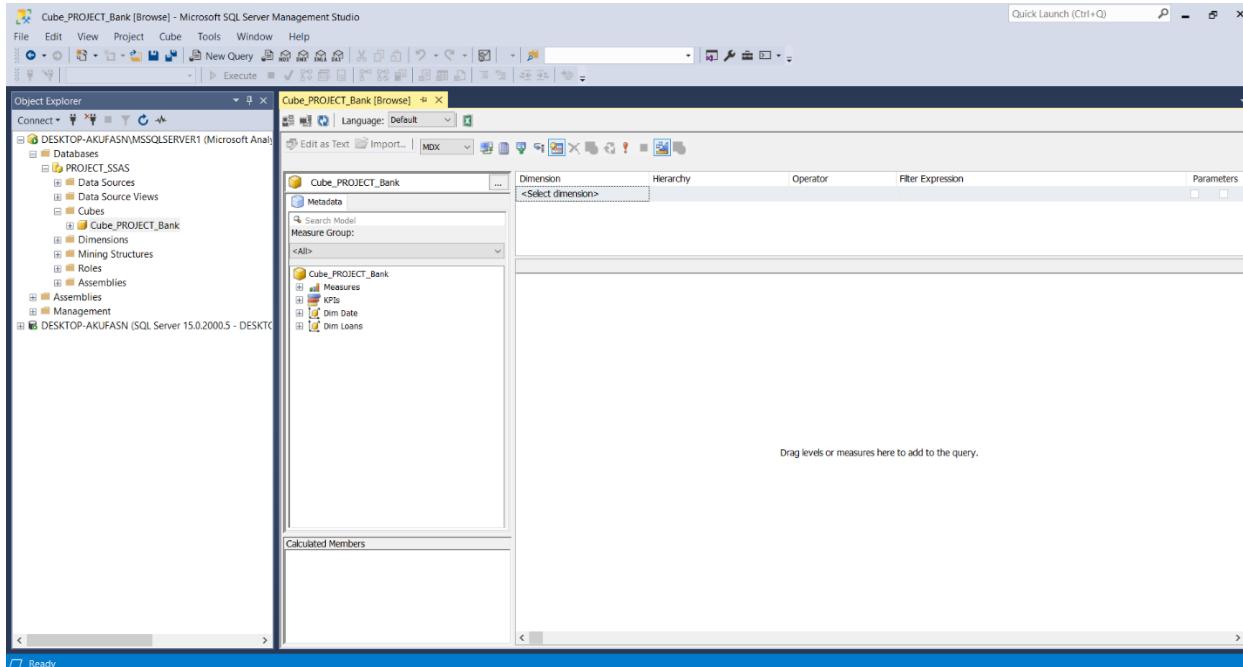
Finally deployed the project by giving user credentials.



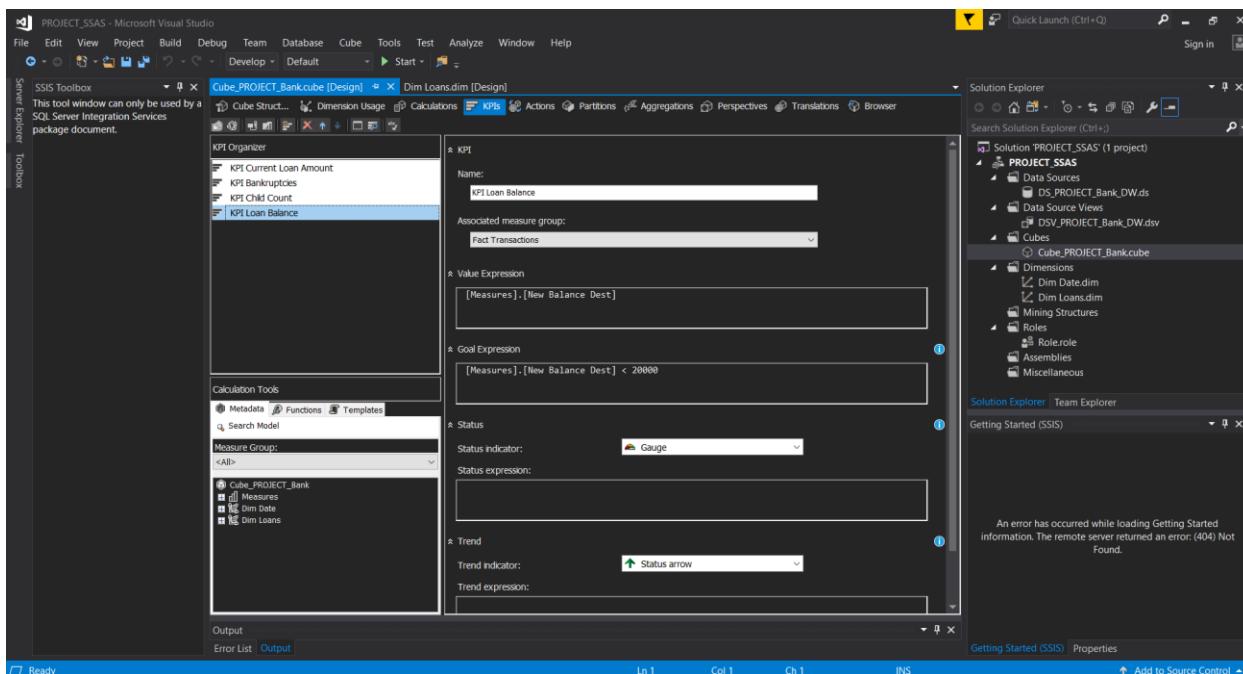
Then you will get 'Deployment Completed Successfully' message.



Connect SSMS to SSAS by giving correct analytical services credentials. In the database section deployed project has been built.



Then created a KPI using KPI tab of SSAS project 'Cubes_PROJECT_Bank' cube. This KPI is to check whether loan balance is less than 20000 or not. Value is [Measures].[New Balance Dest] and goal is [Measures].[New Balance Dest] < 20000. Deploy the project again.



3. Demonstration of OLAP operations

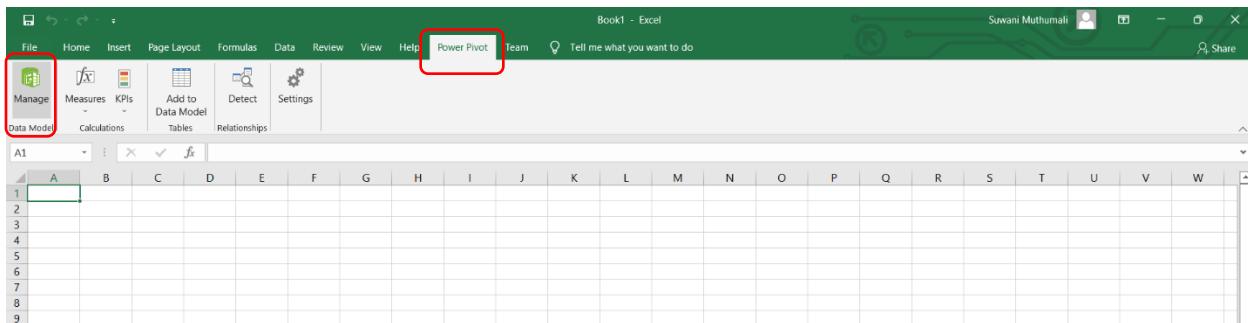
Drag Name, Gender, Income Type Family Status, KPI value and goal to the grid. Then execute query. Then generate the MDX query using the cube's browser.

The screenshot shows the Microsoft SQL Server Management Studio (SSMS) interface with the title "Cube_PROJECT_Bank [Browse] - Microsoft SQL Server Management Studio". The left pane, "Object Explorer", shows the SSAS project structure under "PROJET_SSAS". The central pane, "Cube_PROJECT_Bank [Browse]", displays the cube's metadata and a large grid of data. The grid has columns: Name, Gender, Income Type, Family Status, KPI Loan Balance Value, and KPI Loan Balance Goal. The data shows various combinations of gender and family status, with values ranging from 0 to 1110864 and goals from False to True. The bottom of the grid pane shows a message: "SELECT NON EMPTY { [KPIValue]([KPI Current Loan Amount], [KPIGoal]([KPI Current Loan Amount])) } ON COLUMNS, NON EMPTY { {[Dim Loans].[Name].>[Name].ALLMEMBERS * [Dim Loans].[Gender].>[Gender].ALLMEMBERS * [Dim Loans].[Income Type].>[Income Type].ALLMEMBERS * [Dim Loans].[Family Status].>[Family Status].ALLMEMBERS } } DIMENSION PROPERTIES MEMBER_CAPTION, MEMBER_UNIQUE_NAME ON ROWS FROM [Cube_PROJECT_Bank] CELL PROPERTIES VALUE, BACK_COLOR, FORE_COLOR, FORMATTED_VALUE, FORMAT_STRING, FONT_NAME, FONT_SIZE, FONT_FLAGS".

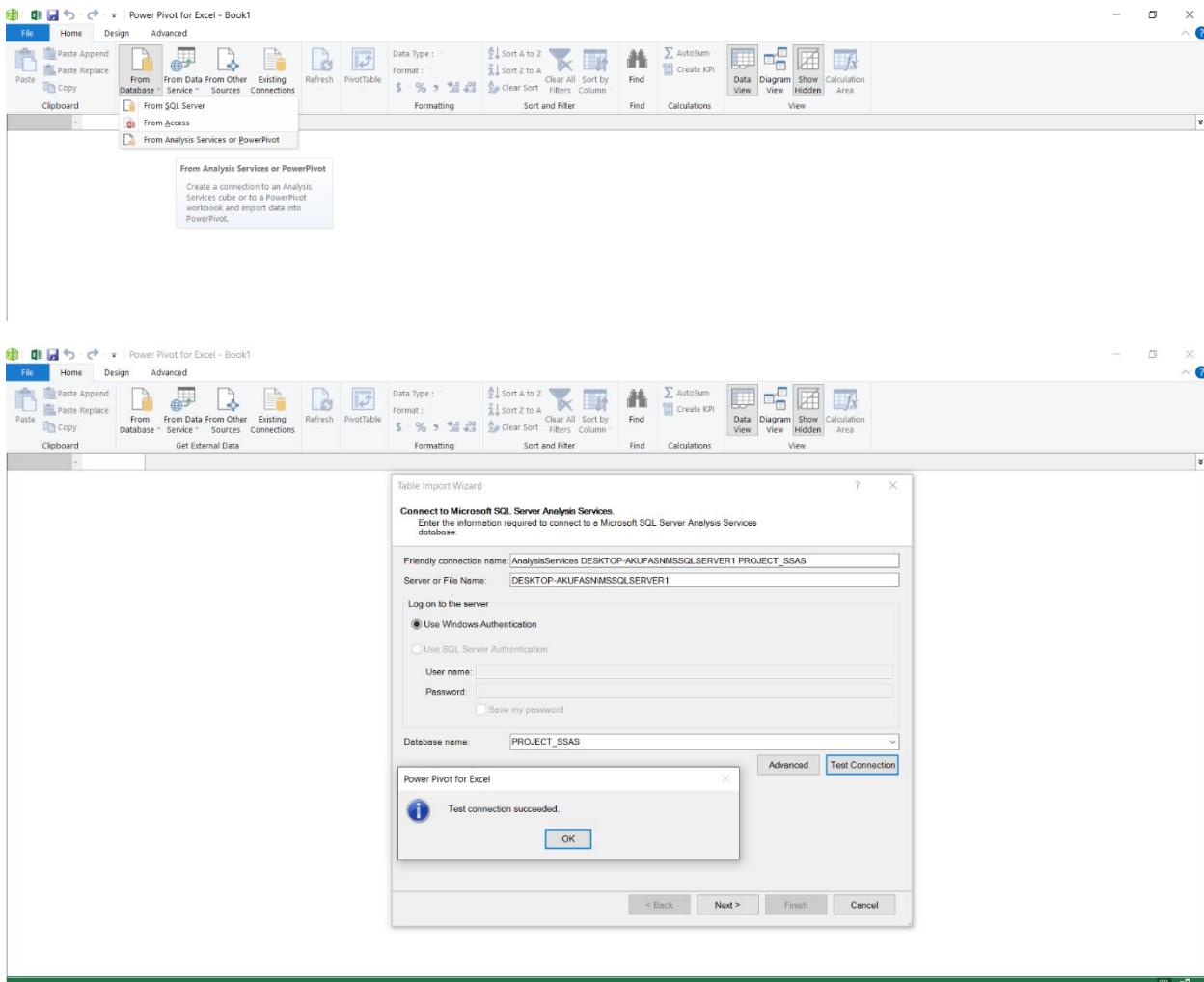
This screenshot is identical to the one above, showing the Microsoft SQL Server Management Studio interface with the title "Cube_PROJECT_Bank [Browse] - Microsoft SQL Server Management Studio". The left pane, "Object Explorer", shows the SSAS project structure under "PROJET_SSAS". The central pane, "Cube_PROJECT_Bank [Browse]", displays the cube's metadata and a large grid of data. The grid has columns: Name, Gender, Income Type, Family Status, New Balance Dest, and KPI Loan Balance Goal. The data shows various combinations of gender and family status, with values ranging from 0 to 1110864 and goals from False to True. The bottom of the grid pane shows the same MDX query as the previous screenshot.

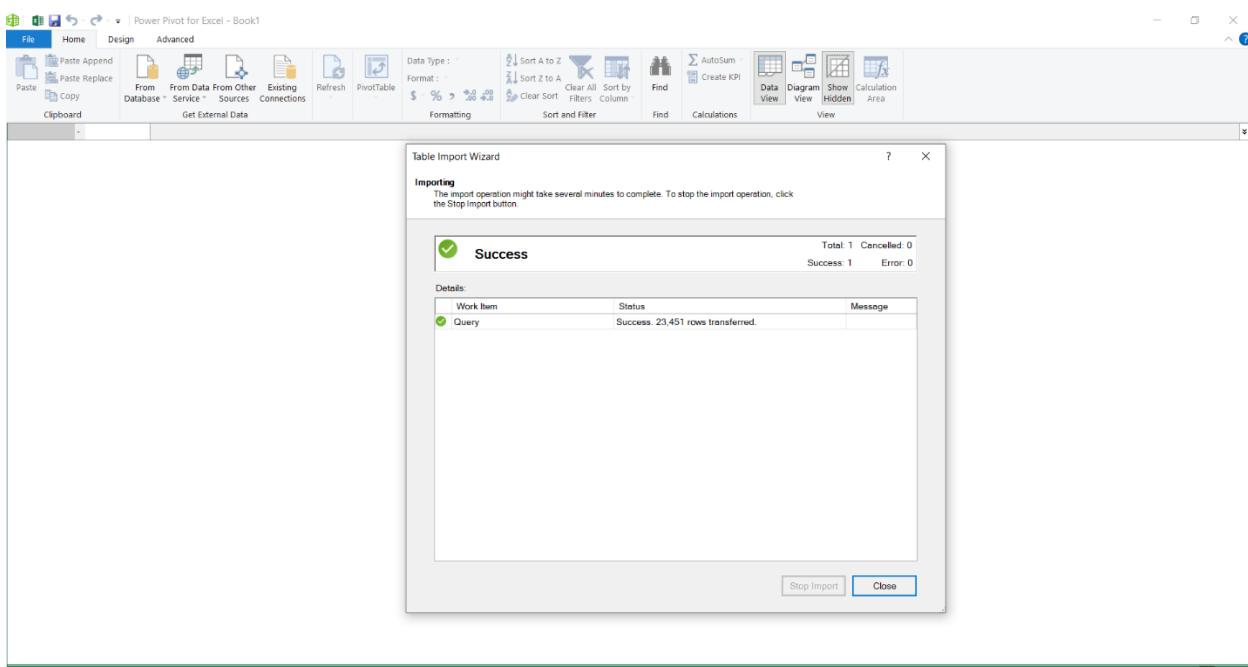
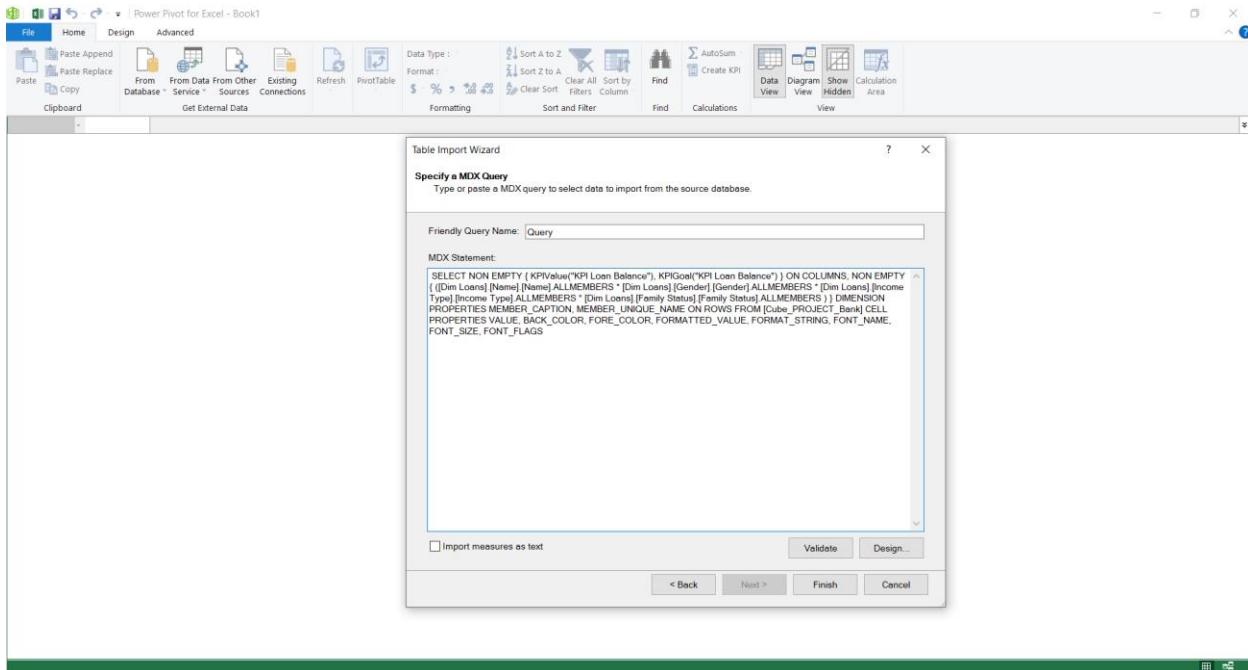
Copy the MDX query above.

Opened MS excel and added POWER PIVOT tab from the settings of excel. Then click POWER PIVOT > Manage

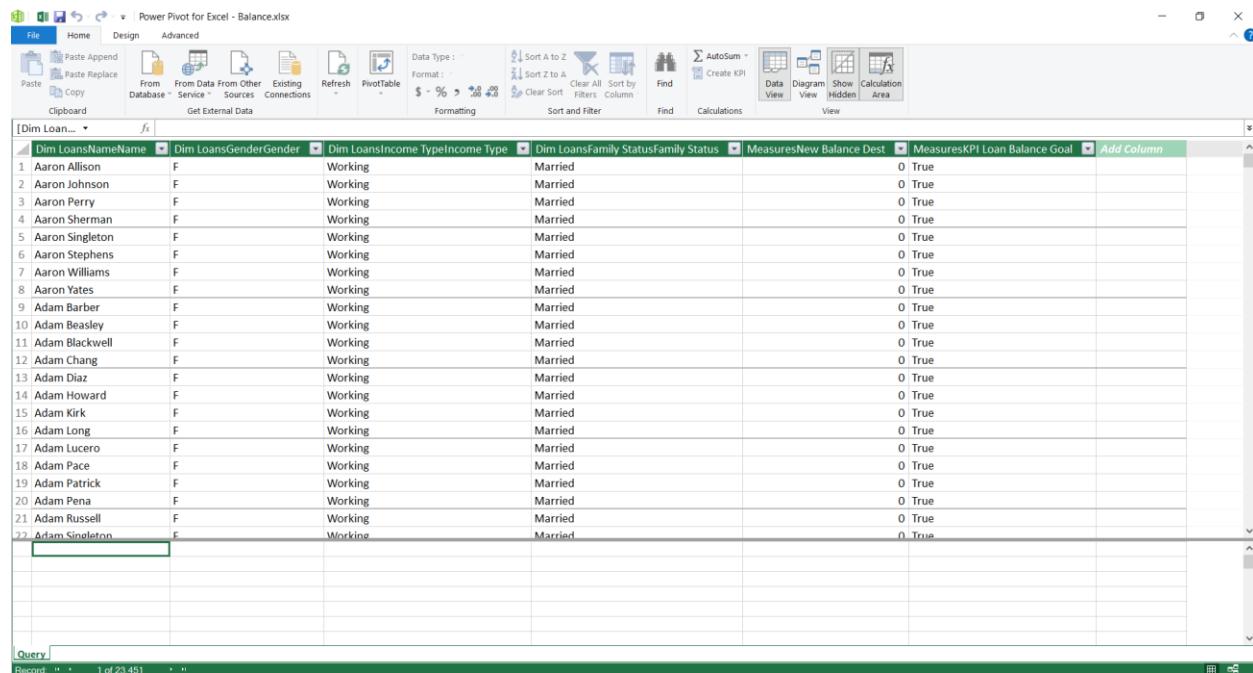


Then navigate to From Databases > From Analysis Service or PowerPivot. Then connected to the server and pasted the MDX query and execute. Then I got success message.





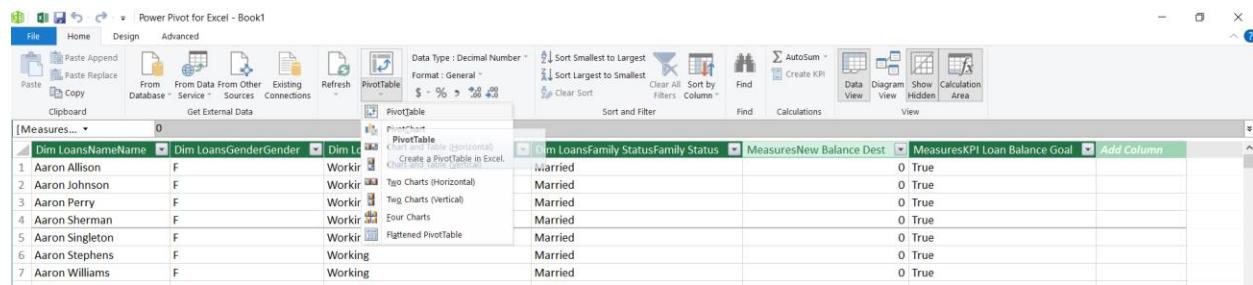
Then it displayed like below.



The screenshot shows the Power Pivot ribbon with tabs like File, Home, Design, and Advanced. The main area displays a table with columns: Dim LoansNameName, Dim LoansGenderGender, Dim LoanIncomeTypeIncome Type, Dim LoansFamilyStatusFamily Status, MeasuresNew Balance Dest, and MeasuresKPI Loan Balance Goal. The table contains 23 rows of data. The status bar at the bottom indicates 23,451 records.

Dim LoansNameName	Dim LoansGenderGender	Dim LoanIncomeTypeIncome Type	Dim LoansFamilyStatusFamily Status	MeasuresNew Balance Dest	MeasuresKPI Loan Balance Goal	Add Column
1 Aaron Allison	F	Working	Married	0	True	
2 Aaron Johnson	F	Working	Married	0	True	
3 Aaron Perry	F	Working	Married	0	True	
4 Aaron Sherman	F	Working	Married	0	True	
5 Aaron Singleton	F	Working	Married	0	True	
6 Aaron Stephens	F	Working	Married	0	True	
7 Aaron Williams	F	Working	Married	0	True	
8 Aaron Yates	F	Working	Married	0	True	
9 Adam Barber	F	Working	Married	0	True	
10 Adam Beasley	F	Working	Married	0	True	
11 Adam Blackwell	F	Working	Married	0	True	
12 Adam Chang	F	Working	Married	0	True	
13 Adam Diaz	F	Working	Married	0	True	
14 Adam Howard	F	Working	Married	0	True	
15 Adam Kirk	F	Working	Married	0	True	
16 Adam Long	F	Working	Married	0	True	
17 Adam Lucero	F	Working	Married	0	True	
18 Adam Pace	F	Working	Married	0	True	
19 Adam Patrick	F	Working	Married	0	True	
20 Adam Pena	F	Working	Married	0	True	
21 Adam Russell	F	Working	Married	0	True	
22 Adam Singleton	F	Working	Married	0	True	

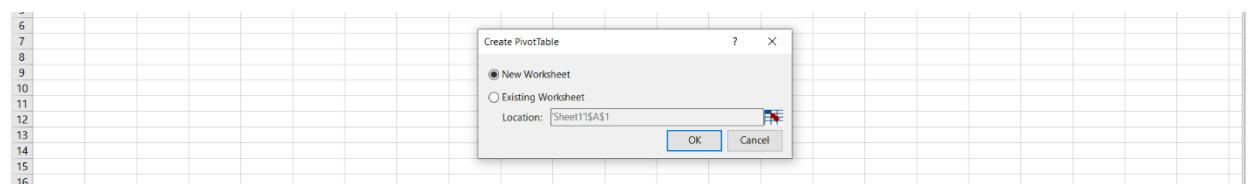
Add Pivot Table for the above dataset by selecting PivotTable from PivotTable.



The screenshot shows the Power Pivot ribbon with the PivotTable button selected. The main area displays the same dataset as the previous screenshot. The status bar at the bottom indicates 23,451 records.

Dim LoansNameName	Dim LoansGenderGender	Dim Loa	Dim LoansFamilyStatusFamily Status	MeasuresNew Balance Dest	MeasuresKPI Loan Balance Goal	Add Column
1 Aaron Allison	F	Workir	Married	0	True	
2 Aaron Johnson	F	Workir	Two Charts (Horizontal)	0	True	
3 Aaron Perry	F	Workir	Two Charts (Vertical)	0	True	
4 Aaron Sherman	F	Workir	Four Charts	0	True	
5 Aaron Singleton	F	Workir	Flattened PivotTable	0	True	
6 Aaron Stephens	F	Working	Married	0	True	
7 Aaron Williams	F	Working	Married	0	True	

Select New Worksheet



In the Excel, I can see all the fields I selected via the MDX Query.

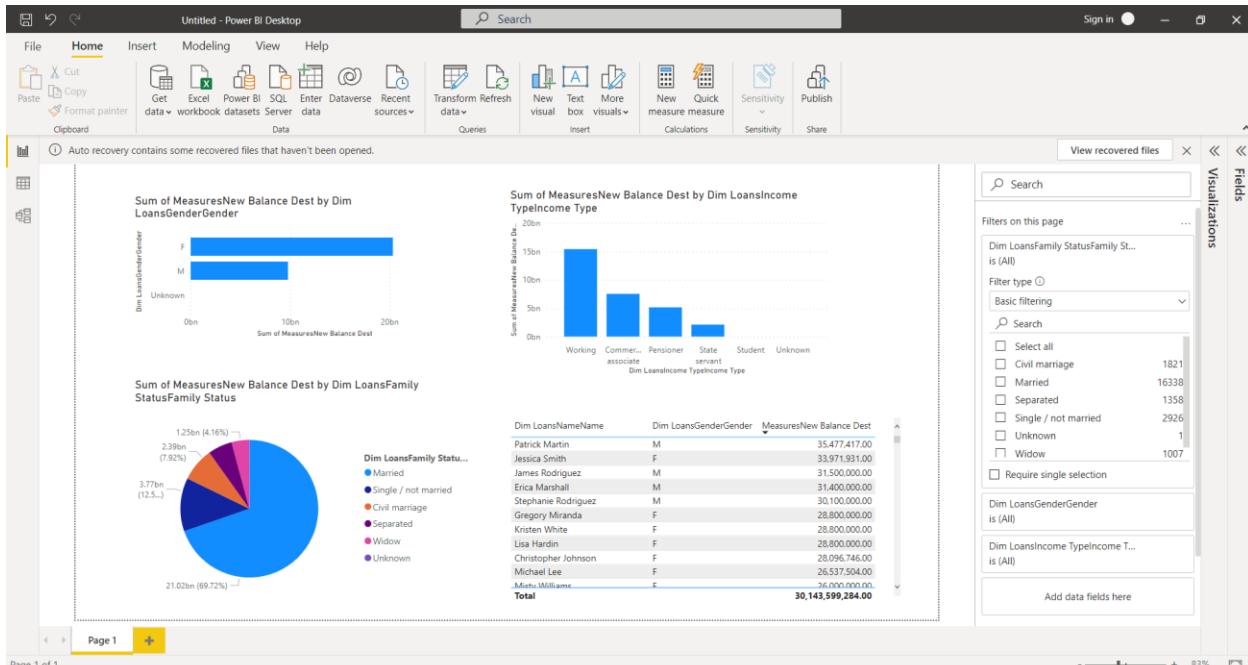
In order to create **Drill Down and Roll Up**, I created the below chart which can be see the data which is relevant to Gender, Income Type and Family Status. Here you can select Drill Down and Roll Up OLAP operations.

	Commercial associate	Average of MeasuresNew Balance Dest
Civil marriage	1264681.89	
Married	1424254.168	
Separated	1297060.886	
Single / not married	1398646.36	
Widow	1504748.057	
Pensioner		
Civil marriage	1283335.891	
Married	1309570.179	
Separated	1266363.188	
Single / not married	1598830.059	
Widow	1333868.388	
State servant		
Civil marriage	1186673.071	
Married	1223199.565	
Separated	1147961.802	
Single / not married	1517528.338	
Widow	1612694.488	
Student		
Married	0	
Working		
Civil marriage	1285172.743	
Married	1289908.427	
Separated	1146112.054	
Single / not married	1178033.325	

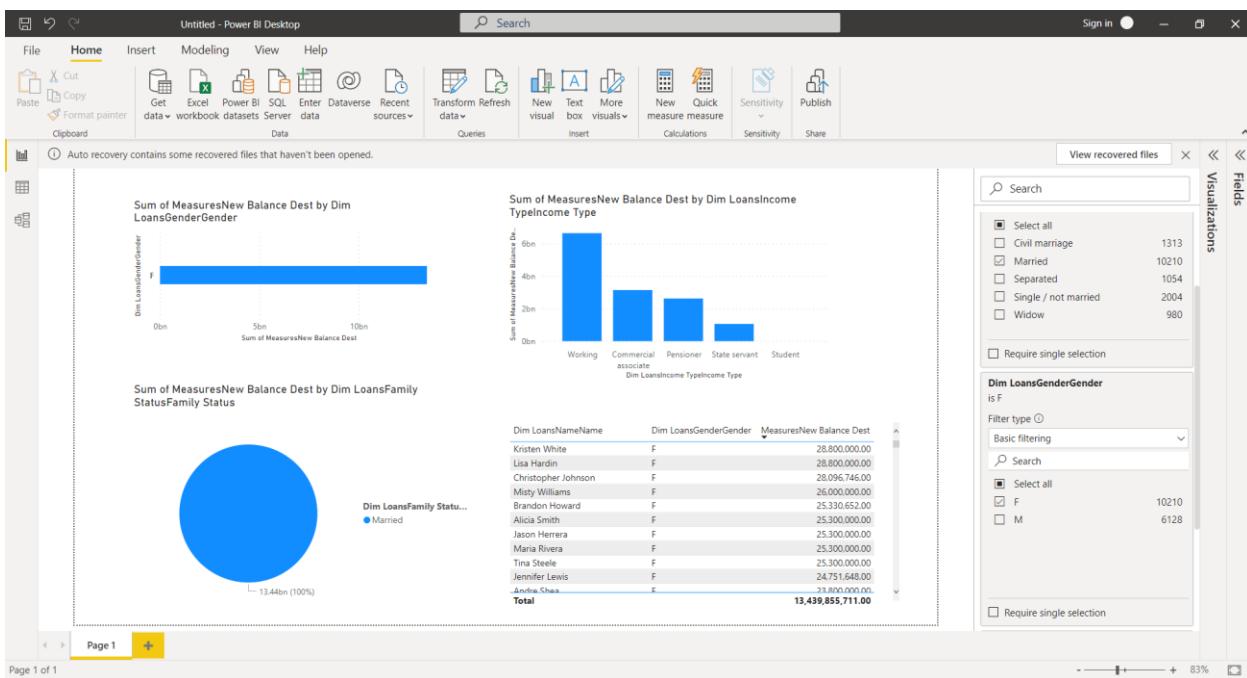
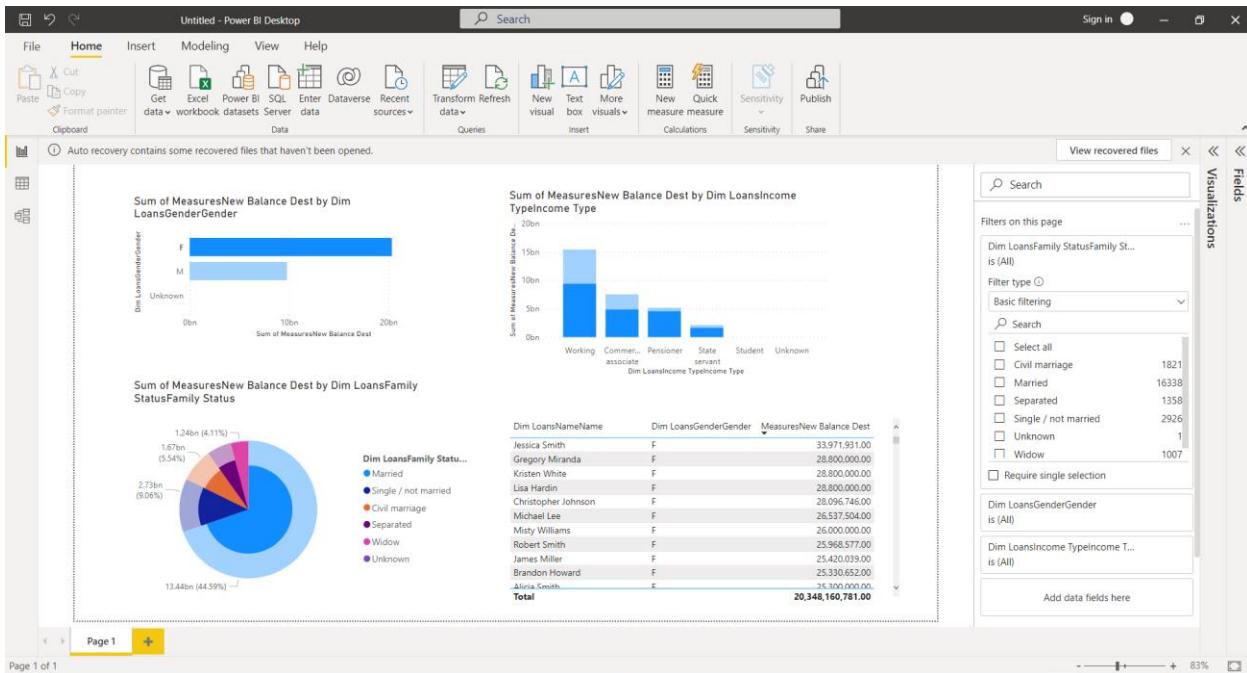
Double click on Average of MeasuresNew Balance Dest column value relevant for any Family Status. You can see the following data.

Data returned for Average of MeasuresNew Balance Dest, F - Pensioner - Civil marriage (First 1000 rows).					
A	B	C	D	E	F
1 Data returned for Average of MeasuresNew Balance Dest, F - Pensioner - Civil marriage (First 1000 rows).					
3 Query[Dim LoanNameName]	Query[Dim LoansGenderGender]	Query[Dim LoansIncome Typeincome Type]	Query[Dim LoansFamily StatusFamily Status]	Query[MeasuresNew Balance Dest]	Query[MeasuresKPI Loan Balance Go
4 Aaron Williams	F	Pensioner	Civil marriage		0 True
5 Amanda Myers	F	Pensioner	Civil marriage		0 True
6 Amanda Page	F	Pensioner	Civil marriage		0 True
7 Amanda Vaughn	F	Pensioner	Civil marriage		0 True
8 Amber Kim	F	Pensioner	Civil marriage		0 True
9 Amber Perez	F	Pensioner	Civil marriage		0 True
10 Amy Williams	F	Pensioner	Civil marriage		0 True
11 Andrea Baker	F	Pensioner	Civil marriage		0 True
12 Andrew Smith	F	Pensioner	Civil marriage		0 True
13 Anne Tran	F	Pensioner	Civil marriage		0 True
14 Annette Campbell	F	Pensioner	Civil marriage		0 True
15 Benjamin Kim	F	Pensioner	Civil marriage		0 True
16 Brandi Mendoza	F	Pensioner	Civil marriage		0 True
17 Brandon Rangel	F	Pensioner	Civil marriage		0 True
18 Brett Owen	F	Pensioner	Civil marriage		0 True
19 Brian Johnson	F	Pensioner	Civil marriage		0 True
20 Brittany Bryan	F	Pensioner	Civil marriage		0 True
21 Candace Horton	F	Pensioner	Civil marriage		0 True
22 Candice Woods	F	Pensioner	Civil marriage		0 True
23 Cassandra Keller	F	Pensioner	Civil marriage		0 True
24 Catherine Johnson	F	Pensioner	Civil marriage		0 True
25 Catherine Larson	F	Pensioner	Civil marriage		0 True
26 Chad Gibson	F	Pensioner	Civil marriage		0 True
27 Christina Barnett	F	Pensioner	Civil marriage		0 True
28 Christine Bennett	F	Pensioner	Civil marriage		0 True
29 Cindy McLaughlin	F	Pensioner	Civil marriage		0 True

In order to create **Slice and Dice** I created the following Power BI dashboard. By creating different kind of charts with respect to total loan balance.



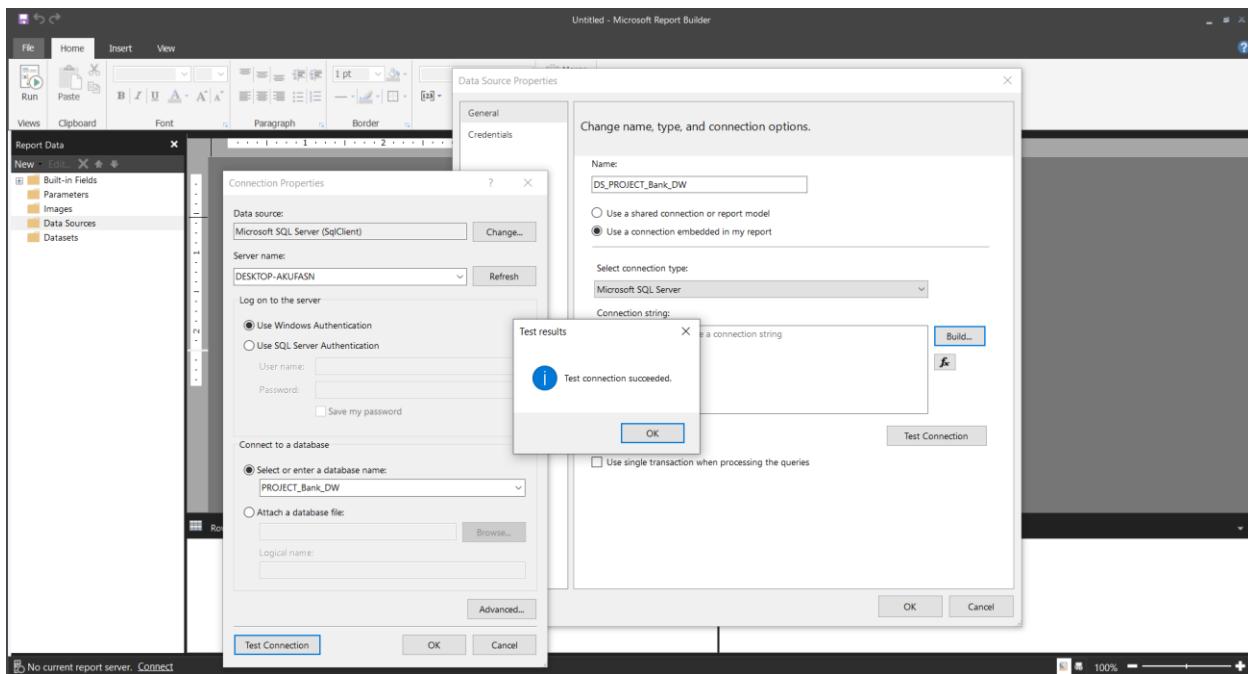
Here you can see the Slice operation from the below diagram.



In the above figure, you can see the data relevant to **Females who Married**.

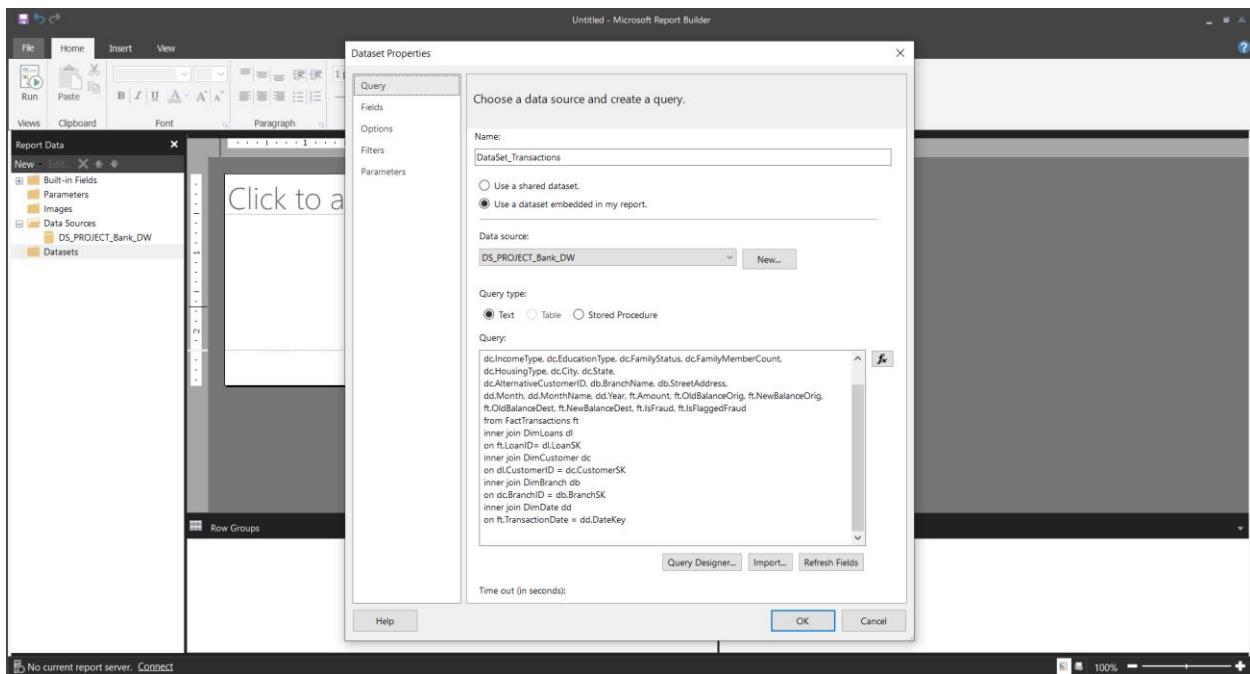
4.SSRS Reports

First open Microsoft Report Builder and then add a Data Source which is the data warehouse (PROJECT_Bank_DW) I built. Test the connection and click 'OK'.



Then created a dataset by giving the following query

```
SELECT dl.LoaStatus, dl.CurrentLoanAmount, dc.Name, dc.Gender, dc.ChildrenCount,
dc.IncomeTotal,
dc.IncomeType, dc.EducationType, dc.FamilyStatus, dc.FamilyMemberCount,
dc.HousingType, dc.City, dc.State,
dc.AlternativeCustomerID, db.BranchName, db.StreetAddress,
dd.Month, dd.MonthName, dd.Year, ft.Amount, ft.OldBalanceOrig, ft.NewBalanceOrig,
ft.OldBalanceDest, ft.NewBalanceDest, ft.IsFraud, ft.IsFlaggedFraud
FROM FactTransactions ft
inner join DimLoans dl
on ft.LoanID= dl.LoaSK
inner join DimCustomer dc
on dl.CustomerID = dc.CustomerSK
inner join DimBranch db
on dc.BranchID = db.BranchSK
inner join DimDate dd
on ft.TransactionDate = dd.DateKey
```



Inserted dataset can be seen like this.

