COP 5725: Database Management Systems

Project Deliverable 3

Group 25

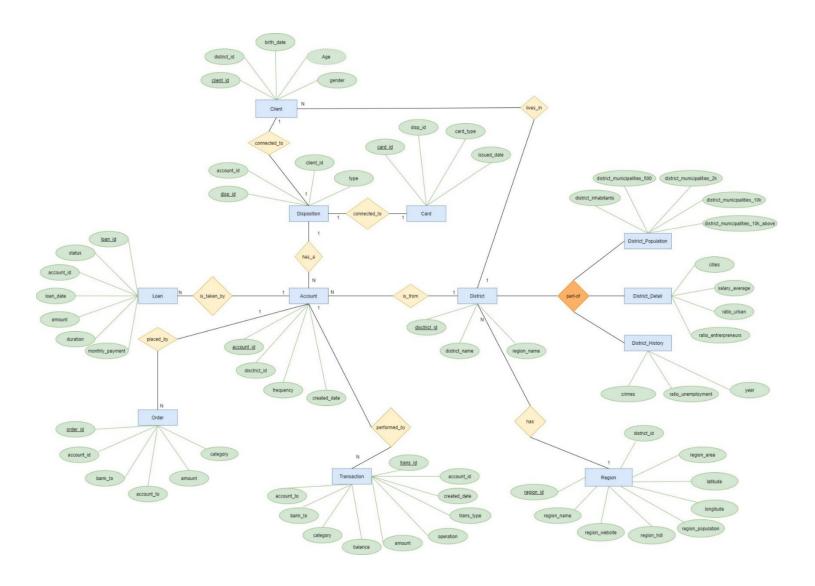
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Czech Bank Financial Data Analysis and Demographics

Contents

=	R Diagram	3	3
₹	elation Schemas	4	4
	Region	4	4
	Account	4	4
	Client	4	4
	Disposition	4	4
	Card	4	4
	District	4	4
	District_Detail	4	4
	District_Population	4	4
	District_History	4	4
	Loan	4	4
	Order	4	4
	Transaction	5	=
S	SQL Table Schemas5		
	Region	5	5
	Account	6	2
	Client	7	7
	Disposition	7	7
	Card	8	3
	District	9	2
	District_Detail	9	2
	District_Population	10	_
	District_History	11	1
	Loan	12	2
	Order	13	3
	Transaction	14	4
כ	ata Source	15	5

ER Diagram



Note: There are no changes in the ER diagram except from the addition of the table "region", which is connected to the district table by district_id with a 1-to-n relationship.

Relation Schemas

Region

region(region_id:number, district_id:number, region_name:varchar, region_area:float, region_population:number, region_hdi:float, region_website:varchar, latitude:number, longitude:number)

Account

account(account_id:number, district_id:number, frequency:char, created_date:date)

Client

client(client_id:number, district_id:number, birth_date:date, gender:char)

Disposition

disposition(disp_id:number, client_id:number, account_id:number, disp_type:char)

Card

card(card_id:number, disp_id:number, card_type:char, issued_date:date)

District

district(district_id:number, region_name:varchar, district_name:varchar)

District Detail

district_detail(district_id:number, salary_average:float, ratio_urban:float, ratio_entrerpreneurs:float)

District Population

district_population(district_id:number, inhabitants:number, municipalities_500:number, municipalities_2k:number, municipalities_10k:number, municipalities_10k_above:number)

District History

district_history(district_id:number, crimes:number, ratio_unemployment:number, year:number)

Loan

loan(loan_id:number, account_id:number, loan_date:date, duration:number, payments:decimal, status:char)

Order

account_order(order_id:number, account_id:number, bank_to:char, account_to:number, amount:decimal, category:char)

Transaction

transaction(trans_id:number, account_id:number, created_date:date, trans_type:char, operation:char, amount:decimal, balance:decimal, category:char, bank_to:char, account_to:number)

SQL Table Schemas

We have included a screenshot for every command and table created. The command can be seen in the main window, while the table created by the command, can be seen at the left panel.

Region

```
CREATE TABLE region(
region_id number NOT NULL,
region_name varchar(100) NOT NULL,
region_area float NOT NULL,
region_population number NOT NULL,
region_hdi float NOT NULL,
region_website varchar(100),
district_id number NOT NULL,
Latitude number,
Longitute number,
PRIMARY KEY (region_id)
);
```

Note: We created this table by cross referencing data from other sources (Wikipedia).

```
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Connections

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                                                                                  Worksheet Query Builder
DBMSProject

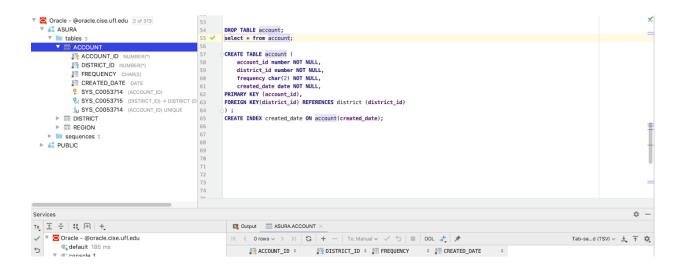
Tables (Filtere
DISTRICT
REGION
                                                                                      CREATE TABLE region (
                                                                                           region_id number NOT NULL,
region_name varchar(100) NOT NULL,
                                                                                            region_area float NOT NULL,
            REGION_ID
                                                                                            region population number NOT NULL.
            REGION NAME
                                                                                            region_hdi float NOT NULL,
            REGION_AREA
                                                                                           region_website varchar(100),
district_id number NOT NULL,
            REGION POPULATION
            REGION_HDI
                                                                                            Latitude number,
            REGION_WEBSITE
                                                                                            Longitute number,
            DISTRICT ID
                                                                                        PRIMARY KEY (region_id)
            LONGITUTE
```

Account

```
CREATE TABLE account (
    account_id number NOT NULL,
    district_id number NOT NULL,
    frequency char(2) NOT NULL,
    created_date date NOT NULL,
    PRIMARY KEY (account_id),

FOREIGN KEY(district_id) REFERENCES district (district_id)
);
```

CREATE INDEX created_date ON account(created_date);



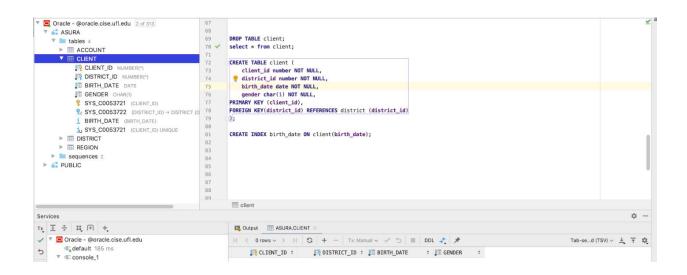
Client

```
CREATE TABLE client (
    client_id number NOT NULL,
    district_id number NOT NULL,
    birth_date date NOT NULL,
    gender char(1) NOT NULL,

PRIMARY KEY (client_id),

FOREIGN KEY(district_id) REFERENCES district (district_id)
);
```

CREATE INDEX birth_date ON client(birth_date);



Disposition

```
CREATE TABLE disposition (
disp_id number NOT NULL,
client_id number NOT NULL,
account_id number NOT NULL,
disp_type char(1) NOT NULL,
```

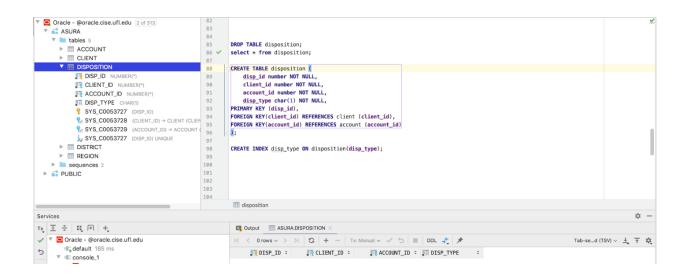
PRIMARY KEY (disp_id),

FOREIGN KEY(client_id) REFERENCES client (client_id),

FOREIGN KEY(account_id) REFERENCES account (account_id)

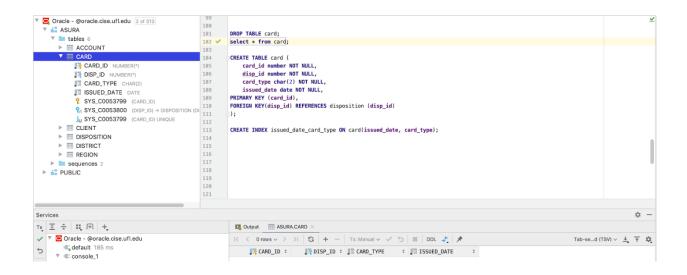
);

CREATE INDEX disp_type **ON** disposition(**disp_type**);



Card

```
CREATE TABLE card (
card_id number NOT NULL,
disp_id number NOT NULL,
card_type char(2) NOT NULL,
issued_date date NOT NULL,
PRIMARY KEY (card_id),
FOREIGN KEY(disp_id) REFERENCES disposition (disp_id)
);
CREATE INDEX issued_date_card_type ON card(issued_date, card_type);
```



District

CREATE TABLE district(

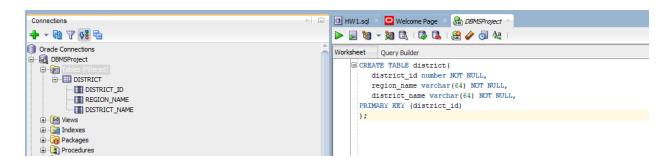
district_id number NOT NULL,

region_name varchar(64) NOT NULL,

district_name varchar(64) NOT NULL,

PRIMARY KEY (district_id)

);



District Detail

CREATE TABLE district_detail(

district_id number NOT NULL,

salary_average float NOT NULL,

```
ratio_urban float NOT NULL,
ratio_entrerpreneurs float NOT NULL,
UNIQUE (district_id),
FOREIGN KEY(district_id) REFERENCES district (district_id)
);
```

```
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                                              ▶ 🇯 🕓 P 🔑 Tx: Manual ∨ 🗸 🖒 🗏
 CISE Oracle DB 2 of 314
                                              20
  MY4
                                              21
                                                     CREATE TABLE district_detail(
    > III DISTRICT
                                              22
                                                         district_id number NOT NULL,

✓ ■ DISTRICT DETAIL

                                              23
                                                         salary_average float NOT NULL,
          ₽ DISTRICT_ID NUMBER(*)
                                              24
                                                         ratio_urban float NOT NULL,
          ■ SALARY_AVERAGE FLOAT(*)
                                              25
                                                         ratio_entrerpreneurs float NOT NULL,
          RATIO_URBAN FLOAT(*)
                                              26
                                                      UNIQUE (district_id),
          ■ RATIO_ENTRERPRENEURS FLOAT(*)
                                              27
                                                      FOREIGN KEY(district_id) REFERENCES district (district_id)
           SYS_C0054278 (DISTRICT_ID)
                                              28
                                                    (<del>|</del>|
          % SYS_C0054279 (DISTRICT_ID) → DISTRICT (DI: 29
           Ju SYS_C0054278 (DISTRICT_ID) UNIQUE
```

District Population

```
CREATE TABLE district_population(
district_id number NOT NULL,
inhabitants number NOT NULL,
municipalities_500 number NOT NULL,
municipalities_2k number NOT NULL,
municipalities_10k number NOT NULL,
municipalities_10k_above number NOT NULL,
UNIQUE (district_id),
FOREIGN KEY(district_id) REFERENCES district (district_id)
);
```

```
■ Database )  CISE Oracle DB )  MY4 )  DISTRICT POPULATION
                                  console [CISE Oracle DB] × 👼 Project work\console.sql ×
 Database
  + 📵 S 🗫 🔳 🖽 💆 🚾 🝸
                                                         © P 🔑 Tx: Manual ∨ 🗸 💆 🗏
                                                  39
  CISE Oracle DB 2 of 314
                                                  40

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MY4

                                                  41
       > III DISTRICT
                                                  42
       > III DISTRICT_DETAIL
                                                  43
       DISTRICT_HISTORY
                                                  44
                                                         CREATE TABLE district_population(
          ■ DISTRICT_POPULATION
                                                  45
                                                             district_id number NOT NULL,
             J DISTRICT_ID NUMBER(*)
                                                  46
                                                             inhabitants number NOT NULL,
             ■ INHABITANTS NUMBER(*)
                                                  47
                                                            municipalities_500 number NOT NULL,
             ■ MUNICIPALITIES_500 NUMBER(*)
                                                  48
                                                            municipalities 2k number NOT NULL,
             ■ MUNICIPALITIES_2K NUMBER(*)
                                                  49
                                                            municipalities 10k number NOT NULL,
             ■ MUNICIPALITIES_10K NUMBER(*)
                                                 50
                                                             municipalities 10k above number NOT NULL,
             ■ MUNICIPALITIES_10K_ABOVE NUMBER(*)
                                                  51
                                                          UNIQUE (district_id),
             SYS_C0054286 (DISTRICT_ID)
             N SYS_C0054287 (DISTRICT_ID) → DISTRICT (DI: 52
                                                          FOREIGN KEY(district_id) REFERENCES district (district_id)
                                                  53
             iu SYS_C0054286 (DISTRICT_ID) UNIQUE
                                                        (<del>|</del>);
                                                  54
       > III EMPLOYEES
```

District_History

```
CREATE TABLE district_history(

district_id number NOT NULL,

crimes number NOT NULL,

ratio_unemployment number NOT NULL,

year number NOT NULL,

UNIQUE (district_id),

FOREIGN KEY(district_id) REFERENCES district (district_id)

);
```

```
■ Database \ ☐ CISE Oracle DB \ ☐ MY4 \ Ⅲ DISTRICT_HISTORY
                              Database
                                             ▶ 🧯 🕓 👂 🔑 Tx: Manual < 🗸 💆 🔳
  + □ 5 % ■ Ⅲ ∠ □ ▼
                                             65
  ✓ CISE Oracle DB 2 of 314
      MY4
                                             66
       > III DISTRICT
                                             67
                                             68
       > III DISTRICT_DETAIL
                                                   CREATE TABLE district_history(
                                             69
         ■ DISTRICT_HISTORY
                                             70
                                                      district_id number NOT NULL,
            DISTRICT_ID NUMBER(*)
                                             71
                                                      crimes number NOT NULL,
            ■ CRIMES NUMBER(*)
                                             72
                                                      ratio_unemployment number NOT NULL,
            RATIO_UNEMPLOYMENT NUMBER(*)
                                             73
                                                      year number NOT NULL,
            YEAR NUMBER(*)
                                             74
                                                    UNIQUE (district_id),
            SYS_C0054292 (DISTRICT_ID)
            SYS_C0054293 (DISTRICT_ID) → DISTRICT (DI: 75
                                                    FOREIGN KEY(district_id) REFERENCES district (district_id)
            Ju SYS_C0054292 (DISTRICT_ID) UNIQUE
```

Loan

```
CREATE TABLE loan

(

loan_id number NOT NULL,

account_id number NOT NULL,

loan_date date NOT NULL,

duration number,

payments decimal(10, 2) NOT NULL,

status char(1) NOT NULL,

PRIMARY KEY (loan_id),

FOREIGN KEY(account_id) REFERENCES account (account_id)

);

CREATE INDEX loan_date ON loan(loan_date);
```

```
▶ ■ DISTRICT
                                             180
                                                     CREATE TABLE loan
                                             181
▶ ■ DISTRICT_DETAIL
                                             182
▶ ■ DISTRICT_HISTORY
                                                                                  NOT NULL.
                                             183
                                                         loan_id
                                                                    number
▶ ■ DISTRICT_POPULATION
                                             184
                                                         account_id number
                                                                                  NOT NULL,
▼ III LOAN
                                             185
                                                         loan_date date
                                                                                  NOT NULL,
     LOAN_ID NUMBER(*)
                                             186
                                                         duration
                                                                   number,
    ACCOUNT_ID NUMBER(*)
                                             187
                                                         payments
                                                                   decimal(10, 2) NOT NULL,
    LOAN_DATE DATE
                                             188
                                                         status
                                                                   char(1)
                                                                                  NOT NULL,
    DURATION NUMBER(*)
                                                      PRIMARY KEY (loan_id),
                                             189
                                                     FOREIGN KEY(account_id) REFERENCES account (account_id)
    PAYMENTS NUMBER(10,2)
                                             190
    STATUS CHAR(1)
                                             191
                                             192
     SYS_C0053837 (LOAN_ID)
                                                      CREATE INDEX loan_date ON loan(loan_date);
                                             193 🗸
     SYS_C0053838 (ACCOUNT_ID) → ACCOUNT (A
     ju SYS_C0053837 (LOAN_ID) UNIQUE
```

Order

```
CREATE TABLE account_order (
order_id number NOT NULL,
account_id number NOT NULL,
bank_to char(2) NOT NULL,
account_to number NOT NULL,
amount decimal(10,2) NOT NULL,
category char(3) NOT NULL,
PRIMARY KEY (order_id),
FOREIGN KEY(account_id) REFERENCES account (account_id),
FOREIGN KEY(account_to) REFERENCES account (account_to)
);
```

```
ACCOUNT_ORDER
                                               199
                                                        CREATE TABLE account_order (
                                               200 %
  ORDER_ID NUMBER(*)
                                               201
                                                           order_id number NOT NULL,
  ACCOUNT_ID NUMBER(*)
                                                           account_id number NOT NULL,
                                               202
  BANK_TO CHAR(2)
                                               203
                                                           bank_to char(2) NOT NULL,
  ACCOUNT_TO NUMBER(*)
                                                           account_to number NOT NULL,
                                               204
  AMOUNT NUMBER(10,2)
                                               205
                                                           amount decimal(10,2) NOT NULL,
  E CATEGORY CHAR(3)
                                               206
                                                           category char(3) NOT NULL,
  SYS_C0053851 (ORDER_ID)
                                               207
                                                        PRIMARY KEY (order_id),
  M SYS_C0053852 (ACCOUNT_ID) → ACCOUNT (ACCC
                                               208
                                                        FOREIGN KEY(account_id) REFERENCES account (account_id),
  SYS_C0053853 (ACCOUNT_TO) → ACCOUNT (ACC
                                                        FOREIGN KEY(account_to) REFERENCES account (account_id)
                                               209
                                               210
                                                        );
  JU SYS_C0053851 (ORDER_ID) UNIQUE
```

Transaction

```
CREATE TABLE transaction (
 trans id number NOT NULL,
 account_id number NOT NULL,
 created_date date NOT NULL,
 trans_type char(2) NOT NULL,
 operation char(3) NOT NULL,
 amount decimal(10,2) NOT NULL,
 balance decimal(10,2) NOT NULL,
 category char(3) NOT NULL,
 bank_to char(2) NOT NULL,
 account to number NOT NULL.
PRIMARY KEY (trans_id),
FOREIGN KEY(account_id) REFERENCES account (account_id)
);
CREATE INDEX trans created date ON transaction(created date, trans type);
CREATE INDEX trans_amount ON transaction(amount);
CREATE INDEX trans balance ON transaction(balance);
CREATE INDEX trans_category ON transaction(category);
```

```
212
▼ III TRANSACTION
                                              213
                                                      CREATE TABLE transaction (
    TRANS_ID NUMBER(*)
                                              214
                                                          trans_id number NOT NULL,
    ACCOUNT_ID NUMBER(*)
                                              215
                                                          account id number NOT NULL,
    CREATED_DATE DATE
                                              216
                                                          created_date date NOT NULL,
    TRANS TYPE CHAR(2)
                                              217
                                                          trans_type char(2) NOT NULL, -- CR+=credit, DB=-debit
    OPERATION CHAR(3)
                                              218
                                                          operation char(3) NOT NULL,
    AMOUNT NUMBER(10,2)
                                              219
                                                          amount decimal(10,2) NOT NULL,
                                              220
                                                          balance decimal(10,2) NOT NULL,
    BALANCE NUMBER(10.2)
                                                          category char(3) NOT NULL,
    CATEGORY CHAR(3)
                                                          bank_to char(2) NOT NULL,
    BANK_TO CHAR(2)
                                                          account_to number NOT NULL,
                                              223
    ACCOUNT_TO NUMBER(*)
                                                      PRIMARY KEY (trans id),
                                              224
    SYS_C0053866 (TRANS_ID)
                                                      FOREIGN KEY(account_id) REFERENCES account (account_id)
    % SYS_C0053867 (ACCOUNT_ID) → ACCOUNT (AC
                                              226
    ju SYS_C0053866 (TRANS_ID) UNIQUE
                                            227
```

Data Sources

The dataset to be used for drawing aforementioned inferences is hosted at <u>data.world</u> website. All of our data can be found in the links below.

- http://lisp.vse.cz/pkdd99/berka.htm
- https://data.world/lpetrocelli/czech-financial-dataset-real-anonymizedtransactions/workspace/intro
- https://www.researchgate.net/post/Is_there_any_public_database_for_financial_transactions_or_a t_least_a_synthetic_generated_data_set
- www.wikipedia.org