380 Project: Stock Exchange Database

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Before Edits

Introduction

In simple terms, the **Stock Exchange Market** (or Stock Market for short) is a market in which companies sell stocks (i.e. shares) to investors.

Concretely, companies must acquire money to finance their expansion and growth, companies do that by selling what's called a *stock,* which is, stocks are traded to *Investors.*

Companies rely on a *Stock Market* to moderate and manage the transactions and security of their stocks. In Saudi Arabia, the only existing stock market is called *Tadawul* (تداول) and it moderates 202 different stocks identified by their *Stock Symbol* (e.g. *Othaim Markets* Stock symbol is *4001*).

A company may sell a number of stocks publicly through Tadawul, and a *Bank* which processes the money exchange from investors. The person in charge of deciding whether a company sells stocks or not is usually the *CEO* of the company.

So the database we're aiming to build should enable the management of the stock market via secure transactions between companies, investors, and banks.

Objectives

- Manage company stocks by building a database to store stock data (Company associated with Stock, number of stocks, etc.)
- Accelerate the trade of stocks by systematizing the process online via a database (In the past trading was not done over the internet)
- Securely trade stocks between companies and investors

2

Data requirements

- **Stock Market's** name, market cap, currency
- Info about a **Company's** name, commercial registration number (رقم السجل التجاري) is collected as well as info about the **CEO** of the company
- In each transaction, we should store the **Investor** info such as his name and IBAN, along with the **Stock** he bought (identified by its stock symbol) and the **Bank** that made this transaction. This is to ensure secure trade among parties

Functions

- Display a **Stock's** data (e.g. price, no. of available Stock)
- Display a **Company's** data to **investors** (e.g. Company Equity, CEO data, etc.)
- Process buy and sell transactions
- Add new Companies, Stocks, Investors, etc
- Delete Companies, Stocks, Investors, etc
- Keep track of each **Stock's** data and update it periodically

Entities and attributes

- Stock Market is identified by Name. Currency, market cap, and number of stock symbols are also recorded
- Stock is identified by Stock symbol. Number of public stocks, stock price are also recorded
- Investor is identified by IBAN No. Networth, ID, sex, age, name are also recorded.
- Company is identified by Commercial registration number. Company equity, company name, number of directors are also recorded
- Bank is identified by Commercial registration number. name, number of branches are also recorded
- The CEO is identified by name. Sex, age are also recorded

Red	Primary Key
Green	Composite Attribute
Yellow	Partial Key

Relationships

- Stock Market has a relationship **Manage** with Stock **(1-m)**
- Company has a relationship **Run** by with CEO **(1-1)**
- Company has a relationship **Associated** with Stock **(1-1)**
- Stock has a relationship **Owned** with Investor **(n-m)**
- Stock has a relationship **Secures** with Bank **(n-m)**
- Investors has a relationship **Secures** with Bank **(n-m)**

Business rules

Constraints

- The CEO **can't** run more than one Company
- Company **can't** be associated with more than one Stock
- Stock **can only** be managed by one Stock Market

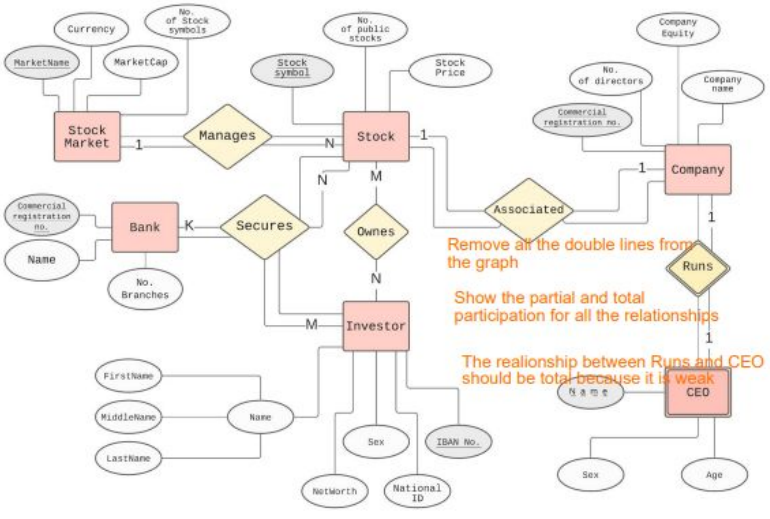
Participation

- Stock Market **totally participate** in manage
- Stock **totally participate** in manage
- Stock **totally participate** in secures
- Stock **totally participate** in associate
- Stock **partially participate** in own
- Company **totally participate** in associate
- Company **totally participate** in run
- CEO **totally participate** in run
- Investors **totally participate** in secures
- Investors **partially participate** in own
- Bank **totally participate** in secures

Queries

1	SELECT ALL **INVESTORS** WITH NETWORTH > 420 MILLION RIYALS
2	SELECT ALL **STOCKS** WITH NO. PUBLIC STOCKS < 20
3	DISPLAY LAST NAME OF **INVESTOR** WITH IBAN NO. NL12RABO8139718173
4	SELECT ALL **INVESTORS** WHO ARE SECURED BY **BANKS** WITH COMMERCIAL REGISTRATION NO. 1110001116
5	SELECT ALL **INVESTORS** WHO OWN **STOCK** WITH STOCK SYMBOL 4001
6	LIST ALL **COMPANIES** WITH **STOCK** WITH STOCK PRICE > 103.5
7	LIST ALL **STOCKS** ASSOCIATED WITH **COMPANIES** THAT HAS MINIMUM NO. OF DIRECTORS OF 3
8	LIST ALL **BANKS** WHO SECURE **INVESTORS** WITH OWNED **STOCK** WITH STOCK SYMBOL 4161
9	SELECT ALL **CEOS** WHO RUN **COMPANIES** WHICH ARE ASSOCIATED WITH **STOCK** WITH STOCK PRICE < 200
10	SELECT ALL MALE **CEOS** THAT RUN **COMPANIES** ASSOCIATED WITH **STOCKS** OWNED BY **INVESTORS** WHOSE AGE IS OVER 50

Entity Relationship Diagram (ERD)



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- Investors **partially participate** in own
- Bank **totally participate** in secures

Queries

1	SELECT ALL **INVESTORS** WITH NETWORTH > 420 MILLION RIYALS
2	SELECT ALL **STOCKS** WITH NO. PUBLIC STOCKS < 2000
3	DISPLAY LAST NAME OF **INVESTOR** WITH IBAN NO. NL12RABO8139718173
4	SELECT ALL **INVESTORS** WHO ARE SECURED BY **BANKS** WITH COMMERCIAL REGISTRATION NO. 1110001116
5	SELECT ALL **INVESTORS** WHO OWN **STOCK** WITH STOCK SYMBOL 4001
6	LIST ALL **COMPANIES** WITH **STOCK** WITH STOCK PRICE > 103.5
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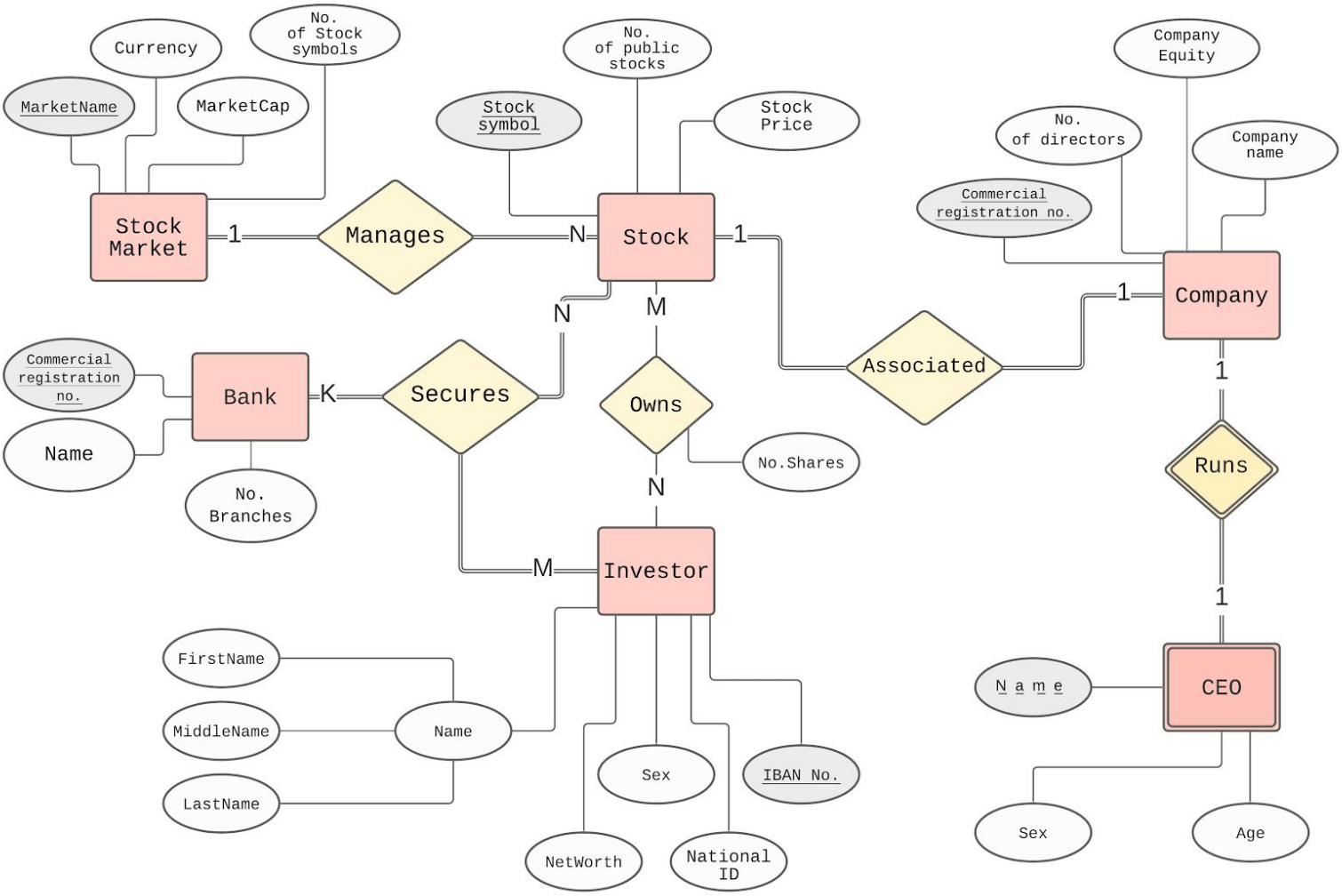
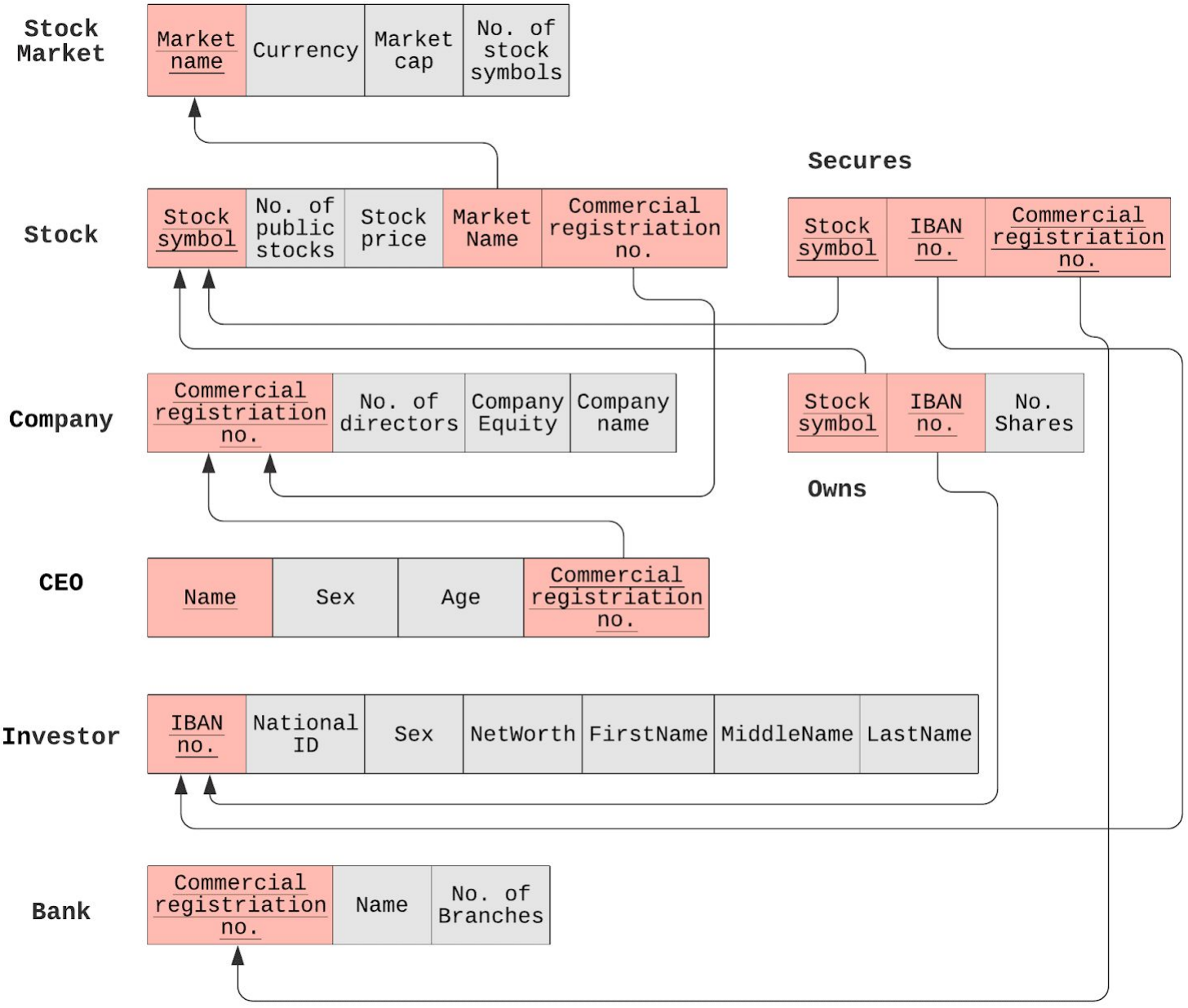


Relational Model Diagram:



Queries Implementation:

1

```
mysql> select * from Investor where NetWorth > 420000000;
+----------------------------+-------------+-----+------------+------------+-------------+-----------+
| IBAN_number                | National_ID | Sex | NetWorth   | First_Name | Middle_Name | Last_Name |
+----------------------------+-------------+-----+------------+------------+-------------+-----------+
| JP6010096000505719826457O4 | 4142356652  | M   | 1009860022 | Hideki     | Matsumoto   | Kamiya    |
| JP8217569000400139544632l5 | 8409156649  | M   |  962214000 | Masahiro   | Michiko     | Sakurai   |
+----------------------------+-------------+-----+------------+------------+-------------+-----------+
2 rows in set (0.00 sec)
```

2

```
mysql> select * from Stock where Number_Of_Public_Stocks_in_thousand < 2000;
+--------------+---------------------------------------+-------------+-------------------------+-------------------------------+
| Stock_Symbol | Number_Of_Public_Stocks_in_thousand | Stock_Price | Market_Name             | Commercial_Registration_Number |
+--------------+---------------------------------------+-------------+-------------------------+-------------------------------+
| SPC          |                                  1501 |      301.00 | Shanghai Stock Exchange | 5098220895                    |
+--------------+---------------------------------------+-------------+-------------------------+-------------------------------+
1 row in set (0.00 sec)
```

3

```
mysql> select Last_Name from Investor where IBAN_number = "NL12RAB0813971873";
+------------+
| Last_Name  |
+------------+
| Tyson      |
+------------+
1 row in set (0.00 sec)
```

4

```
mysql> select Investor.* from Secures natural join Investor where Secures.Commercial_Registration_Number=1110001116 group by Investor.IBAN_number;
+--------------------+-------------+-----+-----------+------------+-------------+------------+
| IBAN_number        | National_ID | Sex | NetWorth  | First_Name | Middle_Name | Last_Name  |
+--------------------+-------------+-----+-----------+------------+-------------+------------+
| US281264541519999339 | 9498117064  | M   |   3590070 | Brent      | Aahil       | Chamberlain |
| US341922553675553244 | 8277836920  | M   | 191000050 | Macauley   | Lugo        | Nguyen     |
+--------------------+-------------+-----+-----------+------------+-------------+------------+
2 rows in set (0.00 sec)
```

5

```
mysql> select Investor.* from Owns natural join Investor where Owns.Stock_Symbol="4001";
+----------------------------+-------------+-----+-----------+------------+-------------+-----------+
| IBAN_number                | National_ID | Sex | NetWorth  | First_Name | Middle_Name | Last_Name |
+----------------------------+-------------+-----+-----------+------------+-------------+-----------+
| JP8217569000400139544632l5 | 8409156649  | M   | 962214000 | Masahiro   | Michiko     | Sakurai   |
| NL12RAB0813971873          | 2300599347  | M   |    173115 | Ralphie    | O Brien     | Tyson     |
| US341922553675553244       | 8277836920  | M   | 191000050 | Macauley   | Lugo        | Nguyen    |
+----------------------------+-------------+-----+-----------+------------+-------------+-----------+
3 rows in set (0.00 sec)
```

6

```
mysql> select Company.* from Company natural join Stock where Stock.Stock_Price > 103.5;
+-------------------------------+---------------------+-----------------------------+---------------+
| Commercial_Registration_Number | Number_Of_Directors | Company_Equity_in_thousand | Company_Name  |
+-------------------------------+---------------------+-----------------------------+---------------+
| 3741894494                    |                   2 |                    89048000 | Softbank      |
| 6229087803                    |                   2 |                    20480000 | Toyota Motor  |
| 4457756495                    |                  22 |                    62060000 | Amazon        |
| 8643657928                    |                  25 |                    25003600 | Google        |
| 6713620014                    |                  11 |                    43000000 | Alibaba Group |
| 5098220895                    |                   2 |                    43000000 | Sinopec       |
| 9598342161                    |                  20 |                    13100000 | Volkswagen    |
+-------------------------------+---------------------+-----------------------------+---------------+
7 rows in set (0.00 sec)
```

7

```
mysql> select Stock.* from Stock natural join Company where Number_Of_Directors >= 3;
+-------------+-----------------------------------+-------------+-----------------------+-------------------------------+
| Stock_Symbol | Number_Of_Public_Stocks_in_thousand | Stock_Price | Market_Name           | Commercial_Registration_Number |
+-------------+-----------------------------------+-------------+-----------------------+-------------------------------+
| NOKIA       |                            988089 |        3.42 | Euronext              | 1792169223                    |
| AMZN        |                            500890 |     3185.00 | NASDAQ                | 4457756495                    |
| 2222        |                            940699 |       35.90 | Tadawul               | 5315073274                    |
| HKG         |                            274500 |      269.00 | Shanghai Stock Exchange | 6713620014                  |
| GOOGL       |                            289886 |     1787.00 | NASDAQ                | 8643657928                    |
| 2010        |                            660000 |       96.00 | Tadawul               | 8857232768                    |
| VOW3        |                            295089 |      149.08 | Euronext              | 9598342161                    |
+-------------+-----------------------------------+-------------+-----------------------+-------------------------------+
7 rows in set (0.00 sec)
```

8

```
mysql> select Bank.* from Owns natural join Secures natural join Bank where Stock_Symbol="4161";
+-------------------------------+---------------+---------------------+
| Commercial_Registration_Number | Name          | Number_Of_Branches |
+-------------------------------+---------------+---------------------+
| 1010001054                    | Riyadh Bank   |                 341 |
| 1516125270                    | Bank of China |               23682 |
| 5016604726                    | MUFG Bank     |                 398 |
+-------------------------------+---------------+---------------------+
3 rows in set (0.00 sec)
```

9

```
mysql> select CEO.* from Ceo natural join Company natural join Stock where Stock_Price < 200;
+------------------+-----+-----+-------------------------------+
| Name             | Sex | Age | Commercial_Registration_Number |
+------------------+-----+-----+-------------------------------+
| Yousef Al-Benyan | M   |  57 | 8857232768                    |
| Amin H. Nasser   | M   |  60 | 5315073274                    |
| Pekka Lundmark   | M   |  56 | 1792169223                    |
| Herbert Diess    | M   |  62 | 9598342161                    |
+------------------+-----+-----+-------------------------------+
4 rows in set (0.00 sec)
```

10

```
mysql> select CEO.* from Ceo natural join Company  natural join Stock natural join Investor  where NetWorth > 50000 and CEO.Sex="M" group by Name;
+------------------+-----+-----+-------------------------------+
| Name             | Sex | Age | Commercial_Registration_Number |
+------------------+-----+-----+-------------------------------+
| Akio Toyoda      | M   |  64 | 6229087803                    |
| Amin H. Nasser   | M   |  60 | 5315073274                    |
| Daniel Zhang     | M   |  48 | 6713620014                    |
| Fu Chengyu       | M   |  69 | 5098220895                    |
| Herbert Diess    | M   |  62 | 9598342161                    |
| Jeff Bezos       | M   |  56 | 4457756495                    |
| Masayoshi Son    | M   |  63 | 3741894494                    |
| Pekka Lundmark   | M   |  56 | 1792169223                    |
| Sundar Pichai    | M   |  48 | 8643657928                    |
| Yousef Al-Benyan | M   |  57 | 8857232768                    |
+------------------+-----+-----+-------------------------------+
10 rows in set (0.00 sec)
```