

PostgreSQL system exercise (33 points)

Due Tuesday April 23

April 8, 2002

1 Market Model

An `Asset` must be either a `Stock`, `Bond`, or a `MutualFund`. No matter the type, an asset is identified by a `symbol` (For example `'MSFT'`, `'MicroSoft-01-03-2003'`, or `'FDEGX'`) and has a `price`.

A stock has an `earningsPerShare`. A bond has a percentage `yield` and `maturityDate`. A bond must be either a `TreasuryBond`, `CorporateBond`, or `MunicipalBond`. A bond is identified by an `issuer` and `maturity date` - for purposes here, the issuer plus the maturity date may be concatenated to provide the `symbol` value for the bond. A mutual fund has a `rating` and `manager`. A mutual fund consists of a set of stocks and bonds. These stocks and bonds are a certain percentage of the mutual fund. For example `'FDEGX'` consists of 50% `'MSFT'`. Clearly the total percent share of the components of a mutual fund must not exceed 100%. If they fall short, assume that the remaining percentage is held in cash.

A `Person` is identified by a 9 digit `SSN` and has a single complex attribute that holds the first name, last name and middle initial. People also have a single complex valued mailing address. This consists of the `streetAddress`, `city`, `state`, `code`, and `country`.

A `Company` is identified by a unique name and has a single industry name, and a description field that may be multi-paragraphs of text. Industry names come from the set `'Chemical'`, `'Energy'`, `'Software'`, or `'Biotech'`. You may add more, but there has to be a closed list and no other industry names (other than those on this closed list are permitted)¹.

A person may work at a company and hold a position (of type `temporary`, `hourly`, `salaried`, or `executive`) - again this is a closed list. A company issues a `corporateOffering` which could be either stock or a corporate bond. Finally a person owns a quantity (> 0) of an asset.

For the simple example here add the predicate defined subclasses of `TechnologyStock`, `OverValuedStock`, and `OverValuedTechStock`. A technology stock is one that is issued by a `'Software'` or `'Biotech'` firm. An over-valued stock is a stock with a price to earnings ratio of greater than 20 or less than or equal to zero (in the case of no earnings).

¹don't worry about representing this in EER.

1.1 EER

Draw an EER Diagram that captures the (simplified) model above:

1.2 Schema Definition

Using the object-relational features of PostgreSQL define a schema that corresponds to the EER diagram (and simple model) above.

Place the integrity constraints that an existent person must only work for an existent company, an existent person may only own existent assets. Corporate offerings may only come from existent companies.

If a company is deleted, then so are all of its corporate offerings, and work records. If a corporate offering is deleted, then so are its assets. If an asset is deleted, then so are the corporate offerings as well as owns records. If a person is deleted, then so are their ownership record as well as work records.

1.3 Views

Create a view that lists all the Price/Earnings ratio for all stocks. The price earnings ratios, are the price per share over the earnings per share. In the event that the ration is negative or greater than 500, return a P/E of value 0. Create views to capture the concepts `TechnologyStock`, `OverValuedStock`, and `OverValuedTechStock`.

1.4 Data Population

The more data you insert the better, but **insert at least the following information to your database.**

Insert the companies Amgen (Biotech), Oracle (Software), MicroSoft (Software), and Exxon (Energy). Provide any descriptions you want. But for Microsoft describe it as "A ... software company building ... desk top software." Where '...' are whatever phrases you wish.

Insert the persons 'Larry E. Ellison', 'Bill G. Gates', and Warren E. Buffet'. Give these people fictitious addresses. Record the fact that Larry Ellison is an executive employee of Oracle and Gates is an executive employee of MicroSoft.

Insert the following assets: A corporate bond issue from MicroSoft with a 1\$ price that gives a 10% yield and has an expiration date of March 1st 2003 (`MicroSoft-01-03-2003`), a corporate bond issued from Exxon with a 1\$ price that gives an 11% yield and has an expiration date of January 1st 2003 (`Exxon-01-01-2003`), a stock offering from MicroSoft at 56\$ and earnings of 1.70\$ per share, a stock offering from Oracle (ORCL) at 15\$ and earnings of 1.11\$ per share, a mutual fund FDEGX at 24\$, a municipal bond from California with yield 12.2% and a maturity date of January 12,2003 (`California-12-01-2003`). A US Treasury Bond with rate 5.7% and maturity January 13, 2003 (`USA-01-12-2003`).

Insert also the fact that Ellison owns 10000 stocks of Oracle stock, Gates owns 100000 shares of MicroSoft stock and 20000 shares of FDEGX. Buffet owns 100 shares of Exxon Bonds and 1000 of US Treasuries.

1.5 Queries

- List the people with the middle initial 'G'.
- List all of the owners of a financial assets issued by MicroSoft.
- List all the corporate offerings in the database
- List the people who own an asset of the company they work for.
- List the companies that are described with Text that contains the phrase "A ... software company building ... desk top software." Where '...' are an arbitrary phrases.
- List the over-valued tech stocks.

1.6 Updates

Try all the following - note that none of these should be allowed.

- insert Buffet as an employee into a non-existent company.
- insert as Gates owner of a stock in a non-existent company (symbol 'POOF').
- insert a corporate bond issue issue from a non-existent company.

1.7 Triggers (Rules)

Send an alert (print a message, or add a tuple to a special warnings table) if an executive dumps 5000\$ worth of assets from the company where they work. Test this by reducing the number of shares that Ellison owns at oracle by 500 shares.

1.8 Constraints

- Delete the company Oracle.
- List all the assets owned by Ellison.

1.9 Transactions

Start two transactions. One in which Gates sells 300\$ worth of MicroSoft and buys 300\$ worth of Amgen. And another transaction in which Gates sells 300\$ worth of Amgen and buys 300\$ worth of MicroSoft. Just log the behavior and experiment. Discuss the implications of running these types of transactions under *Read Committed* and *Serializable* isolation levels.

1.10 Extra Credit

(7 points - only awarded if you completed all prior sections)

Populate the aggregation relationship that Mutual funds are actually collections of stocks and corporate bonds. Add the fact that FDEGX is 50% Microsoft, 20% Exxon, and 30% Cash. Have Gates sell 1000 shares of FDEGX. This should now trigger the warning about executives dumping more than 5000\$ worth of assets in the companies they work for. You will probably need to extend your trigger defined above.

2 What to Hand in?

A cover page identifying the people who worked on this assignment. A total log, suitably formatted and annotated, of your query, update, triggered notifications, and transaction logs. Print this out and give to me.

I may also log into your databases and test things out. So don't drop the tables you created until I am done grading.