

## Online Trading Platform and Database

### Group 24:

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### Application Description:

Inspired by the self-directed investment service provided by commercial banks such as BMO investorline, the database application our group chose to develop serves for an online trading platform of financial products. The application stores information of available financial products on market and their quotes, and as well allows users to place ask and/or bid orders for their favorable financial products so that users would trade at an agreed price. In addition, this application stores data about its users. For each user, the database keeps records on the activities of one's accounts, including transactions, orders and current holding.

## Part I: Requirement Analysis

### Data requirements (Entity sets):

**Financial product:** is a product that is publicly tradable between users on an exchange market. It's uniquely identified by an artificial key: **FId**. It has several attributes including:

- **Bid and Ask:** The highest price that any order is willing to buy at, and the lowest price that any order is willing to sell at.
- **Last:** price of the last executed order of a product
- **Volume:** total volume of a security traded on market for the day
- **Date&Time:** current date and time

**Stock** is a security representing a portion of ownership of a corporation. The holder of a stock is entitled to the corporation's earning and assets as well as risks and losses. Stock has one more attribute:

- **Dividend:** a portion of corporation's profits paid to its shareholders

**Option:** is a financial product which gives the holder right to buy or sell the stock indicated for a predetermined price before it expires. It has two more attributes:

- **Expiration date:** The date that this option expires and cannot be executed anymore
- **Strike price:** The predetermined price that holder can trade stock at

**Futures:** is a financial product which gives the holder obligation to trade the product indicated for a predetermined price at delivery date. It has two more attributes:

- **Delivery date:** The date that the futures need to be executed
- **Future's price:** The predetermined price that owner will trade the indicated product

**Bond:** is a security representing debt of a corporation or government. It has three more attributes:

- **Face Value:** a predetermined price stated on a bond to be paid to the bond holder on the date to maturity
- **Interest Rate:** a percentage of face value to be paid per time period
- **Date to maturity:** date that the bond is paid off

**User:** is one who uses the trading system. A user is identified by an artificial key, **UId**. (A user can consign to another user for an amount of cash which is usually the case when an individual user let an institution user invest with his/her money. See "consigns" relationship below for more. )

**Account:** the record of a user's investment positions. An account is identified by an artificial key **AId**. It has attributes:

- **Cash:** the value of cash that this account holds
- **Position:** the value of all financial products that this account holds

**Order:** is an instruction to buy or sell a product. An order is uniquely identified by an artificial key, **OId**. It has attributes:

- **Price:** price of a product one's willing to trade at
- **Quantity:** quantity of a product willing to be traded
- **Date&Time:** date and time when the order is posted
- **Status:**    1-pending: if an order is posted while not executed  
                  2-Executed: if an order has finished, i.e. transaction  
                  3-cancelled: if an order is taken off

### **Functional requirements (Relationships and constraints):**

#### **ISA:**

- Stock, Option, Future and Bond are subtypes of Security.

#### **Consigns:**

- A user can consign an amount of money to another user
- A user can consign to any number of user or does not consign any money at all.
- Attribute: Amount

#### **Owns:**

- A user should own at least one account
- an account can be owned by exactly one user

#### **Places:**

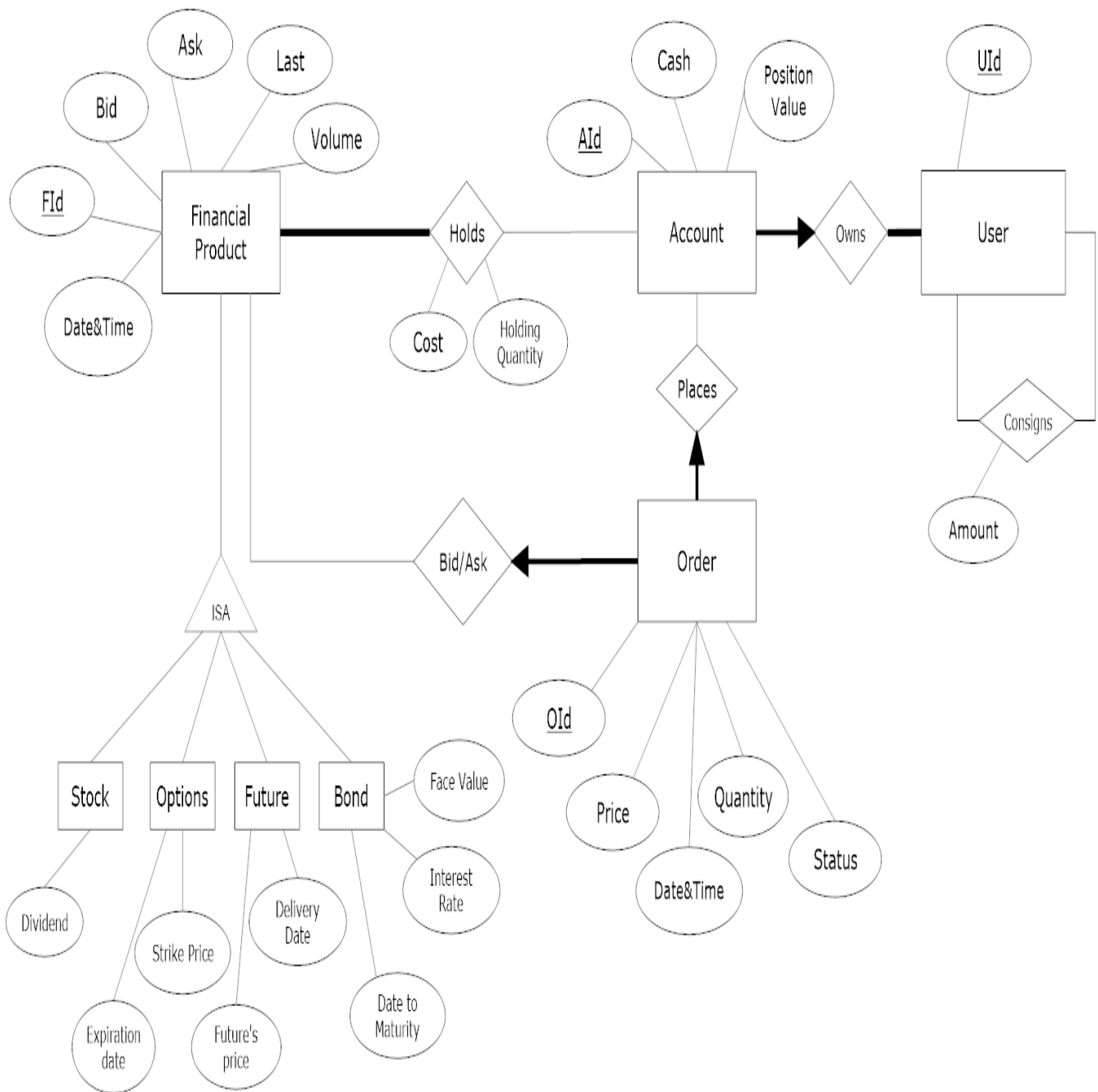
- An account can place orders, and an order can be placed by exactly one account.

#### **Holds:**

- An account can hold multiple securities, and a security should be held by at least one account.
- Attributes:
  - Cost: the average price paid for the financial product
  - Holding Quantity: amount of the financial product owned

#### **Bid/Ask:**

- An order should bid or ask exactly one security at a time.

**Part II: E/R MODEL**

## Part III: Relations

**FinancialProduct** (FId, Bid, Ask, Date&Time, Volume, Last)

**Stock** (FId, Dividend)

FId is the foreign key referencing FinancialProduct.

**Options** (FId, ExpirationDate, StrikePrice)

FId is the foreign key referencing FinancialProduct.

**Future** (FId, Future's price, DeliveryDate)

FId is the foreign key referencing FinancialProduct.

**Bond** (FId, DateToMaturity, InterestRate, FaceValue)

FId is the foreign key referencing FinancialProduct.

**Holds** (FId, AId, Cost, HoldingQuantity)

FId is the foreign key referencing FinancialProduct.

AId is the foreign key referencing Account.

**User** (UId)

**Consign** (UId, UId, Amount)

(First) UId is the foreign key referencing User. (i.e. The consigner)

(Second) UId is the foreign key referencing User. (i.e. The consignee)

**Account** (AId, Cash, PositionValue, UId)

UId is the foreign key referencing User.

Since an account can only be owned by a user, we can include the "Owns" relationship set in the table of Account and imply the constraint.

**Order** (Oid, Price, Date&Time, Quantity, Status, AId)

AId is the foreign key referencing Account.

Since every order can only be placed by one account, we can include the "Places" relationship set in the table of Order and imply the constraint.

**Bid/Ask** (Oid, FId)

Oid is the foreign key referencing Order

FId is the foreign key referencing FinancialProduct.

## Part IV: Inspired Sites

1. [www.bmo.com/self-directed](http://www.bmo.com/self-directed) : The trading platform that BMO offer to its customer for self-directed investment. This platform allows user to trade stock and option in its US or CA account, view the portofolio of holding and the quotes of financial products.
2. <https://m-x.grid.inovestor.com> : This is the trading simulator offered by Montreal Exchange, it contains a dashboard for current account, a trade system to place fictious order, and a quote function to obtain quote of canadian financial product.

## References:

1. Bodie, Z., Kane, A., Marcus, A. J., Perrakis, S., Ryan, P. J., & Switzer, L. (2014). *Investments*. McGraw-Hill Ryerson.
2. Berk, J. (2014). *Corporate Finance, Third Canadian Edition*. Pearson Education Canada.