

COMP 3111: Software Engineering

Lab Activity: Managing Data Using SQL Server Create, Populate and Query Some Tables in the *HKeInvest* Database



If you have not attended the tutorial or read the tutorial and lab notes for *Managing Data Using SQL Server*, you may not know how to complete this lab activity. Attending the tutorial will ensure that you are able to complete the lab activity during the lab period.

LAB OBJECTIVE

The *HKeInvest* application requires that data about clients and their investments be stored in a relational database. In this lab activity you will use SQL Server to create the database and some of the tables required to store this data.

CREATE THE DATABASE

1. In Visual Studio open the HKeInvestWebApplication that you created in the previous lab.
2. Right-click the HKeInvestWebApplication folder in the Solution Explorer and select "Add New Item..." from the popup menu.
3. In the Add New Item window, select "...Visual C#→Data" in the left pane, "SQL Server Database" in the centre pane and enter "HKeInvestDB.mdf" in the "Name" field.
4. Click the "Add" button.
5. Click on "Yes" in the dialog box advising you to save the database in the App_Data folder¹.

CREATE THE TABLES

1. Create the following tables in the *HKeInvestDB* database. (See pages 3 and 4 of the "Managing Data Using Microsoft SQL Server" Tutorial and Lab Notes if you have forgotten how to do this.)

Note: These tables do not necessarily contain all of the columns required to correctly represent the data requirements of the application. In general, each table may require additional columns.

Client Table

Name	Data Type	Allow Nulls	Default
firstName	nchar(35)	<input type="checkbox"/>	
lastName	nchar(35)	<input type="checkbox"/>	
dateOfBirth	date	<input type="checkbox"/>	
email	nchar(30)	<input type="checkbox"/>	
HKIDPassportNumber	nchar(8)	<input type="checkbox"/>	
accountNumber	nchar(10)	<input type="checkbox"/>	

```
CREATE TABLE [dbo].[Client] (  
    [firstName]          NCHAR (35) NOT NULL,  
    [lastName]           NCHAR (35) NOT NULL,  
    [dateOfBirth]        DATE      NOT NULL,  
    [email]              NCHAR (30) NOT NULL,  
    [HKIDPassportNumber] NCHAR (8)  NOT NULL,  
    [accountNumber]      NCHAR (10) NOT NULL,  
    CONSTRAINT [FK_Client_Account] FOREIGN KEY ([accountNumber])  
    REFERENCES [dbo].[Account] ([accountNumber]) ON DELETE CASCADE  
);
```

¹ It is highly recommended that all permanent data for a website be stored in the App-Data folder. This helps protect the data and provides a good design structure for your website.

Account Table

	Name	Data Type	Allow Nulls	Default
no	accountNumber	nchar(10)	<input type="checkbox"/>	
	accountType	nchar(12)	<input type="checkbox"/>	
	balance	numeric(12,2)	<input type="checkbox"/>	
	userName	nchar(10)	<input checked="" type="checkbox"/>	

```
CREATE TABLE [dbo].[Account] (
    [accountNumber] NCHAR (10) NOT NULL,
    [accountType] NCHAR (12) NOT NULL,
    [balance] NUMERIC (12, 2) NOT NULL,
    [userName] NCHAR (10) NULL,
    PRIMARY KEY CLUSTERED ([accountNumber] ASC)
);
```

SecurityHolding Table

	Name	Data Type	Allow Nulls	Default
no	accountNumber	nchar(10)	<input type="checkbox"/>	
no	type	nchar(10)	<input type="checkbox"/>	
no	code	nchar(4)	<input type="checkbox"/>	
	name	nchar(80)	<input type="checkbox"/>	
	shares	numeric(10,2)	<input type="checkbox"/>	
	base	nchar(4)	<input type="checkbox"/>	

```
CREATE TABLE [dbo].[SecurityHolding] (
    [accountNumber] NCHAR (10) NOT NULL,
    [type] NCHAR (10) NOT NULL,
    [code] NCHAR (4) NOT NULL,
    [name] NCHAR (80) NOT NULL,
    [shares] NUMERIC (10, 2) NOT NULL,
    [base] NCHAR (4) NOT NULL,
    CONSTRAINT [PK_SecurityHolding] PRIMARY KEY CLUSTERED
    ([accountNumber] ASC, [code] ASC, [type] ASC),
    CONSTRAINT [FK_SecurityHolding_Account] FOREIGN KEY ([accountNumber])
    REFERENCES [dbo].[Account] ([accountNumber]) ON DELETE CASCADE
);
```

RELATE THE TABLES

1. Relate the *Client* and *Account* tables as shown in the SQL code in the preceding figures. Account numbers cannot be updated and each account must be related to at least one client. If an account is deleted, then any related clients should also be deleted².
2. Relate the *Account* and *SecurityHolding* tables as shown in the SQL code in the preceding figures. Account numbers cannot be updated and each security holding must be related to exactly one account. If an account is deleted, then any related security holdings should also be deleted.

POPULATE THE DATABASE

1. Download the folder "SQLServerLabActivity-Download.zip" from the Tutorial and Lab Schedule section of the course web page to the desktop and unzip it.
2. Insert the data in the *Account.xlsx*, *Client.xlsx* and *SecurityHolding.xlsx* Excel files, in this order, into the corresponding tables.

² While in reality an account will never be deleted, to facilitate removing unwanted data during testing, when an account is deleted, then any related clients and security holdings should also be deleted.

Lab Activity: Managing Data Using Microsoft SQL Server

3. Add the following record to the *Account* table in “Data View”. (This record must be added first.)

accountNumber	AA<your HKUST student number>
accountType	individual
balance	20000
userName	NULL

4. Add the following record to the *Client* table in “Data View”.

firstName	<your first name>
lastName	<your last name>
dateOfBirth	<any date>
email	<your HKUST email>
HKIDPassportNumber	<your HKUST student number>
accountNumber	AA<your HKUST student number>

5. Add the following record to the *SecurityHolding* table in “Data View”.

accountNumber	AA<your HKUST student number>
type	stock
code	22
name	Mexan Ltd
shares	12000
base	HKD

QUERY THE DATABASE

Use the Query Editor to construct the following SQL queries.

- Find the first and last name of all clients whose last name starts with ‘La’.
[Hint: You need to use the *like* comparison operator and the % wild card character.]
[Challenge: Find the first and last name of all clients whose last name ends with ‘am’.]
- Find the account numbers of all accounts whose balance is zero.
- Find the account numbers of all accounts that hold stock code 22.
- Find those accounts that do not have any security holdings.
[Hint: To answer this query you need to compare two sets, all account numbers in the *Account* table and all account numbers in the *SecurityHolding* table. The SQL Server *Except* set operator can be used for this purpose.]
- Find how many accounts there are of each type.
[Hint: You need to use a *group by* clause and the *count* aggregate function.]

Query result

lastName	firstName
Lam	Nick
Lai	Winnie

Query result

accountNumber
HU00000001

Query result

accountNumber
AA<student#>
AU00000001
WO00000001

Query result

accountNumber
KA00000001

Query result

accountType	count
common	2
individual	6
survivorship	1

Lab Activity: Managing Data Using Microsoft SQL Server

6. Find the first name, last name, email and HKID/passport number of all clients ordered by last name who hold stock code 22.

Query result

<i>firstName</i>	<i>lastName</i>	<i>email</i>	<i>HKIDPassportNumber</i>
John	Au	john@nomail.com	A1234567
Agnes	Chan	agnes@nomail.com	K9176524
Otto	Wong	otto@nomail.com	R2781986
<your first name here>	<your last name here in the correct order>	<your HKUST email here>	<your student number here>

HOW TO GET THE CREDIT FOR THIS LAB

Part 1: During the Lab Session

To get half the credit for this lab you must submit, by the end of the lab period, a printout of the screenshot showing the following in the result of Query 6.

- Your first name in the *firstName* column.
- Your last name in the *lastName* column
- Your HKUST email in the *email* column.
- Your student number in the *HKIDPassportNumber* column.

An example of such a printout is shown in Figure 1.

	<i>firstName</i>	<i>lastName</i>	<i>email</i>	<i>HKIDPassportNumber</i>
1	John	Au	john@nomail.com	A1234567
2	Agnes	Chan	agnes@nomail.com	K9176524
3	Typical	Student	typical@ust.hk	00000000
4	Otto	Wong	otto@nomail.com	R2781986

Your name, email and student number must appear here.

Figure 1: Part of the example printout of Query 6

To get a screen shot and print it out, do the following.

1. Select the Visual Studio window containing the result of Query 6.
2. Press "alt+Print Screen".
3. Open the Paint program, which can be found in the Accessories folder in the Start Menu.
4. Paste the screenshot copied in step 2 into the Paint window.
5. Select "Print" in the Paint program.

Part 2: After the Lab Session

To get the remaining credit for this lab, you need to modify the design of your *HKeInvestDB* so that it is able to store all the information about a client that is represented in *Appendix A: Account Application* of the course project problem statement. The maximum size of most fields of the application form is indicated on the form included on the following pages. Where no explicit size is given for a field, the size should be able to be inferred from the application form itself.

Submit a screenshot of the definition of all the tables that you use to represent the client data in the next lab.

Application Instructions

To open your **HKeInvest** account, please complete all sections below.

Each account application must include the following:

- A minimum initial deposit of HK\$20,000 to open your account.
- A photocopy of your Hong Kong Identity Card or the inside pages of your passport(s), including photo, signature and personal information for each account applicant.
- One bank (or financial institution) statement and one utility bill dated within the last six months. One of the documents must be an original. In lieu of a bank statement and utility bill, you may provide a verifiable letter from a known bank or financial institution.
- Additional documents may be required if your application is not submitted in person.

Please submit the completed application and all required documents to **Hong Kong Electronic Investments LLC, Suite 8801, 3 IFC, Central, Hong Kong**.

We respect your privacy. **HKeInvest** will use the information you provide to verify your identity, to open and service your account, communicate with you and provide information about products and services.

1 Account Type

- | | | |
|-------------------------------------|--|---|
| <input type="checkbox"/> Individual | <input type="checkbox"/> Joint Tenants with Rights of Survivorship
If one owner dies, his/her interest passes to the surviving owner. | <input type="checkbox"/> Joint Tenants in Common
If one owner dies, his/her interest passes to his/her estate. |
|-------------------------------------|--|---|

2 Client Information

Security industry regulations require that we collect the following information.

Primary Account Holder

Title: <input type="checkbox"/> Mr. <input type="checkbox"/> Mrs. <input type="checkbox"/> Ms. <input type="checkbox"/> Dr.
First name: (max 35 characters)
Last name: (max 35 characters)
Date of birth (dd/mm/yyyy):
Email address: (max 30 characters)
Home address (cannot be a PO box): Building (if any): (max 50 characters) Street: (max 35 characters) District: (max 19 characters)
Home phone: (8 digits)
Home fax: (8 digits)
Business phone: (8 digits)
Mobile phone: (8 digits)
Country of citizenship: (max 70 characters)
Country of legal residence: (max 70 characters)
HKID/passport number: (max 8 characters)
Passport country of issue: (max 70 characters)

Co-Account Holder, if applicable

Title: <input type="checkbox"/> Mr. <input type="checkbox"/> Mrs. <input type="checkbox"/> Ms. <input type="checkbox"/> Dr.
First name:
Last name:
Date of birth (dd/mm/yyyy):
Email address:
Home address (cannot be a PO box): Building (if any): Street: District:
Home phone:
Home fax:
Business phone:
Mobile phone:
Country of citizenship:
Country of legal residence:
HKID/passport number:
Passport country of issue:

3 Employment Information

Security industry regulations require that we collect the following information.

Primary Account Holder

Employment status:

- ☐ Employed ☐ Self-employed ☐ Retired
☐ Student ☐ Not Employed ☐ Homemaker

Specific occupation: (max 20 characters)

Years with employer: (max 2 digits)

Employer name: (max 25 characters)

Employer phone: (8 digits)

Nature of business: (max 20 characters)

Co-Account Holder, if applicable

Employment status:

- ☐ Employed ☐ Self-employed ☐ Retired
☐ Student ☐ Not Employed ☐ Homemaker

Specific occupation:

Years with employer:

Employer name:

Employer phone:

Nature of business:

4 Disclosures and Regulatory Information

Security industry regulations require that we collect the following information.

Primary Account Holder

Are you employed by a registered securities broker/dealer, investment advisor, bank or other financial institution?

- ☐ No
☐ Yes (you must submit a compliance letter with this application)

Are you a director, 10% shareholder or policy-making officer of a publicly traded company?

- ☐ No
☐ Yes

Co-Account Holder, if applicable

Are you employed by a registered securities broker/dealer, investment advisor, bank or other financial institution?

- ☐ No
☐ Yes (you must submit a compliance letter with this application)

Are you a director, 10% shareholder or policy-making officer of a publicly traded company?

- ☐ No
☐ Yes

Describe the primary source of funds deposited to this account:

- ☐ salary/wages/savings ☐ investment/capital gains ☐ family/relatives/inheritance ☐ Other (describe below)

(max 30 characters)

5 Investment Profile

Security industry regulations require that we collect the following information. For joint accounts, please include combined amounts.

Investment objective* for this account:

- ☐ capital preservation ☐ income ☐ growth ☐ speculation

Investment knowledge:

- ☐ none ☐ limited ☐ good ☐ extensive

Investment experience:

- ☐ none ☐ limited ☐ good ☐ extensive

Annual income:

- ☐ under HK\$20,000 ☐ HK\$20,001 - HK\$200,000 ☐ HK\$200,001 - HK\$2,000,000 ☐ more than HK\$2,000,000

Approximate liquid net worth (cash and securities):

- ☐ under HK\$100,000 ☐ HK\$100,001 - HK\$1,000,000 ☐ HK\$1,000,001 - HK\$10,000,000 ☐ more than HK\$10,000,000

* Investment objective definitions

Capital preservation: The objective of a capital preservation strategy is to protect your initial investment by choosing investments that minimize the potential of any loss of principal. The long-term risk of capital preservation is that the returns may not be adequate to offset inflation.

Income: The objective of an income strategy is to provide current income rather than long-term growth of principal.

Growth: The objective of a growth strategy is to increase the value of your investment over time while recognizing a high likelihood of volatility.

Speculation: The objective of a speculation strategy is to assume a higher risk of loss in anticipation of potentially higher than average gain by taking advantage of expected price changes.

6 Account Feature

Earn Income on Your Cash Balance

The Free Credit Balance in your **HKeInvest** account is not interest bearing. However, you may choose to earn interest on the Free Credit Balance in your account by having daily automatic investment in or redemption of (“sweep”) shares of our sweep fund (“Fund”). (The Free Credit Balance is the sum of the cash balances in your Cash Account and Margin Account (if applicable) offset by any debit balances and/or cash retained as collateral in the accounts.)

On any Exchange Business Day, the Free Credit Balance will be automatically invested in shares of the Fund on the following Exchange Business Day. Shares of the Fund will be automatically redeemed to satisfy a debit balance in your **HKeInvest** account, to provide necessary cash collateral in your Margin Account (if applicable) or to the extent necessary to settle securities transactions.

☐ Yes, sweep my Free Credit Balance into the Fund.

7 Initial Account Deposit

A **HK\$20,000 minimum deposit** is required to open an account.

Check one or more:

☐ A cheque for HK\$ _____ made payable to **Hong Kong Electronic Investments LLC** is enclosed.

☐ A completed Account Transfer Form for HK\$ _____ is attached.

8 Declaration and Signature

I am of legal age to enter into this contract. I acknowledge that I have received, read and agree to be bound by the terms and conditions as currently set forth in the HKeInvest Customer Agreement and as amended from time to time. I authorize HKeInvest to inquire from any source, including a consumer reporting agency, as to my identity, creditworthiness and ongoing eligibility for the account at account opening, at any time throughout the life of the account and thereafter for debt collection or investigative purposes.

I acknowledge that HKeInvest does not provide investment, tax or legal advice.

Account Holder's Signature

Co-Account Holder's Signature, if applicable

Date:

Date: