



**NANYANG
TECHNOLOGICAL
UNIVERSITY**
SINGAPORE

College of Computing and Data Science

SC2207 - Introduction to Database Systems Lab 5 Deliverables

SCMB Team 4

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1. SQL DDL Command for Table Creation

```
DROP TABLE IF EXISTS Investor;
CREATE TABLE Investor (
    PhoneNumber VARCHAR(15) PRIMARY KEY,
    InvestorName VARCHAR(255) NOT NULL,
    DoB DATE NOT NULL,
    Gender VARCHAR(1) NOT NULL,
    Email VARCHAR(255) NOT NULL,
    RiskTolerance VARCHAR(4) NOT NULL,
    AnnualIncome DECIMAL(15, 2) NOT NULL,
    Company VARCHAR(255) NOT NULL,
    CONSTRAINT chk_riskTolerance CHECK (RiskTolerance IN ('CONS', 'MODR', 'AGGR')),
    CONSTRAINT chk_gender CHECK (Gender IN ('M', 'F', 'O'))
);

CREATE INDEX idx_Investor_Name on Investor(InvestorName)
CREATE INDEX idx_Investor_Gender ON Investor(Gender)

DROP TABLE IF EXISTS Financial_Goal;
CREATE TABLE Financial_Goal (
    GoalID UNIQUEIDENTIFIER DEFAULT NEWID() PRIMARY KEY,
    TargetAmount DECIMAL(15, 2) NOT NULL,
    TargetTimeline DATE NOT NULL,
    StartDate DATE NOT NULL,
    GoalType VARCHAR(255) NOT NULL
);

DROP TABLE IF EXISTS Portfolio;
CREATE TABLE Portfolio (
    PortfolioID UNIQUEIDENTIFIER DEFAULT NEWID() PRIMARY KEY,
    PortfolioStatus VARCHAR(7) NOT NULL,
    AnnualisedReturn DECIMAL(8, 2) NOT NULL,
    StartDate DATE NOT NULL,
    MarketValue DECIMAL(15, 2) NOT NULL,
    CONSTRAINT chk_Status CHECK (PortfolioStatus IN ('ACTIVE', 'CLOSED', 'INACTIVE'))
);

DROP TABLE IF EXISTS Investor_Record;
CREATE TABLE Investor_Record (
```

```

RecordID UNIQUEIDENTIFIER DEFAULT NEWID() PRIMARY KEY,
PhoneNumber VARCHAR(15) NOT NULL,
PortfolioID UNIQUEIDENTIFIER NOT NULL,
GoalID UNIQUEIDENTIFIER,

FOREIGN KEY (PortfolioID) REFERENCES Portfolio(PortfolioID)
    ON DELETE CASCADE,
FOREIGN KEY (PhoneNumber) REFERENCES Investor(PhoneNumber)
    ON DELETE CASCADE ON UPDATE CASCADE,
FOREIGN KEY (GoalID) REFERENCES Financial_Goal(GoalID) ON DELETE SET NULL
);

CREATE INDEX idx_IR_Goal_ID ON Investor_Record(GoalID);
CREATE INDEX idx_IR_Portfolio_ID ON Investor_Record(PortfolioID);
CREATE INDEX idx_IR_Investor_PhoneNumber ON Investor_Record(PhoneNumber);

DROP TABLE IF EXISTS Asset_Allocation;
CREATE TABLE Asset_Allocation (
    PortfolioID UNIQUEIDENTIFIER NOT NULL,
    AssetType VARCHAR(5) NOT NULL,
    AllocationRatio DECIMAL(5, 2) NOT NULL,
    AllocatedValue DECIMAL(15, 2) NOT NULL,

    CONSTRAINT chk_AssetAlloc_Type CHECK (AssetType IN ('STOCK', 'BOND', 'FUND',
'COMM', 'CASH')),

    FOREIGN KEY (PortfolioID) REFERENCES Portfolio(PortfolioID) ON DELETE CASCADE,
    PRIMARY KEY (PortfolioID, AssetType)
);

DROP TABLE IF EXISTS Invested_Value;
CREATE TABLE Invested_Value (
    PortfolioID UNIQUEIDENTIFIER PRIMARY KEY,
    InvestedValueDate DATE NOT NULL,
    InvestedValue DECIMAL(15, 2) NOT NULL,

    CONSTRAINT chk_Value_Ge CHECK (InvestedValue >= 0),

    FOREIGN KEY (PortfolioID) REFERENCES Portfolio(PortfolioID) ON DELETE CASCADE,
);

DROP TABLE IF EXISTS Unrealised_Gain_Loss;

```

```

CREATE TABLE Unrealised_Gain_Loss (
    PortfolioID UNIQUEIDENTIFIER NOT NULL,
    UGLDate DATE NOT NULL,
    Amount DECIMAL(15, 2) NOT NULL,
    PRIMARY KEY (PortfolioID, UGLDate),
    FOREIGN KEY (PortfolioID) REFERENCES Portfolio(PortfolioID) ON DELETE CASCADE,
);

CREATE INDEX idx_UGL_PortfolioID ON Unrealised_Gain_Loss(PortfolioID)
CREATE INDEX idx_UGL_UGL_Date ON Unrealised_Gain_Loss(UGLDate)

DROP TABLE IF EXISTS PTtransaction
CREATE TABLE PTtransaction (
    TransactionID UNIQUEIDENTIFIER DEFAULT NEWID() PRIMARY KEY,
    PTtransactionType VARCHAR(8) NOT NULL,
    PTtransactionDate DATE NOT NULL,
    Unit INT,
    PricePerUnit DECIMAL(10, 2) NOT NULL,
    PortfolioID UNIQUEIDENTIFIER NOT NULL,
    CONSTRAINT chk_Type CHECK (PTtransactionType in ('BUY', 'SELL', 'TOPUP', 'WITHDRAW', 'FEE')),
    CONSTRAINT chk_Unit_PTrans_Ge CHECK (Unit >= 0),
    FOREIGN KEY (PortfolioID) REFERENCES Portfolio(PortfolioID) ON DELETE CASCADE,
);
CREATE INDEX idx_PTtransaction_PTtransactionDate ON PTtransaction(PTtransactionDate)

DROP TABLE IF EXISTS Owned_Assets;
CREATE TABLE Owned_Assets (
    OwnedAssetID UNIQUEIDENTIFIER DEFAULT NEWID() PRIMARY KEY,
    Unit INT NOT NULL DEFAULT 0,
    PortfolioID UNIQUEIDENTIFIER NOT NULL,
    PurchasePrice DECIMAL(10, 2) NOT NULL,
    CONSTRAINT chk_Unit_OwnedA_Ge CHECK (Unit >= 0),
    FOREIGN KEY (PortfolioID) REFERENCES Portfolio(PortfolioID) ON DELETE CASCADE,
);

```

```

CREATE INDEX idx_Owned_Assets_PortfolioID ON Owned_Assets(PortfolioID)

DROP TABLE IF EXISTS Asset;
CREATE TABLE Asset (
    AssetID INT IDENTITY(1,1) PRIMARY KEY,
    AssetName VARCHAR(255) NOT NULL,
    Code VARCHAR(10) NOT NULL,
    AssetType VARCHAR(5) NOT NULL,

    CONSTRAINT chk_AssetType CHECK (AssetType in ('STOCK', 'BOND', 'FUND', 'COMM',
'CASH')),
);

DROP TABLE IF EXISTS Stock;
CREATE TABLE Stock (
    AssetID INT PRIMARY KEY,
    EBITDA DECIMAL(15, 2) NOT NULL,
    PERatio DECIMAL(5, 2) NOT NULL,
    EarningPerShare DECIMAL(5, 2) NOT NULL,

    FOREIGN KEY (AssetID) REFERENCES Asset(AssetID) ON DELETE CASCADE
);

DROP TABLE IF EXISTS Bond;
CREATE TABLE Bond (
    AssetID INT PRIMARY KEY,
    InterestRate DECIMAL(5, 2) NOT NULL,
    MaturityDate DATE NOT NULL,

    FOREIGN KEY (AssetID) REFERENCES Asset(AssetID) ON DELETE CASCADE
);

DROP TABLE IF EXISTS Fund;
CREATE TABLE Fund (
    AssetID INT PRIMARY KEY,
    ExpenseRatio DECIMAL(5, 2) NOT NULL,
    DividendYield DECIMAL(5, 2) NOT NULL,

    FOREIGN KEY (AssetID) REFERENCES Asset(AssetID) ON DELETE CASCADE
);

DROP TABLE IF EXISTS AssetPrice;

```

```

CREATE TABLE AssetPrice (
    AssetID INT,
    MarketPrice DECIMAL(10, 2) NOT NULL,
    AssetDate DATE NOT NULL,

    PRIMARY KEY (AssetID, AssetDate),
    FOREIGN KEY (AssetID) REFERENCES Asset(AssetID) ON DELETE CASCADE
) ;

DROP TABLE IF EXISTS Bought_Asset_From;
CREATE TABLE Bought_Asset_From (
    OwnedAssetID UNIQUEIDENTIFIER NOT NULL,
    AssetID INT NOT NULL,
    AssetBroker VARCHAR(255) NOT NULL,

    FOREIGN KEY (OwnedAssetID) REFERENCES Owned_Assets(OwnedAssetID) ON DELETE CASCADE,
    FOREIGN KEY (AssetID) REFERENCES Asset(AssetID) ON DELETE SET NULL,

    PRIMARY KEY (OwnedAssetID, AssetID)
) ;

DROP TABLE IF EXISTS Fee_Rate_History;
CREATE TABLE Fee_Rate_History (
    FeeType VARCHAR(5) NOT NULL,
    Rate DECIMAL(10, 2) NOT NULL,
    StartDate DATE NOT NULL,
    EndDate DATE,

    CONSTRAINT chk_FeeType CHECK (FeeType in ('TRANS', 'MGMT')),
    CONSTRAINT chk_End_Ge_Start CHECK (EndDate >= StartDate),

    PRIMARY KEY (FeeType, StartDate)
) ;

-- Create unique filtered index to ensure that only one TRANS and one MGMT fee
-- record can have NULL end date.

CREATE UNIQUE INDEX UX_OneNullEndDate ON Fee_Rate_History (FeeType)
WHERE EndDate IS NULL;

```

2. SQL Statements & Output for Appendix B Query

2.1 Find investors who are making on average a loss across all their portfolios in 2024.

SQL statements:

```
-- Compute the avg gain loss for each Investor as CTE
WITH InvestorAvgGainLoss AS (
    SELECT i.InvestorName, i.PhoneNumber, AVG(ugl.Amount) AS AverageGainLoss
    FROM Investor_Record ir
    INNER JOIN Investor i ON ir.PhoneNumber = i.PhoneNumber
    INNER JOIN Unrealised_Gain_Loss ugl ON ir.PortfolioID = ugl.PortfolioID
    WHERE YEAR(ugl.UGLDate) = '2024'
    GROUP BY i.InvestorName, i.PhoneNumber
)

-- Select from the AverageGainLoss CTE
SELECT InvestorName, PhoneNumber, AverageGainLoss
FROM InvestorAvgGainLoss
WHERE AverageGainLoss < 0
ORDER BY AverageGainLoss ASC;
```

Output:

	InvestorName	PhoneNumber	AverageGainLoss
1	Olivia Wong	94567890	-379.800358
2	Ethan Koh	81234567	-331.392865
3	Lydia Pang	81239876	-298.137700
4	Liam Teo	84567890	-283.495635
5	Julian Koh	86743210	-39.428956

Explanation:

1. The `InvestorAvgGainLoss` CTE first joins the `Investor_Record`, `Investor`, and `Unrealised_Gain_Loss` tables using `PhoneNumber` and `PortfolioID` as keys.
2. We filter the unrealised gain/loss records to only include those from the year 2024.
3. For each investor, we compute the average gain or loss (`AVG(ugl.Amount)`) across all their portfolios.
4. The final query selects those investors whose average gain/loss is negative, indicating an overall unrealised loss, and sorts them from the largest to smallest loss.

2.2 Find investors who are seeing an annualized return of more than 10% from their portfolios in 2024.

SQL statements:

```
-- Q2: Find investors who are seeing an annualized return of more than 10% from their
portfolios in 2024.

USE sc2207;

SELECT DISTINCT i.InvestorName, i.PhoneNumber, p.PortfolioID, p.AnnualisedReturn
FROM Investor_Record ir
INNER JOIN Investor i ON ir.PhoneNumber = i.PhoneNumber
INNER JOIN Portfolio p ON ir.PortfolioID = p.PortfolioID
WHERE p.AnnualisedReturn > 10;
```

Output:

	InvestorName	PhoneNumber	PortfolioID	AnnualisedReturn
1	Mason Yap	90123456	ad4c9118-d677-4682-84f4-4ecc4b6fa73e	13.59
2	Ryan Lee	91234567	26eb6d31-aedf-47c5-a6f4-884edd1b125d	11.05
3	Ryan Lee	91234567	90ef5178-f495-4295-bdcc-9a7b69b2fa19	10.25

Explanation:

1. The query joins `Investor_Record`, `Investor`, and `Portfolio` to link each investor to their portfolio performance.
2. Then, we filter for portfolios with an AnnualisedReturn greater than 10%.
3. `DISTINCT` ensures that each investor–portfolio pair appears only once in the result.

2.3 Find the monthly average unrealized gain/loss of portfolios for each month in 2024.

SQL statements:

```
-- Q3: Find the monthly average unrealized gain/loss of portfolios for each month in 2024
```

```
SELECT
    i.InvestorName, i.PhoneNumber, ir.PortfolioID,
    MONTH(ugl.uglDate) AS Month,
    AVG(ugl.Amount) AS AverageUnrealizedGainLoss
FROM Investor_Record ir
INNER JOIN Investor i ON ir.PhoneNumber = i.PhoneNumber
INNER JOIN Unrealised_Gain_Loss ugl ON ir.PortfolioID = ugl.PortfolioID
GROUP BY i.InvestorName, i.PhoneNumber, ir.PortfolioID, MONTH(ugl.UGLDate)
ORDER BY Month ASC;
```

Output:

	InvestorName	PhoneNumber	PortfolioID	Month	AverageUnrealizedGainLoss
1	Ethan Koh	81234567	68901f35-bf7d-486b-818b-ae9a7366d79c	1	-251.803666
2	Ethan Koh	81234567	7988a2a3-7d15-4bc9-a084-f7726b39de48	1	-56.931785
3	Ethan Koh	81234567	f1890cf8-7685-4a7c-8422-fc6606625567	1	-99.960689
4	Lydia Pang	81239876	7f2f54c4-76f3-4657-b8a9-ca8b13d28525	1	-19.675185
5	Owen Phua	82347654	d297f9bc-cfeb-4985-a914-b18ec238a78b	1	-110.804000
6	Owen Phua	82347654	00fb526e-690a-405a-9176-e1b72e05b9bc	1	6538.886400
7	Liam Teo	84567890	d8845d17-da5e-40f8-817e-3e9a9c0dfb2f	1	-47.119285
8	Amelia Ong	85654321	a4638cce-2fd2-4920-8b4d-1c095c226c36	1	4510.671333
9	Amelia Ong	85654321	fb87faa1-37d1-49e1-8d38-e32643c13e9c	1	4523.685600
10	Sophie Lim	85678901	11319b09-c731-4e61-b6f9-46dc3775d0b4	1	-104.915600
11	Sophie Lim	85678901	27b64350-e5c8-43e3-a470-dbf888f81b67	1	6156.927500
12	Julian Koh	86743210	4b137d3d-ea06-4fb6-a031-e5b32710fa26	1	-121.879000
13	Ava Chong	87842109	90e9498f-d40c-4713-9efc-2b5e8043b0ed	1	4388.733666
14	Ava Chong	87842109	6686c407-5a5d-4c1e-97dc-4bba7b13bf31	1	4311.661200
15	Hazel Chew	87890123	f4ad49d8-768a-45ef-a235-6f1526105fe5	1	-70.185517
16	Hazel Chew	87890123	18e68c3c-6520-497f-9bd7-c2877c633a45	1	4266.207857
17	Jasper Heng	88932098	3df8fff18-6ee6-439c-bb17-c33652e8178e	1	3694.026206
18	Jasper Heng	88932098	15762112-2c72-446f-b5df-e701ce7bd9cc	1	3779.917407
19	Clara Wee	89921987	705ac068-b288-437d-b458-08033ff25d38	1	5239.224000
20	Clara Wee	89921987	0707bc79-8cfe-4ffb-a2d1-a9fc023019b7	1	-61.925172
21	Mason Yap	90123456	ad4c9118-d677-4682-84f4-4ecc4b6fa73e	1	7180.267586
22	Mason Yap	90123456	7e5edcd4-2fbf-4add-a6f0-a94ecee7a1dd	1	6437.575600

	InvestorName	PhoneNumber	PortfolioID	Month	AverageUnrealizedGainLoss
351	Sophie Lim	85678901	11319b09-c731-4e61-b6f9-46dc3775d0b4	12	-713.275666
352	Sophie Lim	85678901	27b64350-e5c8-43e3-a470-dbf888f81b67	12	8372.512666
353	Julian Koh	86743210	4b137d3d-ea06-4fb6-a031-e5b32710fa26	12	-425.365666
354	Ava Chong	87842109	90e9498f-d40c-4713-9efc-2b5e8043b0ed	12	5137.304000
355	Ava Chong	87842109	6686c407-5a5d-4c1e-97dc-4bba7b13bf31	12	4383.105000
356	Hazel Chew	87890123	f4ad49d8-768a-45ef-a235-6f1526105fe5	12	-660.904666
357	Hazel Chew	87890123	18e68c3c-6520-497f-9bd7-c2877c633a45	12	4743.025666
358	Jasper Heng	88932098	3df8ff18-6ee6-439c-bb17-c33652e8178e	12	4045.673000
359	Jasper Heng	88932098	15762112-2c72-446f-b5df-e701ce7bd9cc	12	3343.916666
360	Clara Wee	89921987	705ac068-b288-437d-b458-08033ff25d38	12	6604.897000
361	Clara Wee	89921987	0707bc79-8cfe-4ffb-a2d1-a9fc023019b7	12	-308.418000
362	Mason Yap	90123456	ad4c9118-d677-4682-84f4-4ecc4b6fa73e	12	8810.088333
363	Mason Yap	90123456	7e5edcd4-2fbf-4add-a6f0-a94ecee7a1dd	12	7582.698333
364	Ryan Lee	91234567	390e4c6d-804c-4185-a364-1a61979f2b28	12	-612.509666
365	Ryan Lee	91234567	26eb6d31-aedf-47c5-a6f4-884edd1b125d	12	5036.251000
366	Ryan Lee	91234567	90ef5178-f495-4295-bdcc-9a7b69b2fa19	12	5304.039666
367	Emma Chen	92345678	6b5a7169-641c-48ee-9444-044c166a7759	12	-885.108333
368	Emma Chen	92345678	fd3c1885-afa3-434e-bfeb-23b53bf187ce	12	5612.952666
369	Emma Chen	92345678	f9d9b5a4-c0c8-4a4c-955e-2e8fc1623fe6	12	4980.296666
370	Jason Tan	93456789	10ea6f18-c648-497e-86e9-282c2ac8b972	12	4145.923000
371	Jason Tan	93456789	95a6b9b7-bb39-4666-9d0b-7b28925f53bb	12	-508.627333
372	Olivia Wong	94567890	5b82d1b5-9a8b-4d63-a348-7cf17cf8fa	12	-538.436666

Explanation:

1. The query joins `Investor_Record`, `Investor`, and `Unrealised_Gain_Loss` to retrieve unrealised gain/loss data for each investor's portfolio.
2. We then group the data by investor, portfolio, and month, and calculate the average unrealised gain/loss for each group.
3. The `MONTH()` function extracts the month from the `UGLDate`, allowing monthly analysis.
4. The results are ordered by month (`Month ASC`) to observe the trend throughout the year.

2.4 What is the top three most popular first financial goals for investors in 2024?

SQL statements:

```
-- Q4: What is the top three most popular first financial goals for investors in 2024?  
SELECT TOP (3) fg.GoalType, COUNT(*) AS Count  
FROM Investor_Record ir  
INNER JOIN Financial_Goal fg ON ir.GoalID = fg.GoalID  
WHERE fg.StartDate = (  
SELECT MIN(fg2.StartDate)  
FROM Investor_Record ir2  
INNER JOIN Financial_Goal fg2 ON ir2.GoalID = fg2.GoalID  
WHERE ir2.PhoneNumber = ir.PhoneNumber  
)  
GROUP BY GoalType  
ORDER BY COUNT(*) DESC;
```

Output:

	GoalType	Count
1	Early Retirement	7
2	First Home Purchase	3
3	Financial Independence	3

Explanation:

1. The query finds each investor's earliest financial goal by comparing the `StartDate` from the `Financial_Goal` table.
2. Then, we group all those earliest goals by their `GoalType` (e.g., Early Retirement, First Home Purchase).
3. For each `GoalType`, the number of how many investors had that as their first financial goal is calculated.
4. The top 3 most common first financial goals across all investors are selected and sorted in descending order by count.

2.5 Find investors who consistently top up their investment at the beginning of every month (dollar-cost averaging) in 2024 for at least one of their portfolios.

SQL statements:

```
-- Q5: Find investors who consistently top up their investment at the beginning of every month (dollar-cost averaging) in 2024 for at least one of their portfolios.
```

```
SELECT DISTINCT i.InvestorName, i.PhoneNumber
FROM Investor_Record ir
INNER JOIN Investor i ON ir.PhoneNumber = i.PhoneNumber
INNER JOIN PTransaction t ON ir.PortfolioID = t.PortfolioID
-- Check for topups in 2024 where the topup is made in the first week
WHERE DAY(t.PTransactionDate) <= 7 AND YEAR(t.PTransactionDate) = 2024 AND
t.PTransactionType = 'TOPUP'
-- Count transaction per investor across all portfolios
GROUP BY i.PhoneNumber, i.InvestorName
HAVING COUNT(DISTINCT MONTH(t.PTransactionDate)) = 12;
```

Output:

	InvestorName	PhoneNumber
1	Owen Phua	82347654
2	Amelia Ong	85654321
3	Sophie Lim	85678901
4	Hazel Chew	87890123

Explanation:

1. The transaction records are filtered to include only those with a type of 'TOPUP', where the transaction date falls between the 1st and 7th day, and the year is 2024.
2. The results are then grouped by investor, based on their phone number and name.
3. The DISTINCT investors who made such top-ups in all 12 months of the year are selected.

2.6 Find the most popular financial goals for investors working in the same company and whose age is between 30 to 40 years old.

SQL statements:

```
-- Q6: Find the most popular financial goals for investors working in the same company  
and whose age is between 30 to 40 years old.  
  
WITH RankedGoals AS (  
  
SELECT  
  
    i2.Company,  
    fg2.GoalType,  
    COUNT(*) AS GoalCount,  
    RANK() OVER (PARTITION BY i2.Company ORDER BY COUNT(*) DESC) AS RankNum  
  
FROM Financial_Goal fg2  
JOIN Investor_Record ir2 ON fg2.GoalID = ir2.GoalID  
JOIN Investor i2 ON ir2.PhoneNumber = i2.PhoneNumber  
WHERE DATEDIFF(YEAR, i2.DoB, GETDATE()) BETWEEN 30 AND 40  
GROUP BY i2.Company, fg2.GoalType  
)  
  
  
SELECT Company, GoalType, GoalCount  
FROM RankedGoals  
WHERE RankNum = 1  
ORDER BY GoalCount DESC;
```

Output:

	Company	GoalType	GoalCount
1	CapitalWave	Children's Education	3
2	Nexlify	First Home Purchase	3
3	BioPulse	Financial Independence	1

Explanation:

1. A Common Table Expression (RankedGoals) is used to count how many times each `GoalType` appears for investors (ages between 30 and 40) from each company.
2. The results are partitioned by company and ranked based on the number of goals, with the most frequent goal type assigned rank 1.
3. The outer query filters the ranked results to include only those with `RankNum = 1`, meaning only the top goal type for each company is selected.
4. The final result is ordered by goal count, showing which goal types are most dominant across companies.

2.7 Are male investors in their 20s making more money from their investments than their female counterparts in 2024?

SQL statements:

```
-- Q7: Are male investors in their 20s making more money from their investments than  
their female counterparts in 2024?
```

```
SELECT i.Gender, AVG(ugl.Amount) AS AverageGainLoss  
FROM Investor_Record ir  
INNER JOIN Investor i ON i.PhoneNumber = ir.PhoneNumber  
INNER JOIN Unrealised_Gain_Loss ugl ON ugl.PortfolioID = ir.PortfolioID  
AND YEAR(ugl.UGLDate) = '2024'  
WHERE i.Gender IN ('M', 'F')  
AND DATEDIFF(YEAR, i.DOB, GETDATE()) BETWEEN 20 AND 29  
GROUP BY i.Gender;
```

Output:

	Gender	AverageGainLoss
1	F	2814.748744
2	M	3014.031274

Male investors in their 20s have higher average gain than female investors in their 20s.

Explanation:

1. The `Investor_Record`, `Investor`, and `Unrealised_Gain_Loss` are joined together to link investors to their portfolio performance.
2. The data is filtered to include only investors aged between 20 and 29 years old, and whose gender is either '`M`' or '`F`'.
3. It also filters unrealised gain/loss records to only include those dated in 2024.
4. The results are grouped by gender, and the average gain/loss amount is computed for each gender.

3. Printout of all Table Records

3.1 Asset

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	AssetID	int	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	AssetName	varchar(255)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	Code	varchar(10)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	AssetType	varchar(5)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	AssetID	AssetName	Code	AssetType
1	1	Apple Inc	AAPL	STOCK
2	2	Microsoft Corporation	MSFT	STOCK
3	3	Google LLC	G00GL	STOCK
4	4	US Treasury Bond	USTB	BOND
5	5	Government Bond	GOVBD	BOND
6	6	Corporate Bond AAA	CORPAA	BOND
7	7	S&P 500 Index Fund	SPY	FUND
8	8	Tech Innovators Fund	TECHF	FUND
9	9	Global Equity Fund	GLOBEQ	FUND
10	10	Gold	GOLD	COMM
11	11	Silver	SLVR	COMM
12	12	Money Market Fund	MMFUND	CASH
13	13	Short-Term Treasury Bills	STBILL	CASH

3.2 Asset Allocation

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	PortfolioID	uniqueidentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	AssetType	varchar(5)	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	AllocationRatio	decimal(5,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	AllocatedValue	decimal(15,2)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	PortfolioID	AssetType	AllocationRatio	AllocatedValue
1	6b5a7169-641c-48ee-9444-044c166a7759	BOND	0.15	70.47
2	6b5a7169-641c-48ee-9444-044c166a7759	CASH	0.00	0.00
3	6b5a7169-641c-48ee-9444-044c166a7759	COMM	0.12	56.38
4	6b5a7169-641c-48ee-9444-044c166a7759	FUND	0.25	117.45
5	6b5a7169-641c-48ee-9444-044c166a7759	STOCK	0.45	211.42
6	705ac068-b288-437d-b458-08033ff25d38	BOND	0.25	141.92
7	705ac068-b288-437d-b458-08033ff25d38	CASH	0.00	0.00
8	705ac068-b288-437d-b458-08033ff25d38	COMM	0.15	85.15
9	705ac068-b288-437d-b458-08033ff25d38	FUND	0.20	113.53
10	705ac068-b288-437d-b458-08033ff25d38	STOCK	0.35	198.68
11	390e4c6d-804c-4185-a364-1a61979f2b28	BOND	0.15	47.33
12	390e4c6d-804c-4185-a364-1a61979f2b28	CASH	0.00	0.00
13	390e4c6d-804c-4185-a364-1a61979f2b28	COMM	0.12	37.87
14	390e4c6d-804c-4185-a364-1a61979f2b28	FUND	0.25	78.89
15	390e4c6d-804c-4185-a364-1a61979f2b28	STOCK	0.45	142.00
140	4b137d3d-ea06-4fb6-a031-e5b32710fa26	STOCK	0.20	189.19
141	15762112-2c72-446f-b5df-e701ce7bd9cc	BOND	0.15	65.03
142	15762112-2c72-446f-b5df-e701ce7bd9cc	CASH	0.00	0.00
143	15762112-2c72-446f-b5df-e701ce7bd9cc	COMM	0.12	52.03
144	15762112-2c72-446f-b5df-e701ce7bd9cc	FUND	0.25	108.39
145	15762112-2c72-446f-b5df-e701ce7bd9cc	STOCK	0.45	195.10
146	7988a2a3-7d15-4bc9-a084-f7726b39de48	BOND	0.25	141.21
147	7988a2a3-7d15-4bc9-a084-f7726b39de48	CASH	0.00	0.00
148	7988a2a3-7d15-4bc9-a084-f7726b39de48	COMM	0.15	84.73
149	7988a2a3-7d15-4bc9-a084-f7726b39de48	FUND	0.20	112.97
150	7988a2a3-7d15-4bc9-a084-f7726b39de48	STOCK	0.35	197.70
151	f1890fcfc-7685-4a7c-8422-fc6606625567	BOND	0.25	111.59
152	f1890fcfc-7685-4a7c-8422-fc6606625567	CASH	0.00	0.00
153	f1890fcfc-7685-4a7c-8422-fc6606625567	COMM	0.15	66.95
154	f1890fcfc-7685-4a7c-8422-fc6606625567	FUND	0.20	89.27
155	f1890fcfc-7685-4a7c-8422-fc6606625567	STOCK	0.35	156.23
156	NULL	NULL	NULL	NULL

3.3 Asset Price

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	AssetID	int	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	MarketPrice	decimal(10,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	AssetDate	date	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...

Record:

	AssetID	MarketPrice	AssetDate
1	1	149.43	2024-01-01
2	1	147.68	2024-01-02
3	1	148.27	2024-01-03
4	1	148.21	2024-01-04
5	1	148.25	2024-01-05
6	1	147.99	2024-01-06
7	1	148.40	2024-01-07
8	1	149.77	2024-01-08
9	1	151.31	2024-01-09
10	1	150.35	2024-01-10
4737	13	103.27	2024-12-22
4738	13	103.29	2024-12-23
4739	13	103.30	2024-12-24
4740	13	103.32	2024-12-25
4741	13	103.33	2024-12-26
4742	13	103.35	2024-12-27
4743	13	103.35	2024-12-28
4744	13	103.37	2024-12-29
4745	13	103.40	2024-12-30

3.4 Bond

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	AssetID	int	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	InterestRate	decimal(5,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	MaturityDate	date	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	AssetID	InterestRate	MaturityDate
1	4	0.03	2030-12-31
2	5	0.03	2030-12-31
3	6	0.03	2030-12-31

3.5 Bought_Asset_From

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	OwnedAssetID	uniqueidentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	AssetID	int	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	AssetBroker	varchar(255)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	OwnedAssetID	AssetID	AssetBroker
1	f84313ac-0bc1...	1	CapitalGainz
2	fbddc196-8d21...	11	CapitalGainz
3	013af61e-aac8...	1	Binanx
4	f4f1b7dc-b66d...	1	Binanx
5	4652ff91-4243...	4	AlanBroker
6	79a44738-9576...	11	AlanBroker
7	1210df31-394c...	11	Binanx
8	77d14b12-b52e...	1	AlanBroker
9	21ebe073-dcb1...	11	Binanx
10	ec6c6364-a400...	3	Binanx
1639	70d8bfa5-110b...	11	Binanx
1640	b8bde51d-7029...	3	CapitalGainz
1641	74091a02-eb02...	12	CapitalGainz
1642	6691f89f-f933...	11	Binanx
1643	04ae2322-d4e1...	5	CapitalGainz
1644	d5e63fd5-1f12...	3	CapitalGainz
1645	9d32ba15-8175...	1	CapitalGainz
1646	c54bbc88-95ca...	11	Binanx
1647	8804fd58-3d6f...	11	CapitalGainz
1648	8a3854cf-b2d7...	3	CapitalGainz
1649	65e5fc2a-3892...	11	CapitalGainz
1650	NULL	NULL	NULL

3.6 Fee_Rate_History

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	FeeType	varchar(5)	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	Rate	decimal(10,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	StartDate	date	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	EndDate	date	<input type="checkbox"/>	<input checked="" type="checkbox"/>			...

Record:

	FeeType ▾	Rate ▾	StartDate ▾	EndDate ▾
1	MGMT	0.75	2024-01-01	2024-03-31
2	MGMT	0.80	2024-04-01	2024-06-30
3	MGMT	0.85	2024-07-01	2024-09-30
4	MGMT	0.90	2024-10-01	NULL
5	TRANS	1.50	2024-01-01	2024-02-29
6	TRANS	1.60	2024-03-01	2024-04-30
7	TRANS	1.55	2024-05-01	2024-06-30
8	TRANS	1.70	2024-07-01	2024-08-31
9	TRANS	1.80	2024-09-01	2024-10-31
10	TRANS	1.75	2024-11-01	NULL

3.7 Financial Goal

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	GoalID	uniqueidentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(newid())		...
==	TargetAmount	decimal(15,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	TargetTimeline	date	<input type="checkbox"/>	<input type="checkbox"/>			...
==	StartDate	date	<input type="checkbox"/>	<input type="checkbox"/>			...
==	GoalType	varchar(255)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	GoalID	TargetAmount	TargetTimeline	StartDate	GoalType
1	a78ab488-14c5...	785166.63	2042-09-26	2024-01-02	Financial Ind...
2	17927770-928a...	810804.39	2036-01-22	2024-01-03	Children's Ed...
3	748752c6-e872...	771929.64	2035-06-15	2024-01-02	Early Retirem...
4	c2d6f768-89bd...	350722.76	2039-05-15	2024-01-02	Early Retirem...
5	00adecb0c-1e25...	350171.97	2029-06-05	2024-01-02	First Home Pu...
6	b6542ad7-1e18...	768630.56	2035-10-27	2024-01-02	First Home Pu...
7	1ca6e5f2-17b7...	829356.33	2029-08-09	2024-01-06	Travel Fund
8	bbacae1f-131a...	673826.01	2042-01-16	2024-01-06	First Home Pu...
9	8795d9fe-f80d...	181096.30	2043-04-04	2024-01-02	Children's Ed...
10	b1061d67-6443...	585485.47	2041-01-26	2024-01-03	Children's Ed...
11	7f2a5232-e4a3...	612453.24	2030-07-20	2024-01-01	Early Retirem...
12	b2dd99a8-89a8...	854896.75	2029-02-26	2024-01-04	First Home Pu...
13	c7ef6cdf-9e7b...	890728.93	2039-02-06	2024-01-06	Children's Ed...
14	8412f3bf-ae2d...	736282.94	2031-05-05	2024-01-02	Financial Ind...
15	acfaf167-4f07...	606531.13	2030-08-10	2024-01-03	Travel Fund
16	118beb31-62e7...	410649.83	2033-07-03	2024-01-05	Children's Ed...
17	ab8b2043-437c...	274186.64	2039-01-12	2024-01-06	Early Retirem...
18	52fdb61e-8b83...	528091.59	2030-02-21	2024-01-01	Early Retirem...
19	5b48946f-9cd2...	487435.58	2037-10-19	2024-01-01	Early Retirem...
20	bc402165-468c...	753525.31	2032-08-22	2024-01-06	Children's Ed...
21	6b9c8d03-1bef...	417035.15	2036-10-02	2024-01-06	First Home Pu...
22	4bfb8709-e36d...	373465.80	2034-12-16	2024-01-02	Early Retirem...
23	e6752796-8602...	832940.42	2038-06-18	2024-01-01	Early Retirem...
24	890cf649-7292...	772479.26	2029-04-21	2024-01-05	Children's Ed...
25	7e242580-547c...	125992.20	2030-02-12	2024-01-03	Financial Ind...
26	c7d8a42e-3508...	686825.75	2038-12-27	2024-01-04	Children's Ed...
27	4f325616-8a3c...	625381.72	2041-08-19	2024-01-06	First Home Pu...

3.8 Fund

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	AssetID	int	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	ExpenseRatio	decimal(5,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	DividendYield	decimal(5,2)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	AssetID	ExpenseRatio	DividendYield
1	7	0.10	1.50
2	8	0.10	1.50
3	9	0.10	1.50
4	NULL	NULL	NULL

3.9 Invested_Value

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	PortfolioID	uniqueidentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	InvestedValueDate	date	<input type="checkbox"/>	<input type="checkbox"/>			...
==	InvestedValue	decimal(15,2)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	PortfolioID	InvestedValue...	InvestedValue
1	6b5a7169-641c...	2024-12-15	17620.46
2	705ac068-b288...	2024-12-29	23022.65
3	390e4c6d-804c...	2024-10-24	17086.96
4	a4638cce-2fd2...	2024-12-08	22162.10
5	fd3c1885-afa3...	2024-12-19	21409.27
6	10ea6f18-c648...	2024-12-24	15966.54
7	90e9498f-d40c...	2024-11-28	17388.43
8	f9d9b5a4-c0c8...	2024-12-27	16735.31
9	d8845d17-da5e...	2024-12-12	17310.83
10	11319b09-c731...	2024-12-12	30364.66
11	6686c407-5a5d...	2024-10-31	19872.24
12	ad4c9118-d677...	2024-12-28	29007.94
13	f4ad49d8-768a...	2024-12-30	24058.59
14	95a6b9b7-bb39...	2024-12-27	16738.98
15	5b82d1b5-9a8b...	2024-10-18	17632.30
16	26eb6d31-aedf...	2024-12-25	17829.99
17	90ef5178-f495...	2024-12-23	18424.34
18	7e5edcd4-2fbf...	2024-12-26	31042.76
19	0707bc79-8cfe...	2024-12-28	22570.52
20	68901f35-bf7d...	2024-12-06	26516.92
21	d297f9bc-cfeb...	2024-12-08	29844.71
22	18e68c3c-6520...	2024-12-01	20546.46
23	3df8ff18-6ee6...	2024-11-27	15389.69
24	7f2f54c4-76f3...	2024-10-25	22270.49
25	27b64350-e5c8...	2024-12-01	29793.87
26	00fb526e-690a...	2024-12-20	32171.69
27	fb87faa1-37d1...	2024-12-04	22091.59

3.10 Investor

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	PhoneNumber	varchar(15)	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	InvestorName	varchar(255)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	DoB	date	<input type="checkbox"/>	<input type="checkbox"/>			...
==	Gender	varchar(1)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	Email	varchar(255)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	RiskTolerance	varchar(4)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	AnnualIncome	decimal(15,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	Company	varchar(255)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	PhoneNumber	InvestorName	DoB	Gender	Email	RiskTolerance	AnnualIncome	Company
1	81234567	Ethan Koh	1990-05-10	M	ethan.koh@nex...	MODR	85000.00	Nexlify
2	81239876	Lydia Pang	1990-09-03	F	lydia.pang@bi...	MODR	93000.00	BioPulse
3	82347654	Owen Phua	1990-12-12	M	owen.phua@cap...	MODR	81000.00	CapitalWave
4	84567890	Liam Teo	1995-08-22	M	liam.teo@nexl...	AGGR	65000.00	Nexlify
5	85654321	Amelia Ong	1992-11-01	F	amelia.ong@ca...	AGGR	60000.00	CapitalWave
6	85678901	Sophie Lim	1987-11-03	F	sophie.lim@ne...	CONS	78000.00	Nexlify
7	86743210	Julian Koh	1985-06-15	M	julian.koh@ca...	CONS	115000.00	CapitalWave
8	87842109	Ava Chong	2003-12-17	F	ava.chong@bio...	AGGR	58000.00	BioPulse
9	87890123	Hazel Chew	1997-01-17	F	hazel.chew@bi...	AGGR	56000.00	BioPulse
1..	88932098	Jasper Heng	1996-05-29	M	jasper.heng@b...	AGGR	50000.00	BioPulse
1..	89921987	Clara Wee	1998-05-20	F	clara.wee@cap...	MODR	72000.00	CapitalWave
1..	90123456	Mason Yap	1986-04-18	M	mason.yap@nex...	MODR	89000.00	Nexlify
1..	91234567	Ryan Lee	2000-03-15	M	ryan.lee@nexl...	AGGR	62000.00	Nexlify
1..	92345678	Emma Chen	2001-07-22	F	emma.chen@nex...	AGGR	60000.00	Nexlify
1..	93456789	Jason Tan	1999-11-05	M	jason.tan@cap...	MODR	58000.00	CapitalWave
1..	94567890	Olivia Wong	2002-02-28	F	olivia.wong@c...	MODR	55000.00	CapitalWave

3.11 Investor_Record

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	RecordID	uniqueidentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(newid())		...
==	PhoneNumber	varchar(15)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	PortfolioID	uniqueidentifier	<input type="checkbox"/>	<input type="checkbox"/>			...
==	GoalID	uniqueidentifier	<input type="checkbox"/>	<input checked="" type="checkbox"/>			...

Record:

	RecordID	PhoneNumber	PortfolioID	GoalID
1	7ea6270d-1654-4196-8bfb-0d0a6280e15c	94567890	5b82d1b5-9a8b...	8795d9fe-f80d...
2	a4237d48-4e0e-444e-a2c4-0dc39558d59f	90123456	ad4c9118-d677...	00adeb0c-1e25...
3	083bcbbd-503b-4186-8fb9-10687720435b	81234567	68901f35-bf7d...	e6752796-8602...
4	ca895d4c-8147-4da1-9566-13ed14b3ec9f	87890123	18e68c3c-6520...	b1061d67-6443...
5	4a65bd6c-bd5c-418a-bb43-17d57beb04cb	81234567	7988a2a3-7d15...	17927770-928a...
6	86575a69-8c04-400c-a7b1-24d07344708c	93456789	95a6b9b7-bb39...	890cf649-7292...
7	6ece80e-ad57-4f0e-917c-27dad317d83c	92345678	fd3c1885-afa3...	748752c6-e872...
8	70b54b1d-e828-4a54-a6cf-283fdfed3145	87842109	90e9498f-d40c...	5b48946f-9cd2...
9	313f7034-f1ae-46c7-82c7-2f13d3577343	93456789	10ea6f18-c648...	b2dd99a8-89a8...
1...	6ae87230-2a57-4560-bb48-3278f32ba78d	82347654	d297f9bc-cfeb...	ab8b2043-437c...
1...	5a68f60e-b367-4440-ba66-3dbb3d386d3f	91234567	390e4c6d-804c...	b6542ad7-1e18...
1...	bbf9414e-6c65-4ea7-b891-449a0e50ed78	92345678	f9d9b5a4-c0c8...	c7d8a42e-3508...
1...	b4d10a1c-faa2-4822-91d1-45d820e7dff	82347654	00fb526e-690a...	bc402165-468c...
1...	57125a54-3459-4126-a716-4ce9d37c1d3f	92345678	6b5a7169-641c...	c091cff9-11f1...
1...	1f35515b-abf3-4eef-8ae4-4fc1ba91a656	87842109	6686c407-5a5d...	6b9c8d03-1bef...
1...	4bc6e05a-61ce-4068-8677-5050cf4c07d1	85678901	27b64350-e5c8...	acfac167-4f07...
1...	686155c0-e637-4c20-92c2-537b935c19d8	87890123	f4ad49d8-768a...	8412f3bf-ae2d...
1...	5bfd3955-c565-4f94-837b-5579fb35f418	85654321	fb87faa1-37d1...	c7ef6cdf-9e7b...
1...	6bbf038a-0c97-407b-998e-591f919bc5e6	91234567	90ef5178-f495...	1ca6e5f2-17b7...
2...	185f4b6d-6950-4682-a7d0-62783c826043	88932098	15762112-2c72...	e0f4f41d-2b28...
2...	6618f559-a09c-430e-971b-632aa482e303	85678901	11319b09-c731...	4f325616-8a3c...
2...	caddcfe4-f84e-4d37-baf6-a0a538427685	86743210	4b137d3d-ea06...	ad4e763b-2a8a...

3.12 Owned_Assets

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	OwnedAssetID	uniqueidentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(newid())		...
==	Unit	int	<input type="checkbox"/>	<input type="checkbox"/>	((0))		...
==	PortfolioID	uniqueidentifier	<input type="checkbox"/>	<input type="checkbox"/>			...
==	PurchasePrice	decimal(10,2)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	OwnedAssetID	Unit	PortfolioID	PurchasePrice
1	f84313ac-0bc1...	1	390e4c6d-804c...	142.71
2	fbddc196-8d21...	1	6686c407-5a5d...	22.03
3	013af61e-aac8...	1	11319b09-c731...	149.19
4	f4f1b7dc-b66d...	1	a4638cce-2fd2...	145.78
5	4652ff91-4243...	1	7988a2a3-7d15...	96.17
6	79a44738-9576...	2	6b5a7169-641c...	21.75
7	1210df31-394c...	1	fd3c1885-afa3...	23.00
8	77d14b12-b52e...	1	68901f35-bf7d...	153.55
9	21ebe073-dcb1...	1	f4ad49d8-768a...	20.89
10	ec6c6364-a400...	1	68901f35-bf7d...	135.96
11	e4e29e11-eac2...	1	00fb526e-690a...	120.30
12	e31b5d7a-d60f...	115	7e5edcd4-2fbf...	23.08
13	492e800d-dddf...	1	7988a2a3-7d15...	96.93
1638	3b150f1a-ca0f...	110	f1890cfcc-7685...	23.05
1639	70d8bfa5-110b...	2	a4638cce-2fd2...	19.66
1640	b8bde51d-7029...	1	fb87faa1-37d1...	119.86
1641	74091a02-eb02...	1	00fb526e-690a...	94.92
1642	6691f89f-f933...	2	6686c407-5a5d...	22.19
1643	04ae2322-d4e1...	3	4b137d3d-ea06...	96.40
1644	d5e63fd5-1f12...	1	ad4c9118-d677...	128.48
1645	9d32ba15-8175...	1	18e68c3c-6520...	143.90
1646	c54bbc88-95ca...	2	00fb526e-690a...	20.44
1647	8804fd58-3d6f...	4	7988a2a3-7d15...	20.91
1648	8a3854cf-b2d7...	1	18e68c3c-6520...	119.19
1649	65e5fc2a-3892...	4	705ac068-b288...	20.64

3.13 Portfolio

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	PortfolioID	uniqueidentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(newid())		...
==	PortfolioStatus	varchar(7)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	AnnualisedReturn	decimal(8,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	StartDate	date	<input type="checkbox"/>	<input type="checkbox"/>			...
==	MarketValue	decimal(15,2)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	PortfolioID	PortfolioStat...	AnnualisedRet...	StartDate	MarketValue
1	6b5a7169-641c...	ACTIVE	-27.41	2024-01-04	12789.92
2	705ac068-b288...	ACTIVE	6.84	2024-01-01	24598.00
3	390e4c6d-804c...	ACTIVE	-21.26	2024-01-02	13454.49
4	a4638cce-2fd2...	ACTIVE	0.26	2024-01-01	22220.41
5	fd3c1885-afa3...	ACTIVE	-0.64	2024-01-02	21271.69
6	10ea6f18-c648...	ACTIVE	4.80	2024-01-04	16732.40
7	90e9498f-d40c...	ACTIVE	8.23	2024-01-01	18819.73
8	f9d9b5a4-c0c8...	ACTIVE	8.88	2024-01-04	18220.62
9	d8845d17-da5e...	ACTIVE	-23.17	2024-01-03	13300.17
10	11319b09-c731...	ACTIVE	-26.67	2024-01-06	22267.35
11	6686c407-5a5d...	ACTIVE	-10.30	2024-01-06	17826.23
12	ad4c9118-d677...	ACTIVE	13.59	2024-01-02	32949.12
13	f4ad49d8-768a...	ACTIVE	-35.37	2024-01-02	15550.01
14	95a6b9b7-bb39...	ACTIVE	-28.15	2024-01-05	12026.44
15	5b82d1b5-9a8b...	ACTIVE	-25.54	2024-01-02	13129.08
16	26eb6d31-aedf...	ACTIVE	11.05	2024-01-05	19800.62
17	90ef5178-f495...	ACTIVE	10.25	2024-01-06	20312.59
18	7e5edcd4-2fbf...	ACTIVE	2.18	2024-01-06	31718.67
19	0707bc79-8cfe...	ACTIVE	-21.45	2024-01-02	17728.16
20	68901f35-bf7d...	ACTIVE	-20.58	2024-01-01	21059.90
21	d297f9bc-cfeb...	ACTIVE	-25.38	2024-01-06	22271.37
22	18e68c3c-6520...	ACTIVE	-7.80	2024-01-03	18944.17
23	3df8ff18-6ee6...	ACTIVE	-1.55	2024-01-02	15151.82
24	7f2f54c4-76f3...	ACTIVE	-16.37	2024-01-04	18624.00
25	27b64350-e5c8...	ACTIVE	3.09	2024-01-03	30714.07
26	00fb526e-690a...	ACTIVE	4.62	2024-01-06	33658.97
27	fb87faa1-37d1...	ACTIVE	-8.71	2024-01-06	20166.63
28	4b137d3d-ea06...	ACTIVE	-13.93	2024-01-01	33369.30
29	15762112-2c72...	ACTIVE	3.33	2024-01-04	14101.22
30	7988a2a3-7d15...	ACTIVE	-25.00	2024-01-03	21231.34
31	f1890fcfc-7685...	ACTIVE	-26.66	2024-01-02	20986.36

3.14 PTransaction

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	TransactionID	uniqueidentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(newid())		...
==	PTransactionType	varchar(8)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	PTransactionDate	date	<input type="checkbox"/>	<input type="checkbox"/>			...
==	Unit	int	<input type="checkbox"/>	<input checked="" type="checkbox"/>			...
==	PricePerUnit	decimal(10,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	PortfolioID	uniqueidentifier	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	TransactionID	PTransactionT...	PTransactionD...	Unit	PricePerUnit	PortfolioID
1	bf09eb2d-9431...	BUY	2024-03-05	4	21.47	f1890cfc-7685...
2	bcaafe3-980c...	BUY	2024-01-16	2	22.55	6686c407-5a5d...
3	6a8daa64-6df4...	BUY	2024-08-19	1	20.42	3df8ff18-6ee6...
4	94b7c3e1-b52d...	TOPUP	2024-07-28	0	866.29	4b137d3d-ea06...
5	ffed2531-ec80...	BUY	2024-01-04	12	182.25	10ea6f18-c648...
6	4761352c-e053...	BUY	2024-09-22	1	145.78	a4638cce-2fd2...
7	794030ec-9763...	BUY	2024-05-20	1	21.00	fb87faa1-37d1...
8	cf658d06-c291...	TOPUP	2024-04-18	0	541.72	11319b09-c731...
9	60bfc880-30ad...	BUY	2024-04-01	1	21.79	fb87faa1-37d1...
10	2a73a4af-0825...	BUY	2024-05-16	2	96.14	00fb526e-690a...
11	31bdc07a-b58b...	BUY	2024-10-28	1	141.42	7e5edcd4-2fbf...
12	4a8d2b2e-3eb3...	BUY	2024-10-04	2	19.83	6b5a7169-641c...
2299	f8849d44-ed46...	TOPUP	2024-06-06	0	341.67	90e9498f-d40c...
2300	e0e4ce17-ebbc...	TOPUP	2024-05-08	0	354.60	d297f9bc-cfeb...
2301	b9aed906-4639...	BUY	2024-11-16	3	20.57	705ac068-b288...
2302	e6877915-0b26...	BUY	2024-11-05	1	98.16	7988a2a3-7d15...
2303	7d565f22-341e...	BUY	2024-11-29	1	94.25	7e5edcd4-2fbf...
2304	0bcbeeb8-fed...	TOPUP	2024-06-07	0	476.82	7988a2a3-7d15...
2305	37bbcd6-f8ce...	BUY	2024-01-12	2	22.94	90e9498f-d40c...
2306	19c60c00-9738...	BUY	2024-03-01	1	97.69	a4638cce-2fd2...
2307	3dd16cbe-17e0...	BUY	2024-10-22	2	19.89	fd3c1885-afa3...
2308	0c8036c8-4089...	BUY	2024-11-13	1	94.12	11319b09-c731...
2309	25ec5d96-138e...	BUY	2024-06-29	1	129.16	d297f9bc-cfeb...

3.15 Stock

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	AssetID	int	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	EBITDA	decimal(15,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	PERatio	decimal(5,2)	<input type="checkbox"/>	<input type="checkbox"/>			...
==	EarningPerShare	decimal(5,2)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	AssetID	EBITDA	PERatio	EarningPerSha...
1	1	100000.00	25.50	6.75
2	2	100000.00	25.50	6.75
3	3	100000.00	25.50	6.75

3.16 Unrealised_Gain_Loss

Structure:

Move	Name	Type	Primary Key	Allow Nulls	Default Value	Remove	More Actions
==	PortfolioID	uniqueidentifier	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	UGLDate	date	<input checked="" type="checkbox"/>	<input type="checkbox"/>			...
==	Amount	decimal(15,2)	<input type="checkbox"/>	<input type="checkbox"/>			...

Record:

	PortfolioID	UGLDate	Amount
1	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-05	11.90
2	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-06	27.08
3	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-07	10.08
4	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-08	-29.24
5	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-09	-54.25
6	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-10	-45.94
7	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-11	-46.45
8	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-12	-60.00
9	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-13	-90.34
10	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-14	-109.22
11	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-15	-157.52
12	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-16	-145.11
13	6b5a7169-641c-48ee-9444-044c166a7759	2024-01-17	-131.18
9989	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-17	-108.36
9990	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-18	-104.83
9991	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-19	-102.37
9992	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-20	-143.96
9993	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-21	-139.69
9994	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-22	-144.08
9995	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-23	-162.02
9996	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-24	-118.24
9997	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-25	-146.41
9998	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-26	-110.67
9999	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-27	-122.04
10000	4b137d3d-ea06-4fb6-a031-e5b32710fa26	2024-08-28	-82.82

4. Additional Efforts

4.1 Database Seeding via Mock Data Simulation

We seeded the database using a simple application that mocked the use cases defined in *Appendix A: Application Description* of the Lab Manual. The application generated mock transactions and portfolio data based on a simulated stock market, mimicking basic investor behaviour, with specific parameters tuned to ensure the queries required returned non-empty rows. We then wrote a script to dump the database data into a seed file.

4.2 Index Creation and Query Optimisation

We explicitly identified and created indexes on foreign keys of specific tables based on the query patterns of the application to speed up query performance, particularly for statements with `WHERE`, `ORDER BY`, and `GROUP BY` clauses. For example,

```
CREATE INDEX idx_IR_Goal_ID ON Investor_Record(GoalID);
CREATE INDEX idx_IR_Portfolio_ID ON Investor_Record(PortfolioID);
CREATE INDEX idx_IR_Investor_PhoneNumber ON Investor_Record(PhoneNumber);
```

4.3 Data Validation and Integrity Rules

We explicitly defined several referential integrity constraints, foreign key constraints and unique indexes for specific relationships and tables throughout the database to ensure data integrity and enforce data validation.

For example, for the `Fee_Rate_History` table, the unique index is created on `FeeType` to ensure that only one record for each `FeeType` can have a null `EndDate` value since that record specifies the most recent active fee record.

```
CREATE UNIQUE INDEX UX_OneNullEndDate ON Fee_Rate_History (FeeType)
WHERE EndDate IS NULL;
```

For example, for the `Fee_Rate_History` table, check constraints are added for data validation.

```
CONSTRAINT chk_FeeType CHECK (FeeType in ('TRANS', 'MGMT')),
CONSTRAINT chk_End_Ge_Start CHECK (EndDate >= StartDate).
```

For example, for the `Investor_Record` table, referential integrity constraints are added to ensure that data integrity is preserved when the referenced row changes.

```
FOREIGN KEY (PortfolioID) REFERENCES Portfolio(PortfolioID) ON DELETE CASCADE,
```

```
FOREIGN KEY (PhoneNumber) REFERENCES Investor(PhoneNumber) ON DELETE CASCADE ON UPDATE  
CASCADE ,
```

APPENDIX C: INDIVIDUAL CONTRIBUTION FORM

Full Name	Individual Contribution to Lab 1 Submission	Percentage of Contribution	Signature
ADAM SOH SHI JIE	Actively engage in discussions and sketch ER Diagram	25%	
JOYCE LEE JIA XUAN	Actively engage in discussions and sketch ER Diagram	25%	
SOONG JUN SHEN	Lead the discussion and provide guidance to complete ER Diagram	25%	
LEE YUE HANG	Provide financial knowledge and insights to improve ER Diagram	25%	

Full Name	Individual Contribution to Lab 3 Submission	Percentage of Contribution	Signature
ADAM SOH SHI JIE	Actively engage in discussions and 3NF normalization	25%	
JOYCE LEE JIA XUAN	Actively engage in discussions and 3NF normalization	25%	
SOONG JUN SHEN	Actively engage in discussions and 3NF normalization	25%	
LEE YUE HANG	Actively engage in discussions and 3NF normalization	25%	

Full Name	Individual Contribution to Lab 5 Submission	Percentage of Contribution	Signature
ADAM SOH SHI JIE	Build database table and writing queries	25%	
JOYCE LEE JIA XUAN	Build database table and writing queries	25%	
SOONG JUN SHEN	Use python to build simulator and actively engage in discussions	25%	
LEE YUE HANG	Actively engage in discussions and provide investment knowlegde	25%	

APPENDIX D: USE OF AI TOOL(S) IN LAB WORK

Each team member should indicate either A or B:

- A. I affirm that my contribution(s) to the lab work is my own, produced without help from any AI tool(s).
- B. I affirm that my contribution(s) to the lab work has been produced with the use of AI tool(s).

Team member (full name)	Signature	Date	A or B
ADAM SOH SHI JIE		4/2/2025	A
JOYCE LEE JIA XUAN		4/2/2025	A
SOONG JUN SHEN		4/2/2025	A
LEE YUE HANG		4/2/2025	A

By signing this form, you declare that the above affirmation made is true and that you have read and understood NTU's policy on the use of AI tools.

If any team member answered B, the team member(s) must indicate and replicate the table below for every instance that AI tool(s) is used:

Name of AI tool	< For example, ChatGPT >
Input prompt	< Insert the question that you asked ChatGPT >
Date generated	
Output generated	< Insert the response verbatim from ChatGPT >
Output screenshots	
Impact on submission	< Briefly explain which part of your submitted work was ChatGPT's response applied >