Programming Assignments

- General goal:
  - How to use a regular programming language (e.g. Java) and SQL together to *take a decision about a real-life situation*
- Specific goal:
  - *Data Mining* on available stocks of different companies

Assignment 1 (5%)

- Analyze **256K+ data points**
- Find when stock split occurs (stock split)
- Find when stock price is behaving in a strange way (crazy day)
- Assignment 1 helps:
  - To understand the stock data very well
  - To understand how to process stock data in a regular text file using Java
- You will require “stock split” part of Assignment 1 to complete Assignment 2

Assignment 2 (10%)

- Analyze ~**22.57 Million** data points
- Assignment 2 helps
  - To learn how to use Java and SQL together
    - How to connect to remote database server
    - How to write query to get data from the remote database server
  - To design a stock investment strategy
    - When to buy a stock
    - When to sell a stock
    - When to do nothing
- You will require “stock split” and “split adjustment” parts of Assignment 2 to complete Assignment 3

Guidelines for Assignment 2

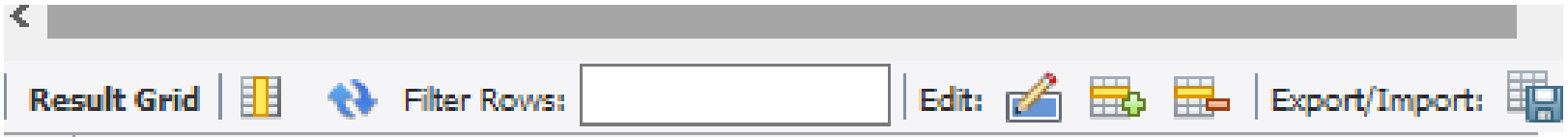
Connect to Remote MySQL Sever

- Please look at the separate file on canvas which explains how to connect to the remote MySQL database server

Database Schema

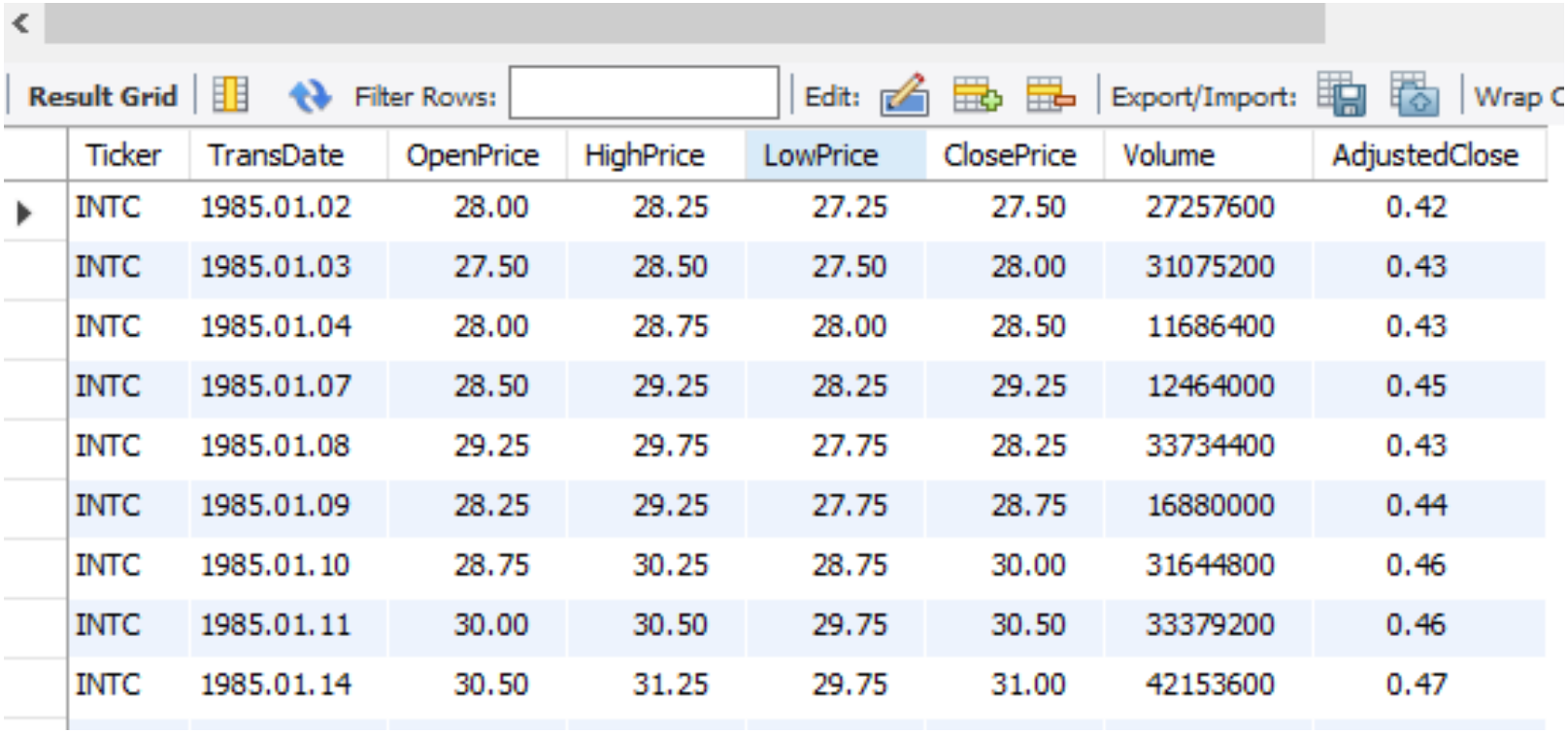
Entity	Attributes	Primary Key	Foreign keys
company	Ticker Name Industry Location	Ticker	
pricevolume	Ticker TransDate OpenPrice HighPrice LowPrice ClosePrice Volume AdjustedClose	Ticker TransDate	Ticker
divid	Ticker Amount	Ticker	

select * from company limit 10;



Ticker	Name	Industry	Location
A	Agilent Technologies Inc	Information Technology	Santa Clara California
AA	Alcoa Inc	Materials	Pittsburgh Pennsylvania
AAPL	Apple Inc.	Information Technology	Cupertino California
ABC	AmerisourceBergen Corp	Health Care	Chesterbrook Pennsylvania
ABT	Abbott Laboratories	Health Care	North Chicago Illinois
ACE	ACE Limited	Financials	Zurich Switzerland
ACN	Accenture	Information Technology	Dublin Ireland
ADBE	Adobe Systems Inc	Information Technology	San Jose California
ADI	Analog Devices Inc	Information Technology	Norwood Massachusetts

```
select * from pricevolume
where Ticker =  'INTC' limit 10;
```


Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap C

Ticker	TransDate	OpenPrice	HighPrice	LowPrice	ClosePrice	Volume	AdjustedClose
INTC	1985.01.02	28.00	28.25	27.25	27.50	27257600	0.42
INTC	1985.01.03	27.50	28.50	27.50	28.00	31075200	0.43
INTC	1985.01.04	28.00	28.75	28.00	28.50	11686400	0.43
INTC	1985.01.07	28.50	29.25	28.25	29.25	12464000	0.45
INTC	1985.01.08	29.25	29.75	27.75	28.25	33734400	0.43
INTC	1985.01.09	28.25	29.25	27.75	28.75	16880000	0.44
INTC	1985.01.10	28.75	30.25	28.75	30.00	31644800	0.46
INTC	1985.01.11	30.00	30.50	29.75	30.50	33379200	0.46
INTC	1985.01.14	30.50	31.25	29.75	31.00	42153600	0.47

Sample Outputs

```
Database connection jdbc:mysql://127.0.0.1:4321/johnson330 yourusername established.
Enter a ticker symbol [start/end dates]: INTC
Intel Corp.
2:1 split on 2000.07.28  129.12 --> 65.44
2:1 split on 1999.04.09  130.81 --> 61.62
2:1 split on 1997.07.11  153.81 --> 77.25
2:1 split on 1995.06.16  116.12 --> 58.50
2:1 split on 1993.06.04  112.75 --> 60.12
3:2 split on 1987.10.28  31.75 --> 21.75
6 splits in 7470 trading days

Executing investment strategy
Transactions executed: 690
Net cash: 14717.72
```

Transaction executed
= How many buy or sales you have done in this time period

```
Enter ticker symbol [start/end dates]: INTC 1980.01.01 1999.12.31
Intel Corp.
2:1 split on 1999.04.09  130.81 --> 61.62
2:1 split on 1997.07.11  153.81 --> 77.25
2:1 split on 1995.06.16  116.12 --> 58.50
2:1 split on 1993.06.04  112.75 --> 60.12
3:2 split on 1987.10.28  31.75 --> 21.75
5 splits in 3791 trading days

Executing investment strategy
Transactions executed: 358
Net cash: 44953.95
```

```
Enter ticker symbol [start/end dates]: T 2000.01.01 2014.08.18
AT&T Inc
0 splits in 3679 trading days

Executing investment strategy

Transactions executed: 148
Net cash: -1568.00
```

How your program should proceed

```
Database connection jdbc:mysql://127.0.0.1:4321/johnson330 yourusername established.
Enter a ticker symbol [start/end dates]: INTC
Intel Corp.
2:1 split on 2000.07.28  129.12 --> 65.44
2:1 split on 1999.04.09  130.81 --> 61.62
2:1 split on 1997.07.11  153.81 --> 77.25
2:1 split on 1995.06.16  116.12 --> 58.50
2:1 split on 1993.06.04  112.75 --> 60.12
3:2 split on 1987.10.28  31.75 --> 21.75
6 splits in 7470 trading days
```

Step 1
Step 2.1 to 2.4

```
Executing investment strategy
Transactions executed: 690
Net cash: 14717.72
```

Step 2.5 to 2.10

Two Queries

Entity	Attributes	Primary Key	Foreign keys
company	Ticker Name Industry Location	Ticker	
pricevolume	Ticker TransDate OpenPrice HighPrice LowPrice ClosePrice Volume AdjustedClose	Ticker TransDate	Ticker
dividend	Ticker Amount	Ticker	Ticker

```
select Name
from company
where Ticker = 'INTC';
```

```
select TransDate, OpenPrice,
HighPrice, LowPrice, ClosePrice
 from priceVolume
where Ticker = 'INTC'
order by TransDate DESC;
```

Split Adjustment for INTC (Step 2.5): A Simple Way

Result Grid | Filter Rows: | Export:

TransDate	OpenPrice	HighPrice	LowPrice	ClosePrice
1999.04.19	57.12	59.00	55.00	55.50
1999.04.16	57.88	58.38	56.45	57.25
1999.04.15	58.50	58.62	56.50	58.44
1999.04.14	61.38	61.50	56.25	57.00
1999.04.13	62.94	63.00	59.81	60.50
1999.04.12	61.62	62.47	60.00	61.25
1999.04.09	132.38	132.69	130.06	130.81
1999.04.08	132.00	133.38	128.44	131.06
1999.04.07	131.44	133.50	128.50	132.12
1999.04.06	126.75	131.19	126.00	130.44
1999.04.05	121.88	127.50	121.75	127.50
1999.04.01	119.94	121.38	118.88	120.88

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TransDate	OpenPrice	HighPrice	LowPrice	ClosePrice
1997.07.21	86.19	86.50	84.56	85.69
1997.07.18	86.75	87.62	84.75	86.44
1997.07.17	88.25	89.69	86.12	87.81
1997.07.16	86.38	88.88	84.75	88.38
1997.07.15	80.75	81.94	79.69	80.91
1997.07.14	77.25	78.98	76.75	78.75
1997.07.11	150.50	154.00	149.88	153.81
1997.07.10	152.50	153.50	149.75	150.12
1997.07.09	151.00	154.56	151.00	152.62
1997.07.08	147.81	150.38	146.25	149.62
1997.07.07	145.69	149.00	145.38	147.38
1997.07.03	144.62	145.31	143.00	144.94

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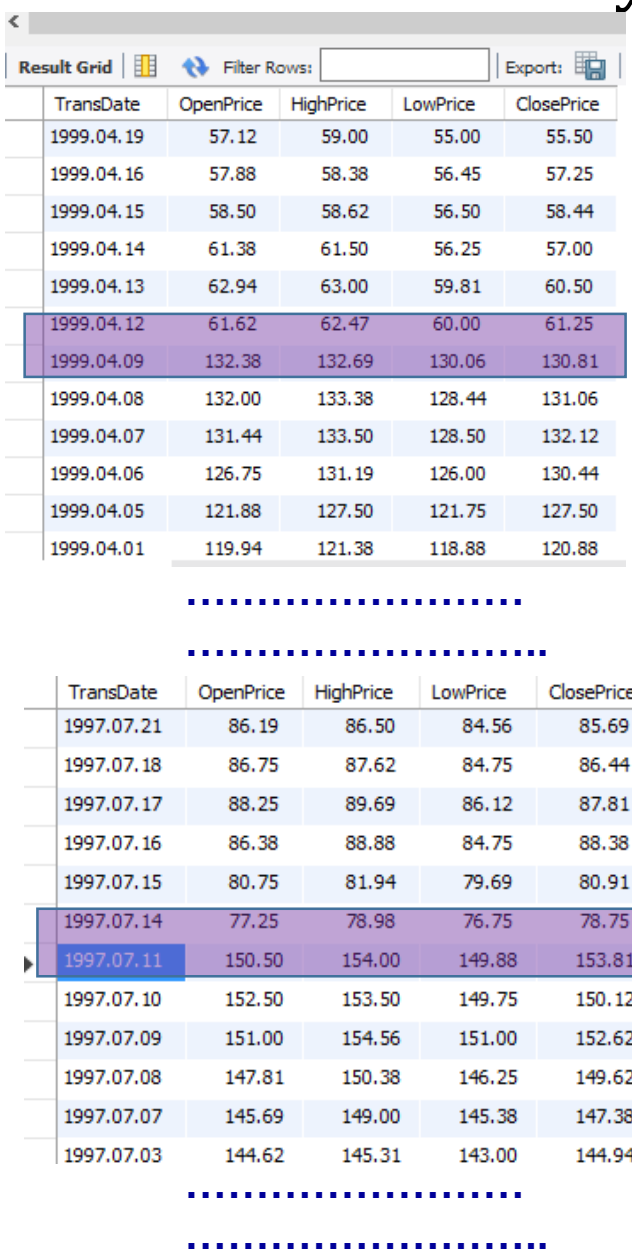
Divide by 2 for split adjustment

Divide by 2 again for split adjustment

Split Adjustment for INTC (Step 2.5): A Smart Way



Result Grid | Filter Rows: | Export:

TransDate	OpenPrice	HighPrice	LowPrice	ClosePrice
1999.04.19	57.12	59.00	55.00	55.50
1999.04.16	57.88	58.38	56.45	57.25
1999.04.15	58.50	58.62	56.50	58.44
1999.04.14	61.38	61.50	56.25	57.00
1999.04.13	62.94	63.00	59.81	60.50
1999.04.12	61.62	62.47	60.00	61.25
1999.04.09	132.38	132.69	130.06	130.81
1999.04.08	132.00	133.38	128.44	131.06
1999.04.07	131.44	133.50	128.50	132.12
1999.04.06	126.75	131.19	126.00	130.44
1999.04.05	121.88	127.50	121.75	127.50
1999.04.01	119.94	121.38	118.88	120.88

TransDate	OpenPrice	HighPrice	LowPrice	ClosePrice
1997.07.21	86.19	86.50	84.56	85.69
1997.07.18	86.75	87.62	84.75	86.44
1997.07.17	88.25	89.69	86.12	87.81
1997.07.16	86.38	88.88	84.75	88.38
1997.07.15	80.75	81.94	79.69	80.91
1997.07.14	77.25	78.98	76.75	78.75
1997.07.11	150.50	154.00	149.88	153.81
1997.07.10	152.50	153.50	149.75	150.12
1997.07.09	151.00	154.56	151.00	152.62
1997.07.08	147.81	150.38	146.25	149.62
1997.07.07	145.69	149.00	145.38	147.38
1997.07.03	144.62	145.31	143.00	144.94

Divide by 2 for split adjustment

Divide by 4 for split adjustment

Investment Strategy for INTC (Now Ascending order): Step 2.6 to Forward

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Result Grid | Filter Rows: | Export:

TransDate	OpenPrice	HighPrice	LowPrice	ClosePrice
1985.01.02	28.00	28.25	27.25	27.50
1985.01.03	27.50	28.50	27.50	28.00
1985.01.04	28.00	28.75	28.00	28.50
1985.01.07	28.50	29.25	28.25	29.25
1985.01.08	29.25	29.75	27.75	28.25
1985.01.09	28.25	29.25	27.75	28.75
1985.01.10	28.75	30.25	28.75	30.00
1985.01.11	30.00	30.50	29.75	30.50
1985.01.14	30.50	31.25	29.75	31.00
1985.01.15	31.00	31.75	31.00	31.25
1985.01.16	31.25	32.00	30.75	31.00
1985.01.17	31.00	31.25	29.75	30.50
1985.01.18	30.50	31.25	30.25	31.00
1985.01.21	31.00	31.75	30.75	31.75
1985.01.22	31.75	32.50	31.75	32.00
1985.01.23	32.00	32.00	31.25	31.50
1985.01.24	31.50	32.50	31.00	31.75
1985.01.25	31.75	31.87	31.25	31.75
1985.01.28	31.75	31.75	30.75	30.75
1985.01.29	30.75	31.25	30.25	31.25
1985.01.30	31.25	32.25	31.13	31.25
1985.01.31	31.25	31.50	30.50	30.75

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The Deque Interface in Java

- Pronounced as deck
- A double-ended-queue.
- Implements both stacks and queues at the same time.

Deque Methods		
Type of Operation	**First Element (Beginning of the Deque instance)**	**Last Element (End of the Deque instance)**
Insert	addFirst(e)	addLast(e)
Remove	removeFirst()	removeLast()
Examine	getFirst()	getLast()

Investment Strategy for INTC (Now Ascending order): Step 2.6 to Forward

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Result Grid | Filter Rows: | Export:

TransDate	OpenPrice	HighPrice	LowPrice	ClosePrice
1985.01.02	28.00	28.25	27.25	27.50
1985.01.03	27.50	28.50	27.50	28.00
1985.01.04	28.00	28.75	28.00	28.50
1985.01.07	28.50	29.25	28.25	29.25
1985.01.08	29.25	29.75	27.75	28.25
1985.01.09	28.25	29.25	27.75	28.75
1985.01.10	28.75	30.25	28.75	30.00
1985.01.11	30.00	30.50	29.75	30.50
1985.01.14	30.50	31.25	29.75	31.00
1985.01.15	31.00	31.75	31.00	31.25
1985.01.16	31.25	32.00	30.75	31.00
1985.01.17	31.00	31.25	29.75	30.50
1985.01.18	30.50	31.25	30.25	31.00
1985.01.21	31.00	31.75	30.75	31.75
1985.01.22	31.75	32.50	31.75	32.00
1985.01.23	32.00	32.00	31.25	31.50
1985.01.24	31.50	32.50	31.00	31.75
1985.01.25	31.75	31.87	31.25	31.75
1985.01.28	31.75	31.75	30.75	30.75
1985.01.29	30.75	31.25	30.25	31.25
1985.01.30	31.25	32.25	31.13	31.25
1985.01.31	31.25	31.50	30.50	30.75

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d = Trading day,
d+1 = the next trading day,
d–1 = the prior trading day
close(d) = closing price for day d
open(d) = opening price for day d

Step 2.7

- Maintain a moving average of closing prices over a 50-day window.
- For day d, the 50-day average is the average closing price for the 50 previous trading days (days d-50 to d-1).

Step 2.8

- If less than 51 days of data, no trading
- Net gain of zero
- Repeat from beginning (step 2.1) to get next user input.

Step 2.9

- If more than 51 days of data, compute 50-day average for the first fifty days.
- From day 51 through the second-to-last trading day, execute following strategy (next slide)

Investment Strategy for INTC

Result Grid | Filter Rows: | Export:

TransDate	OpenPrice	HighPrice	LowPrice	ClosePrice
1985.01.02	28.00	28.25	27.25	27.50
1985.01.03	27.50	28.50	27.50	28.00
1985.01.04	28.00	28.75	28.00	28.50
1985.01.07	28.50	29.25	28.25	29.25
1985.01.08	29.25	29.75	27.75	28.25
1985.01.09	28.25	29.25	27.75	28.75
1985.01.10	28.75	30.25	28.75	30.00
1985.01.11	30.00	30.50	29.75	30.50
1985.01.14	30.50	31.25	29.75	31.00
1985.01.15	31.00	31.75	31.00	31.25
1985.01.16	31.25	32.00	30.75	31.00
1985.01.17	31.00	31.25	29.75	30.50
1985.01.18	30.50	31.25	30.25	31.00
1985.01.21	31.00	31.75	30.75	31.75
1985.01.22	31.75	32.50	31.75	32.00
1985.01.23	32.00	32.00	31.25	31.50
1985.01.24	31.50	32.50	31.00	31.75
1985.01.25	31.75	31.87	31.25	31.75
1985.01.28	31.75	31.75	30.75	30.75
1985.01.29	30.75	31.25	30.25	31.25
1985.01.30	31.25	32.25	31.13	31.25
1985.01.31	31.25	31.50	30.50	30.75

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2.9.1 Initially

- cash = 0.0 and number of stock=0;

2.9.2 Buy criterion

- If close(d) < 50-day average and

(close(d) / open(d) <= 0.97)
buy 100 shares of the stock at price open(d+1).

2.9.3 Sell criterion

- If shares >= 100 and

open(d) > 50-day average and
(open(d) / close(d-1) >= 1.01),
sell 100 shares at price (open(d) + close(d))/2.

2.9.4 Transaction Fee

- For either a buy or sell transaction, cash is reduced by a transaction fee of $8.00.

2.9.5 If neither the buy nor the sell criterion is met, do not trade on that day.

2.9.6 Regardless of trading activity, update 50-day average to reflect average over last 50 days, and continue with day d+1.

Investment Strategy for INTC

Result Grid | Filter Rows: | Export:

TransDate	OpenPrice	HighPrice	LowPrice	ClosePrice
1985.01.02	28.00	28.25	27.25	27.50
1985.01.03	27.50	28.50	27.50	28.00
1985.01.04	28.00	28.75	28.00	28.50
1985.01.07	28.50	29.25	28.25	29.25
1985.01.08	29.25	29.75	27.75	28.25
1985.01.09	28.25	29.25	27.75	28.75
1985.01.10	28.75	30.25	28.75	30.00
1985.01.11	30.00	30.50	29.75	30.50
1985.01.14	30.50	31.25	29.75	31.00
1985.01.15	31.00	31.75	31.00	31.25
1985.01.16	31.25	32.00	30.75	31.00
1985.01.17	31.00	31.25	29.75	30.50
1985.01.18	30.50	31.25	30.25	31.00
1985.01.21	31.00	31.75	30.75	31.75
1985.01.22	31.75	32.50	31.75	32.00
1985.01.23	32.00	32.00	31.25	31.50
1985.01.24	31.50	32.50	31.00	31.75
1985.01.25	31.75	31.87	31.25	31.75
1985.01.28	31.75	31.75	30.75	30.75
1985.01.29	30.75	31.25	30.25	31.25
1985.01.30	31.25	32.25	31.13	31.25
1985.01.31	31.25	31.50	30.50	30.75

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Step 2.10
After processing data through second-to-last day, if there are any shares remaining, on the last day add ***open(d) * shares remaining*** to cash to account for the value of those remaining shares (No transaction fee applies to this).

Sample output one more time

```
Database connection jdbc:mysql://127.0.0.1:4321/johnson330 yourusername established.
Enter a ticker symbol [start/end dates]: INTC
Intel Corp.
2:1 split on 2000.07.28  129.12 --> 65.44
2:1 split on 1999.04.09  130.81 --> 61.62
2:1 split on 1997.07.11  153.81 --> 77.25
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6 splits in 7470 trading days

Executing investment strategy
Transactions executed: 690
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```

Transaction executed
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```
Enter ticker symbol [start/end dates]: INTC 1980.01.01 1999.12.31
Intel Corp.
2:1 split on 1999.04.09  130.81 --> 61.62
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2:1 split on 1993.06.04  112.75 --> 60.12
3:2 split on 1987.10.28  31.75 --> 21.75
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Executing investment strategy
Transactions executed: 358
Net cash: 44953.95
```

```
Enter ticker symbol [start/end dates]: T 2000.01.01 2014.08.18
AT&T Inc
0 splits in 3679 trading days

Executing investment strategy

Transactions executed: 148
Net cash: -1568.00
```

The End