

Introduction:

The programme under consideration is intended to read, process, and deliver analytical insights from a CSV dataset. The heart of this information is Moody's yield on seasoned corporate bonds, specifically those of type BAA. Each entry in this collection displays the bond's yield.

Functionality and output:

When the programme runs successfully, it produces two important details:

- The bond yield matching to a date selected by the user.
- The difference between the yield of the specified date and the dataset's overall average yield.

Breakdown of Functions:

Apart from the core main purpose, the architecture of the programme is based on three specialised functions. A brief explanation of each follows:

1) Validation Function - `is_valid_date(string date)`:

The purpose of this function, as the name suggests, is to screen the user's date input.

It guarantees that the inputs are not only in the correct format but also that they are relevant to the dataset. A date between January 1919 and July 2013, in the 'YYYY-MM' format, passes certification. Variations, such as a flipped month-year or an incorrect delimiter, result in a validation failure. By minimising superfluous and unproductive data lookups, proper validation assures optimal utilisation of computation cycles.

2) Average Calculation - `average(vector<double> v)`:

The goal of this function is to compute the mean yield from the full dataset.

It computes the sum of the yields using the `accumulate()` method from the `<numeric>` library. Following summarization, this aggregate value is divided by the size of the dataset to obtain the average.

3) Yield Retrieval - `find_rate(vector<double> rate_vec, vector<string> date_vec, string date)`:

The primary goal of this function is to locate and retrieve the bond yield for a certain date.

Functionality: A contemporary programming method is used here. To traverse the `date_vec`, the function uses a range-based for loop, a feature introduced in C++11. The `auto` keyword is used to allow the compiler to deduce the type of the iterator. Once the target date has been determined, its index is used to retrieve the associated yield from the `rate_vec`.

Main Execution:

The `main()` function is the program's command and control centre:

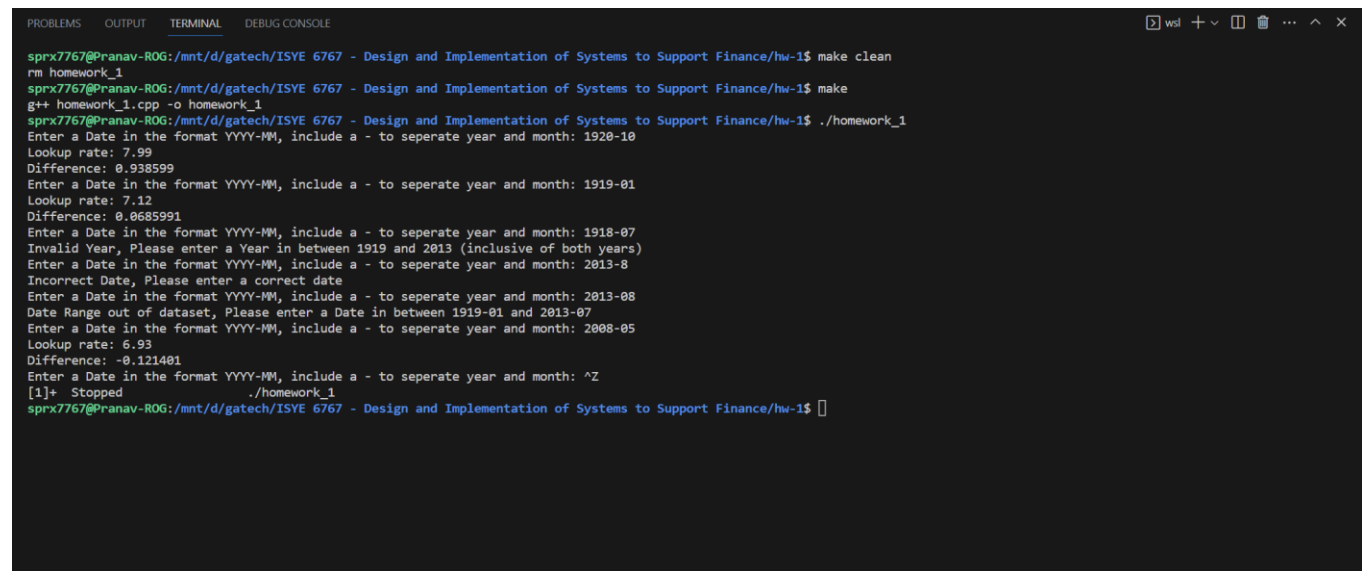
Initialization: It reads and loads the CSV data into system memory at first. The first six rows, which are mostly header and metadata, are omitted because they do not contribute to the primary computations.

User Interaction Loop: The function then begins a continuous loop, where it awaits the user's date input. The date is validated for each input. If the condition is met, the programme retrieves the bond's yield for that date, computes the average, and returns the yield as well as its departure from the average.

Termination: This interaction continues until an EOF command (such as Ctrl + D or its OS-specific equivalent) is received, indicating that the program should be terminated.

Result

The program works as expected and covers all the edge cases, here is a screenshot that depicts the program's output with various inputs.



```
sprx7767@Pranav-RDG:/mnt/d/gatech/ISYE 6767 - Design and Implementation of Systems to Support Finance/hw-1$ make clean
rm homework_1
sprx7767@Pranav-RDG:/mnt/d/gatech/ISYE 6767 - Design and Implementation of Systems to Support Finance/hw-1$ make
g++ homework_1.cpp -o homework_1
sprx7767@Pranav-RDG:/mnt/d/gatech/ISYE 6767 - Design and Implementation of Systems to Support Finance/hw-1$ ./homework_1
Enter a Date in the format YYYY-MM, include a - to seperate year and month: 1920-10
Lookup rate: 7.99
Difference: 0.938599
Enter a Date in the format YYYY-MM, include a - to seperate year and month: 1919-01
Lookup rate: 7.12
Difference: 0.0685991
Enter a Date in the format YYYY-MM, include a - to seperate year and month: 1918-07
Invalid Year, Please enter a Year in between 1919 and 2013 (inclusive of both years)
Enter a Date in the format YYYY-MM, include a - to seperate year and month: 2013-8
Incorrect Date, Please enter a correct date
Enter a Date in the format YYYY-MM, include a - to seperate year and month: 2013-08
Date Range out of dataset, Please enter a Date in between 1919-01 and 2013-07
Enter a Date in the format YYYY-MM, include a - to seperate year and month: 2008-05
Lookup rate: 6.93
Difference: -0.121401
Enter a Date in the format YYYY-MM, include a - to seperate year and month: ^Z
[1]+  Stopped                  ./homework_1
sprx7767@Pranav-RDG:/mnt/d/gatech/ISYE 6767 - Design and Implementation of Systems to Support Finance/hw-1$
```