Momentum Trading

Fall 2022

The goal of this assignment is to calculate returns on a long-short momentum portfolio, using monthly data retrieved from the CRSP database. Before diving in with the full CRSP data, you may want to test your code on **testData.csv**. The smaller data set will help you fail faster through trial and error.

THE RECIPE

Vanilla Momentum

1. Calculate for each stock i in month t its $momentum_{i,t} = \frac{P_{i,t-1}}{P_{i,t-12}}$, i.e. the cumulative gross return from the end of month $t - 12$ to the end of month $t - 1$.

2. For each month t, find the historical winners (stocks in top momentum decile) and losers (stocks in bottom momentum decile)

3. Using equal weights, calculate returns from investing \$1 in the winners and shorting \$1 on the losers.

Note that returns are calculated as $r_{i,t} = \frac{P_{i,t}+d_{i,t}}{P_{i,t-1}} - 1$ and that the portfolio return is $r_{p,t} = \sum_i w_{i,t} \cdot r_{i,t}$. The weights $w_{i,t}$ need to be known as of time $t - 1$ (e.g. February portfolio weights are used to invest from the end of January to the end of Februrary). When building and backtesting strategies, be careful your $w_{i,t}$ does not accidentally use any "future" information.

1 – IMPORT DATA

Import **crsp20042008.csv** with the **readtable( )** function.

2 – ADD DATENUM, YEAR, AND MONTH

Before using the data, we will convert the **crsp.DateOfObservation** into a more MATLAB friendly variable type.

From the **crsp.DateOfObservation**, add three new variables to your table **crsp**:

crsp.datenum : The current date, stored as a datenum variable

crsp.year : The current year

crsp.month : The current month

Note: Since DateOfObservation contains numbers, you may need **num2str()** to convert numbers to strings, and **datenum(string,'yyyymmdd')** to convert strings to datenums. The **year( )** and **month( )** functions return the year and month of a datenum variable.

3 – WRITE FUNCTION FOR MOMENTUM

Write a function that takes as input

thisPermno : Stock identifier

thisYear : The current year

thisMonth : The current month

crsp : Table with variables **PERMNO**, **year**, **month**, and **adjustedPrice**

and returns the 11-month cumulative return for **thisPermno**.

For example, if **thisPermno==10001**, **thisYear==2008**, and **thisMonth==01**, then **getMomentum(thisPermno,thisYear,thisMonth,crsp)** should return the cumulative gross return from the end of January 2007 to the end of December 2007.

When the required data is missing from **crsp**, your function should return **NaN** instead.

Note that when you try to retrieve data from a table, with a condition that is never met, the result is an empty vector.

For example, when **missingData.m** tries to retrieve stock prices from before 1800, the **isempty( )** function checks that **thisPrice** is empty and returns '**true**'.

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missingData.m

```
1  %Get prices before 1800
2  thisPrice=crsp.adjustedPrice(crsp.year<=1800);
3
4  %Check if anything was retrieved from crsp
5  isempty(thisPrice);
```

4 – CALCULATE MOMENTUM

Construct a new variable **crsp.momentum** using the **NaN(n,k)** function and use **getMomentum( )** to calculate momentum for each stock and month in a for-loop.

5 – CALCULATE MOMENTUM RETURNS

Create a new table **momentum** by retrieving the list of unique dates that appeared in **crsp.DateOfObservation**. Add the variables **momentum.year** and **momentum.month** the same way you did in step 2.

Construct the equal weighted momentum returns by adding

momentum.mom1 : Equal weighted return on the stock in the bottom momentum decile (loser portfolio)

momentum.mom10 : Equal weighted return on the stock in the bottom momentum decile (winner portfolio)

momentum.mom : Long winner short loser returns (**momentum.mom10 - momentum.mom1**)

Note:

- **quantile(x,N)** returns N cut-offs that evenly separates the x vector into $N+1$ buckets. For example, $quantile([1, 3, 2, 5, 4, 6], 2)$ returns the vector $[2.5, 4.5]$.

- You can subset a table with conditions. For example, **crsp.Returns(crsp.year==2005 & crsp.month==12 & crsp.momentum>=2)** will give you the returns of the stocks that, as of December 2005, have at least doubled in value during the 11 preceding months.

- The **mean(x)** function returns the average of values found in the vector **x**, and is useful in finding equal weighted returns.

6 – CALCULATE CUMULATIVE RETURNS

Add **momentum.cumulativeRet**, the cumulative net return on the long-short momentum portfolio. Treat missing (**NaN**) returns as 0. For example, for the returns **[NaN;.1;.1]**, the cumulative returns would be **[0;.1;.21]**.