STOCKHOLM UNIVERSITY
Dept of Mathematics
Div if Mathematical Statistics
Advanced Finance Mathematics
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COMPUTER ASSIGNMENT 2

A Trading Strategy that performs better than Index?

You shall trade by moving money between a cash account and the OMXS30 Index. You are going to buy the index when it turns up and sell it when it turns down. See Task 2 below for details.

Data
Data consist of INDEX_OMXS30 and RATE_STIBOR. The first contains the closing prices from the 5863 trading days from September 30, 1986 to February 10, 2010. (Note that the dividends are not included in this index, and hence that the stock market has performed a few percent better per year.) The second file represents the short rate, it contains data from the same period (except the last day). You are assumed to trade at the end of the day, and the interest rate you "buy" one day will be valid until the end of the next day. (To be exact: The interest rate is the STIBOR 1 month with some gaps filled in with approximate values, and it is compounded only during trading days. The unit is % per year. One year=250 days.)

Task 1
Plot the development of $Index$ and $Cash$ during the period (in the same plot). Here $Index$ is the development of 1 EUR invested the first day in the Index, and $Cash$ is the development of 1 EUR invested the first day in the cash account.

Transaction costs These are important at least if you trade frequently. To begin with we shall assume that these are 2% each time you trade (buy or sell the index). Note that the trading costs do not only consist of courtage and spread, but also the cost that delay may cause.

Task 2
Here you shall use the development of the present value of the Index;

$$PVI(i) = Index(i)/Cash(i),\ i = 1, ..., 5863.$$

Let $x > 0$ be a positive number, and let $l1$ and $l2$ be integers such that $1 \leq l1 < l2 \leq l$. Here $l = 5863$ is the length of the entire period. Write a program that calculates the development of the present value of one euro invested in the following trading strategy:

Start at day $l1$ with your euro in the cash account. Keep it there as long as

$$PVI(i) < (1+x) \min_{last \leq j < i} PVI(j),$$

where $last$ is the day when the last trade occurred. (In this case $last = l1$.) Buy the index for all your money the first day this inequality is violated. Then wait until the inequality

$$PVI(i) > \max_{last \leq j < i} PVI(j)/(1+x)$$

is violated for the first time. At that day you sell your entire holding in the index. Then wait until the inequality

$$PVI(i) < (1+x) \min_{last \leq j < i} PVI(j)$$

is violated for the first time. And so on. Stop when $i = l2$, and don't forget the transaction costs.

You are also supposed to plot the developments of

(a) your trading strategy, and

(b) one euro invested in the index at the beginning of this period.

Use present values.

Task 3 Assume that today is day $l/2$, the middle of the period. Try to find an optimal x only using data from the past. Here is a first attempt: Determine the x that maximizes the portfolio value at $l2$ in the case $l1 = 1$, $l2 = l/2$. Search in the interval 1% to 50%. Note that there can be several local maxima. Then check if this value works fairly well under the two sub periods $[1 : l/4]$ and $[l/4 : l/2]$. If not, try to find a value of x that you think will perform better.

Apply your optimal x to the future. That is, the second half of the entire period; $[l/2 : l]$. Plot the developments of (the present values) of your trading strategy and the index during this period.

What happens if you have been too optimistic about the trading costs? Will this spoil the strategy?

Task 4 Conclusions or reflections. Just a few words.