上海交通大學

SHANGHAI JIAO TONG UNIVERSITY

THE REPORT FOR THE TEAM PROJECT OF BUSSINESS COMPUTING

TITLE: Beta Coefficient Calculation

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Report of team project

1.Description

Our team named “iloveby” aimed to calculate the Beta coefficient of a stock to indicate whether the stock is more or less volatile than the market as a whole and offer the clients suggestions on investment.

2.Background

2.1 Definition of beta

In finance, the beta (β or beta coefficient) of a stock indicates whether the stock is more or less volatile than the market as a whole. In other words, Beta is a measure of the risk arising from exposure to general market movements as opposed to idiosyncratic factors. The market portfolio of all investable assets has a beta of exactly 1. A beta below 1 can indicate either an investment with lower volatility than the market. A beta greater than 1 generally means that the asset both is volatile and tends to move up and down with the market.

2.2 Beta’s formula

$$\beta = \frac{\text{Covariance of Market Return with Stock Return}}{\text{Variance of Market Return}}$$

$$\beta = \frac{\text{Correlation Coefficient}}{\text{Between Market and Stock}} \times \frac{\text{Standard Deviation of Stock Returns}}{\text{Standard Deviation of Market Returns}}$$

2.3 The value of beta

Value of Beta	Interpretation	Example
$\beta < 0$	Asset movement is in the opposite direction of the benchmark	An inverse exchange-traded fund or a short position
$\beta = 0$	Asset movement is uncorrelated to the benchmark	Fixed-yield asset, whose growth is unrelated to the movement of the stock market
$0 < \beta < 1$	Asset moves in the same direction, but in a lesser amount than the benchmark	Stable, "staple" stock such as a company that makes soap. Moves in the same direction as the market at large, but less susceptible to day-to-day fluctuation.
$\beta = 1$	Asset moves in the same direction and in the same amount as the benchmark	A representative stock, or a stock that is a strong contributor to the index itself.
$\beta > 1$	Asset moves in the same direction, but in a greater amount than the benchmark	Stocks which are very strongly influenced by day-to-day market news, or by the general health of the economy.

3.The python program

3.1 Data collection

The daily closing price of all individual shares and market index in the past two years can be found from the CSMAR database. We choose to process the data in a CSV file. We need both of their weekly return on equity to calculate the beta. Because a day is too short and a month is too long, to narrow the error, we use systematic sampling to

filter every fifth data after a random start (e.g.: day1, day6, day11, day16……)， and then calculate the return on equity.

There are four columns of data in the CSV file.

3.2 process

3.2.1 preparation

First, we import the packages for the following calculations.

3.2.2 read, filtrate and process the data

Then we use CSV to import the data, the situation of the market and the price of the stock we will analyze over a relatively long period of time. Then we use the program to read, filtrate and process the data for subsequent use.

3.2.3 function

we program the function of calculation procedure by adopting different market and processing the data to obtain the beta coefficient of the stock and a series of relevant indexes which reflect the risk of the stock.

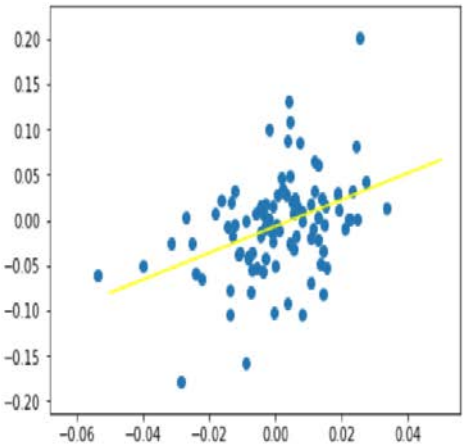
3.3 Result

The users only need to follow the program's instruction to input the stock code. Then about a minutes later, they can get the beta on the scatter diagram. Each point represents a date, plotted by the market's rate of return in that week on the horizontal axis and the rate of return of the individual stock we analyze on the vertical. The slope of the linear fitting equation is the beta.

According to the relationship between beta and 1or 0. Our program will also affix instructions of the extent of the risk of the stock and offer the clients suggestions on investment.

Just as follows:

```
Please input the stock code: 10
beta = 1.4696414284519999
The stock moves in the same direction, but in a greater amount than the benchmark, involving more systematic risk than the overall market.
Suggestion: Pay close attention to day-to-day market news or the general health of the economy.
```



4.Problems in programming

4.1 unable to use crawler

Since we are unable to use crawler, we just can use offline data which can’t be updated. Due to this problem, the accuracy of the program may be affected.

4.2 the process of data

Stocks sometimes may be suspended, therefore, they may not match the data of stock market, while it’s too troublesome to deal with it manually.

5.Advantages of the program

5.1 the accuracy and sufficiency of data

Since we use the daily closing price of all individual shares and market index in the past two years which can be found from the CSMAR database. Owing to the accuracy and sufficiency of data, the correctness of beta coefficient of a stock can be substantially guaranteed.

5.2 the use of scatter diagram

On the scatter diagram, each point represents a date, plotted by the market’s rate of return in that week on the horizontal axis and the rate of return of the individual stock we analyze on the vertical. The slope of the linear fitting equation is the beta. Because our group focus on data of a successive duration, the scatter diagram is able to reflect the approximate trend of beta coefficient, predicting whether the stock will be more or less volatile than the market.

6.Disdvantages of the program

6.1 unable to update data

Since we are unable to use crawler, we just can use offline data from June 8 in 2016 to June 6 in 2018 which can’t be updated. Because the beta coefficient is changing, the accuracy of the program may be affected.

6.2 the limited number of stock

So far, our group has only completed a limited quantity of stocks, so not beta coefficient of all stocks can be acquired from our program.

6.3 long operation time

Since the process of dealing with all the data and charting is complex, it takes about one minute to obtain the result.

6.4 unable to compare different stocks

The user is only allowed to acquire beta coefficient of one stock at one time, which means the user can’t compare the beta coefficient of different stocks.

7.Conclusion

After we successfully ran the program for the first time, we found an unavoidable deficiency is that it takes quite a long time to finish the running process and compute the result. Apart from that, it’s complex to import all the data and update it. Nevertheless, it’s reasonable to encounter such problems in our first project. To be frank, it’s just a primitive version of the calculation of the Beta coefficient and we’ll improve it according to the actual usage and suggestions from users in the future.