Calculate the FV of the instruments by simple interest (rank in descending order, identify suspected errors in data and offer remediation actions)

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1 Introduction

The topic of our research project is to calculate the future value of the investor as a result of investing money under a certain interest rate in the bank (on deposit).Note that the key bank rate changes regularly depending on many factors, such as the nature of inflation. Therefore, we pay attention to the website of the Central Bank of the Russian Federation (we will consider investors in Russia) showing changes in the interest rate over several years interest rate of bank.

2 Some additions and how did we create our Dataset

2.1 Addition

We decided to expand the research model. Let's remember that investors always have a choice: either put their current capital on a deposit at a bank interest or invest in some kind of business

2.2 Dataset

We have created a dataset that reflects the following information. Investors, their current capital (present value). Each investor has two options (as we have already said, invest in a business or put money on deposit), in both cases we consider a period of four years. In each period, we displayed the bank interest rate and the business growth rate (note that these change every year). We randomized the bank rate in the range stated on our attached central bank website (2019-2023).

In the case of a business, the outcomes can be unpredictable. Let us immediately note that in order for the experiment to be fair, we do not consider unsuccessful businesses (it is logical that an investor will not invest in a "fading" business). Therefore, we will consider two types of business: a business that is at the initial stage, so it is unprofitable, and a developed business in which we make a profit from the first year. Consequently, we randomized the business rate range so that it could be either negative or positive in the first two years. Further, based on our research, it is only positive.

Next, using the simple interest formula, we calculated the future values of investors after each year, in the case of investing money on a deposit or in a business. We attach a formula for calculating the future value using simple interest.

$$P_i = P * (1 + \frac{n}{100} * r)$$

Where P_i - future value, n - interest rate, r - number of years. Here you can see our dataset:

2.3 Total win

We decided to add a new parameter - total win (a column in our dataset), which shows how much percent the investor earned or lost from the invested money by choosing to invest the money in a deposit rather than in a business

3 Analytical part

3.1 Correlation matrix

To analyze the correlation matrix, we removed all business-related columns from our dataset, that is, we are only considering the possibility of investing money in a bank at a simple interest rate.

Obviously, along the diagonal the correlation coefficient is approximately equal to **1**, because it shows the relationship between the indicators and themselves. In all other cases, the relationship between the parameters is insignificant (**0-0.03**), that is, the indicators are practically independent of each other (it is clear that the bank's rate and the amount of money that the investor has are not interrelated in any way).

Please note that the relationship between total deposit profit and the interest rate in each year has a correlation coefficient of **0.5**, which means a moderate positive relationship, which is explained by the fact that the higher the key rate in the bank, the more the investor will earn. Note that the correlation coefficient is equal to **1** in cases where the intermediate capital of investors is compared with its initial capital (after all, the intermediate capital is made up of the initial capital plus the rate multiplied by the previous intermediate capital)

3.2 Graph analytics

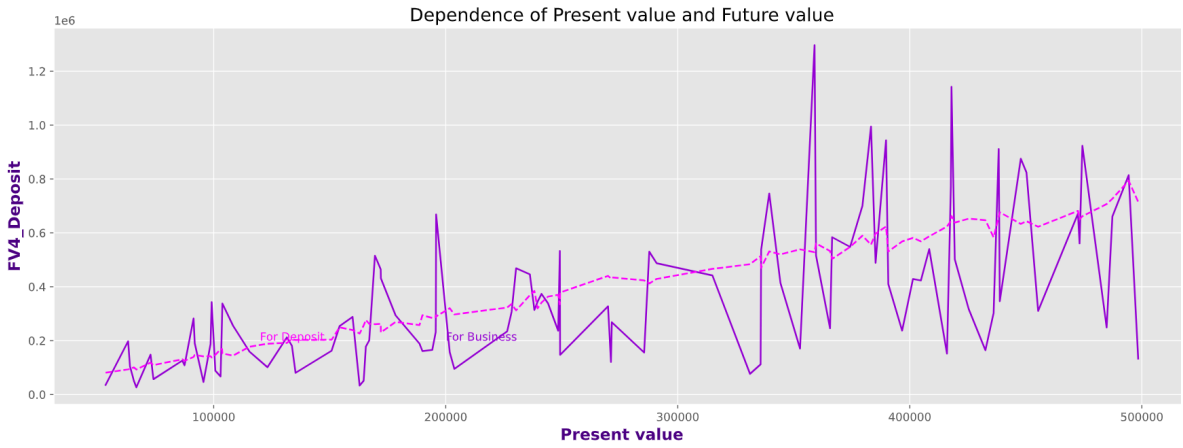

Figure 1: Dependence of Present value and Future value

1. Here is a graph of the relationship between the future value and the present value of the investor. We can observe the following trend on it: in the case of business, the graph is discontinuous, and in the case of a deposit it is close to linear. We can mention, if our investor is a risk-phobe, then even if, if he invests money in a business, he will most likely be able to get a big profit, he will still choose the option with a deposit, because over a longer period of time this method of receiving money is less risky. Such a person gives preference to stability over profitability. If an investor is a risk-taker, he will choose the opportunity to get "quick money", that is, he will invest money in a business.

   As a result, we can say that in the case of investing money on a deposit, there is a direct relationship between the present value and the future value (the larger the amount we put on deposit, the more money we will ultimately receive). In the case of investing money in a business, we do not have a guarantee of making a profit, due to investing a large amount of money, we can both repeatedly increase our profit and completely lose our initial capital

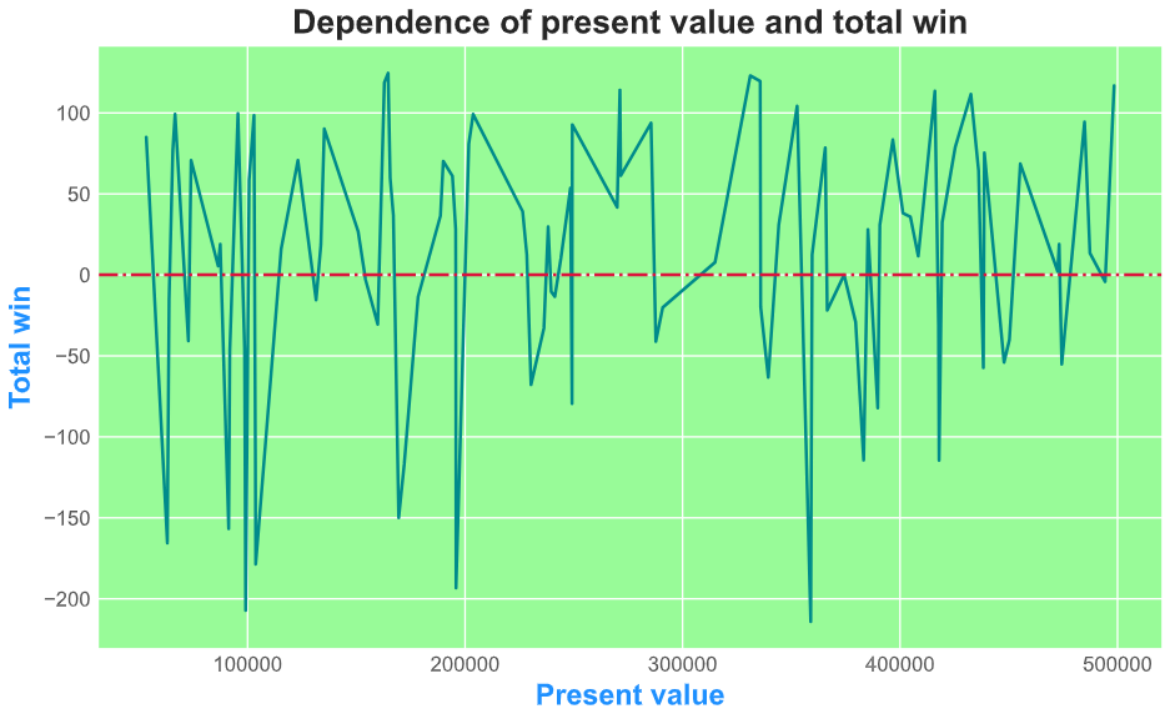

Figure 2: Dependence of Present value and total win

2. The following graph shows the percentage of winnings from putting money on deposit, in preference to the possibility of investing in a business. You can notice that, based on the parameters we have specified, in most cases the deposit is in a more advantageous position (It often brings more profit than the business). However, if the business turns out to be more profitable, then the profit from it is noticeably higher than any profitability from the deposit.