RESARCH ASSISTANT ROLE-CRYPTO

TASKS

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COMPUTER SCIENCE

WHY IT IS A BAD IDEA TO USE RECURSION METHOD FOR FIND THE FIBONACCI OF A NUMBER

When you call your function again itself (as recursion) the compiler allocates **new Activation Record** (Just think of it as an ordinary Stack) for that new function. That stack is used to keep your states, variables, and addresses. A Compiler creates a stack for each function and this creation process continues until the base case is reached.
So, when the data size becomes larger, the **compiler** will need large stack segment to calculate the whole process. Calculating and managing those Records is also counted during this process. This increases the time it takes to run; hence it is **really** slow.
Also, in recursion, the stack segment is being **raised during run-time**. Compiler does not know **how much memory will be occupied during compile time**. The reason for the poor performance is heavy push-pop of the stack memory in each recursive call.

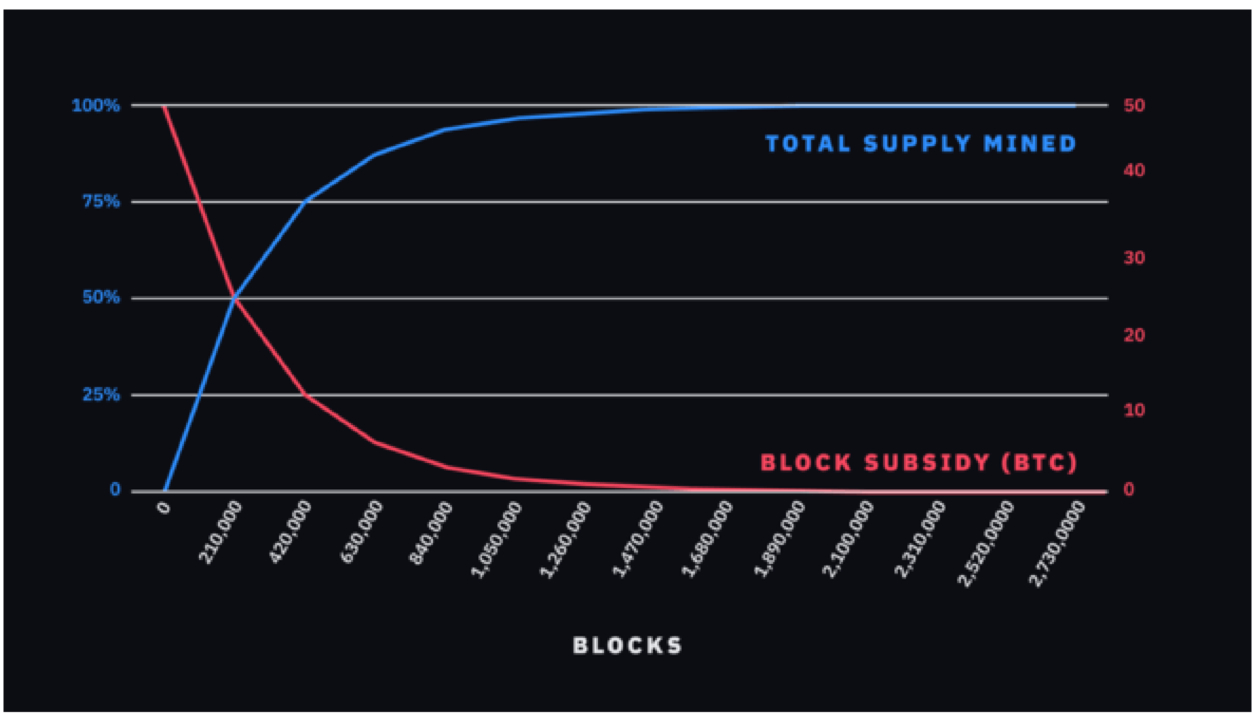
It is important to note that If we use recursion to find the Fibonacci, we will end up “overlapping” and thus, take additional time and computing power. With very large inputs, the program will not finish (or at least in a reasonable time assuming you have places to be). The operation using recursion is far too expensive.

FINANCE

Bitcoin and the Stock to Flow Model

In simple terms, the Stock to Flow (SF or S2F) model is a way to measure the abundance of a particular resource. The Stock to Flow ratio is the amount of a resource held in reserves divided by the amount it is produced annually. The Stock to Flow model is generally applied to natural resources. This same logic applies to bitcoin, which becomes more valuable as new supply is reduced every four years, ultimately culminating in a supply of 21 million bitcoin.

Gold and silver are often called *store of value* resources. They, in theory, should retain their value over the long term due to relative scarcity and low flow. It is very difficult to significantly increase their supply within a short period of time.



BTC Total Supply Mined (%) and Block Subsidy (BTC).

This premise is then translated into the hypothesis, "…that scarcity, as measured by SF, directly drives value." PlanB then plots bitcoin's SF against USD market capitalization as well as two arbitrarily chosen SF data points for gold and silver.

PlanB then runs a linear regression using the natural logarithm of bitcoin's SF metric as the independent variable and the USD market capitalization as the dependent variable. The paper ends with the conclusion that there is a statistically significant relationship between USD market capitalization and SF values, as evidenced by the linear regression resulting in an R2 (a statistical measure of how close the data fits to a regression line) of ~0.95. The two randomly chosen data points for gold and silver are in line with bitcoin's trajectory and presented as further evidence of the hypothesis.

Problems with the Stock to Flow Method

There are deficiencies with the paper. First, the model is based on the rather strong assertion that USD market capitalization of a monetary good (e.g. gold and silver) is derived directly from their rate of new supply. No evidence or research is provided to support this idea, other than the singular data points selected to chart gold and silver's market capitalization against bitcoin's trajectory.

This becomes quite obvious when one extends the model into the near future. By 2045, the model estimates each Bitcoin will be worth $235,000,000,000.

The second is the naïve application of a linear regression that results in a high probability of a researcher finding spurious results. "Good" statistical results, such as a high R-square, do not constitute a meaningful finding. It is common to underestimate how often such techniques lead to false results; particularly in this situation, where there is a large degree of freedom for random data to fit a specific outcome.

This assumes that increasing new supply depresses price through increased selling pressure from producers and vice versa.

We are left with a hypothesis that applies to no economic assets except bitcoin and whose only evidence is a linear regression with questionable application and clear selection bias. It is important to note that past results are not representative of future returns.

BLACK-SCHOLES PRICE CALCULATION

a. What are S and B? S = 40 (the current stock price as given), and B = 45 exp(−.03(1/3)) ≈ 44.55224. Note that 1/3 is the time to maturity 4/12 months.

b. What are x1 and x2?

$$x_1 = \frac{\log\left(\frac{S}{B}\right)}{\sigma\sqrt{T}} + \frac{1}{2}\sigma\sqrt{T}$$

$$= \frac{\log\left(\frac{S}{B}\right)}{4\sqrt{1}/3} + \frac{1}{2}.4\sqrt{1}/3$$

$$\approx -0.3512442$$

$$x_2 = \frac{\log\left(\frac{S}{B}\right)}{\sigma\sqrt{T}} + \frac{1}{2}\sigma\sqrt{T}$$

$$= \frac{\log\left(\frac{S}{B}\right)}{4\sqrt{1}/3} + \frac{1}{2}.4\sqrt{1}/3$$

$$\approx -0.5821843$$

c. $N(x_1)$ = 0.3627026 and $N(x_2)$ = 0.2802213

What is the Black-Scholes call price?

C = SN(x1) − BN(x2) ≈ 40 × 0.3627026 − 44.55224 × 0.2802213 ≈ 2.023617

MATHEMATICS

$y1 = \sqrt{(x+6)^2 + 25}$ = distance of P (-6, 5) to (x, 0) on the X- axis.

= also distance of P'(-6, -5) to (x, 0) on the X- axis.

$y2 = \sqrt{(x-6)^2 + 121}$ = Distance of Q (6, 11) to (x, 0) on the X- axis.

= also distance of Q'(6, -11) to (x, 0) on the X- axis.

PQ' : $(y + 11) = -(16/12)(x - 6) = -(4/3)(x-6) \implies$ ***$3y + 4x = -9$***.

P'Q: $(y - 11) = (16/12)(x - 6) = (4/3)(x-6) \implies$ ***$3y - 4x = 9$.***

Intersection ***(-9/4, 0)***.

Minimum $y = \sqrt{(-9/4+6)^2 + 25} + \sqrt{(-9/4-6)^2 + 121} = 20$

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