COCO white paper

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Abstract

一些经济学理论背景

一班人合作创造一件 product，这件商品的 **价格** 是由 **市场** 决定的。这个思想可以追溯到 Adam Smith 在 1776 年 提出的 **自由市场** 理论，亦即是经济学里最基础的理论。而自由市场这一思想，甚至可以说 符合了 后来 Charles Darwin 在 1859 年 提出的 生物的 **进化论**。COCO 假设自由市场的基本条件成立。

在 1859-60's，Karl Marx 发表了《资本论》，其中提出了 著名的 **剩馀价值理论**，认为 商品 的价值是投入的 **资本** 和 **劳动力** 的某个 **函数**。这个假设现在受到很大质疑，因为 价值 和投入的 劳动力 之间，可以有非常复杂而非线性的关系。

股份公司 的概念是资本主义最伟大的发明之一。**公司** (company) 制造 product，product 的价格由外面的市场决定，但合作者在公司内的 **股份** (shares) 是可以由公司内部决定的。后者就是 COCO 企图解决的问题，或许可以做到比现有方法更好。

实名 vs 匿名

Free-riders 的问题

按道理，那些不作为的 founders，其股份应该下跌。但怎样分辨 懒惰的 free-riders 和 要求较高的 founders?

其中一个解决的可能是：当 founders 们意见不合时可以 **分叉** (branching)，....

分叉的意义是：保留两种可能。

1. branch A accepts new contrib X
   (a) X is a good contrib
   (b) X is a bad contrib
2. branch B rejects new contrib X
   (a) X is a good contrib
   (b) X is a bad contrib

在 (1b) 和 (2a) 的情况下，branch 1 和 branch 2 分别应该受到惩罚。

很明显，应该有 users 能判断哪个是 better branch，但实际上可能出现 branching 太多的问题，还有 users 不能分辨有没有渗入 free-riders 的分支。

但如果所有 votes 是公开的，则在统计上，始终会是较好的 branch 胜出。

Collective bidding scheme

Assume that **initially**, $A, B, ...$ shares the company by the ratio $A : B : ...$. The new-comer X wants to join.

We use the same symbol A to denote the user as well as the “value” (**equity**) she owns in the company.

Before bidding, the fraction $\frac{A}{A+B+...}$ is the % shares of A in the company $A + B + ...$.

In practice, the equity values cannot be known internally, we can only measure their % percentage shares. In other words, we always have the normalization

$$A + B + ... = 1 \tag{1}$$

and the quantities $A, B, ...$ are regarded as percentages.

The actual equity-value of these shares is **market-determined**. This is how the traditional stock market works.

Scenario 1: New-comer X offers a contrib and bids (suggests) a share amount

Each prior member (A, B, ...) would respond with the % percentage shares she thinks X may own. This respond is denoted $\sigma_i \in [0, 1] = 0\%...100\%$ where i is the **member index** ($A, B, ...$ etc).

The amount of shares X will get is given by:

$$\frac{X}{A + B + ...} = \sigma_A(\frac{A}{A + B + ...}) + \sigma_B(\frac{B}{A + B + ...}) + ... \tag{2}$$

In other words, it is the **weighted-average** of assigned shares.

Q: if A refuses X’s contrib, ie, $\sigma_A = 0$, would A’s original shares be **diluted**? Under the current scheme, the answer is yes, but the dilution may be reasonable / acceptable.

Scenario 2: Prior member offers a job with a share amount

In this case, all prior members need to collectively decide if the new-comer has accomplished the task, which is a **binary** decision ("yes" or "no").

After-bidding shares adjustment

After bidding, prior members' shares must decrease to create X's new shares.

The shares assigned to X is given by (2). So the prior members must split the **remaining** shares among themselves:

$$\boxed{\text{remainder}} \quad r = 1 - X/\mathcal{E} \tag{3}$$

where we used the shorthand $\mathcal{E} = A + B + ...$, *ie*, the normalization factor.

Each prior member's shares can be renewed via this formula:

$$A = r \cdot \frac{\sigma_B + \sigma_C + ...}{\sum \sigma_i} \tag{4}$$