COCO white paper

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Abstract

- A company's **stock prices** are determined externally by the free-market ("invisible hand")
- How the company distributes its **shares** are decided internally; This is where COCO tries to innovate.

Real-name vs anonymity

The problem of free-riders

In principle, if a founder hoards shares without performing useful work, his shares in the company should be reduced. But how could we distinguish between lazy free-riders and someone who has high standards for other people's work?

A possible solution is via **branching** when founders disagree with each other.

The essence of branching is: to preserve both options in a disagreement.

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

In cases (1b) and (2a), branch 1 and 2 should be penalized respectively.

Obviously, there should be users who can determine which branches are better, but in practice there may be too many branches to consider. Users may be unable to tell which branches are contaminated with free-riders.

However, if all votes are openly visible, then statistically we may believe that good branches will win out eventually.

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 <u>cannot be known internally</u>, 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:

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