Smart Contracts and External Financing by Katrin Tinn

Discussion by Jean Charles Rochet (SFI@Geneva University)

Prepared for the Banque de France TSE Conference

Paris 12 November 2018

The paper in a nutshell

How blockchain could change the borrower lender-relationship.

Fintech improves access to external financing by making information collection easier.

The paper argues that blockchain technology can go much further by using **smart contracts** that can adjust repayments based on past performance certified by timestamps.

Has blockchain made debt and equity obsolete?

The model

Take Holmström Tirole external financing model under moral hazard (btw you should cite it: you even use their peculiar notation)

- Repeat it T times as in DeMarzo- Fishman(2007) and Biais et al.(2007).
- Extend it by assuming that probability of success depends on past performance: either Success Raises Prospects (SRP) or the contrary (SLP)
- Assume effort always optimal in the Second Best Optimum
- Optimal contract minimizes expected informational rent of borrower under incentive compatibility and limited liability constraints

Main Results

Optimal contract is such that borrower gets a share of successive cash flows according to past performance.

Thus traditional debt (payment to lender is constant) or equity contracts (shares are constant) are not optimal.

In the SLP environment, the project can be 100% externally financed.

In the SRP environment, some self finance is needed but it is smaller if all sales are observed.

My Comments

The paper is very interesting but:

1. You do not need to impose a participation constraint for the borrower.
2. Assuming a zero probability of success when effort is not exerted is very peculiar: this is the main reason why you can sometimes implement the first best.
3. The modelling of future potential sales is strange.

Comment 1 (focused on the two date case)

Why do you impose a participation constraint for the borrower?

- You assume that total surplus is positive:

$$S = \mathbb{E}[s_1 + s_2] - e_0 - e_1 - \mathrm{I} > 0.$$

- You assume that lenders are competitive:

$$I - A_0 = \mathbb{E}[s_1 + s_2] - \mathbb{E}[w]$$

Therefore, if the project is financed, the borrower gets the whole surplus:

$$U_B = \mathbb{E}[w] - e_0 - e_1 - A_0 = S > 0$$

No need to require $\mathbb{E}[w] - e_0 - e_1 \geq 0$ or assume lexicographic preferences(!)

Comment 1 (continued)

The optimal contract is obtained by minimizing the (net) informational rent of the borrower

$$R = \mathbb{E}[w] - e_0 - e_1$$

under incentive compatibility and limited liability constraints.

The important question is whether the project will always be financed, which is equivalent to

$$A_0 = R - S \leq 0$$

Comment 2 (focused on the static problem)

In the static case, the informational rent of the borrower in the optimal contract

$$R = \frac{e.p(1|effort)}{p(1|effort) - p(1|no\ effort)} - \mathrm{e}$$

Thus if $p(1|no\ effort)$=0, this rent is zero! This is no true in general.

I suspect that your result that the first best can sometimes be implemented is not true if you relax this assumption.

Comment 3

You assume that the probability of future potential sales (say s_2 at date 2) $p(s_1, s_2)$ depends on past **potential** sales (here s_1).

I would find more natural to assume that they depend on past **realized** sales $p(\hat{s}_1, s_2)$, because potential sales are not observed!

Then the borrower's effort today would have an impact on the probability of his future sales.

The program you solve

$$\min \mathbb{E}\left[\tilde{w}\left(s_1, s_2\right)\right]$$

$$\mathbb{E}\left[\tilde{w}\left(s_1, s_2\right)\right] \geq e_0 + e_1$$

$$\mathbb{E}\left[\tilde{w}\left(s_1, s_2\right) - \tilde{w}\left(0, s_2\right)\right] \geq e_0$$

$$\mathbb{E}\left[\tilde{w}\left(0, s_2\right) - \tilde{w}\left(0, 0\right) | s_1 = 0\right] \geq e_1$$

$$\mathbb{E}\left[\tilde{w}\left(1, s_2\right) - \tilde{w}\left(1, 0\right) | s_1 = 1\right] \geq e_1$$

The problem I would solve

$$\min \mathbb{E}\left[\tilde{w}\left(s_1, s_2\right)\right]$$

$$\mathbb{E}[\tilde{w}(s_1, s_2)] - \mathbb{E}[\tilde{w}(0, s_2)|\hat{s}_1 = 0] \geq e_0$$

$$\mathbb{E}[\tilde{w}(0, s_2)] - \mathbb{E}[\tilde{w}(0,0\ )|\hat{s}_1 = 0] \geq e_1$$

$$\mathbb{E}[\tilde{w}(1, s_2)] - \mathbb{E}[\tilde{w}(0, s_2)|\hat{s}_1 = 1] \geq e_0$$

Obviously, the solution is different!