Reversible Destiny Lofts MITAKA (Japan) Photo from <u>https://www.airbnb.com/rooms/4673248</u>

# tokenizing spaces

3/4/18 @interfluidity steve randy waldman ethereum silicon valley meetup

#### • IANAL

- Little domain-specific expertise
- Three(ish) words: pro se registration
  - (not currently a thing AFAIK, but we need to find some way to make this practical if the potential benefits of small-scale tokenized projects are to be realized.)

#### related work

#### rebuilding finance from the bottom up

using cryptographic tokens as a means of small business finance <u>http://interfluidity.com/uploads/2017/04/small-biz-crypto-light-edit-to-publish.pdf</u>

— This talk is a specialization of ideas i presented in that one

 What if you could buy tokens representing claims on units of a particular condominium or office building?

 What if developers could finance the construction of condominium or office buildings by pre-selling tokens representing such claims?

•Why would anyone want to do this?

•How could one make this work?

#### *motivation — investor perspective*

- Especially for investors in less-developed countries, realestate is like Bitcoin, "real" and credible in ways that financial securities may not be.
- Investing in real-estate is challenging, in the developed as well as the developing world.
  - Owning real-estate directly is a pain: physical property must be secured and managed; utilities, taxes and insurance must be paid; if rented (often it is inefficiently not!), tenants must be serviced
  - Real estate is expensive and granular. Buying a property often leaves investors poorly diversified both within the space and in overall asset allocation
  - Real estate is illiquid
  - Ownership of real-estate indirectly is primarily through funds, like REITs. These give benefits of diversification, professional management, and liquidity, but may be subject to adverse selection of properties relative to properties directly selected and owned by beneficial investors

#### *motivation — investor perspective*

- Unlike public shares of distant firms, some particular realestate project is a domain in which individual investors may have an informational "edge", by virtue of local knowledge and the fact that, at least for now, real-estate markets are not well-arbitraged by an essentially infinite pool of putatively better-informed competitors
- Real-estate investment can confer nonfinancial benefits to investors, by virtue of the architecture and development they may bring to a locality, and by virtue an option to directly use a project's services (i.e. to move in or vacation there)
- In a world in which individual real-estate projects were tokenized, investors could
  - 1) directly select the projects in which they wish to invest
  - 2) hold liquid, well diversified portfolios of real-estate as an asset class
  - 3) hold the allocation of real-estate as an asset class they desire
  - 4) factor nonfinancial benefits of real-estate investment into their decisions

#### *motivation – developer perspective*

• Financing options for the development of real-estate projects are deep but very narrow.









#### editorial remark

We Live In A Dark Age.

In An Architectural Wasteland.

(like fish in sewage, we don't even notice.)

#### *motivation – developer perspective*

- Financing options for the development of real-estate projects are deep but very narrow.
- For established developers offering conformist, financially evaluable projects in already sought-after places, bank finance is appropriate and readily available, at decent rates and in large amounts.
- For architecturally speculative projects, in places notnecessarily-so-sought-after (and so more tolerant of unusual architecture), proposed by less established developers, whose motivation may not be purely financial, bank finance is not so readily available, and may not be appropriate given less predictable cash flows.

#### *motivation — developer perspective*

- In general, beneficial investors speculating on their own accounts can take risks on speculative and less financially oriented projects than institutional investors who have to justify their choices, in financial terms, as fiduciaries.
  - There are exceptions (hello Silicon Valley venture cap!), but these rely on very high financial returns of winners to make up for losers and justify the bearing of risk.
  - The case for speculative architecture relies on nonfinancial benefits and limited financial downside rather than unlimited financial upside.
- Delegating investment to fiduciaries means that positive nonfinancial externalities of projects are ignored in decisionmaking and so are inefficiently underproduced.
- Tokenization increases the range of projects developers can pursue, by enabling investors who enjoy these positive externalities to invest while using diversification and liquidity to manage idiosyncratic (to the project, to themselves) financial risk.
- Tokenization need not involve conventional leverage, can be appropriate for cash-flow speculative projects.



"<u>Corporate Ghosts</u>" are what you get — if you are lucky — when a government forces "flourishes" upon financially-penciled architecture as an afterthought.

#### *motivation — architecture*

 Adventurous architecture is an underprovided public good whose provision tokenization can encourage

## *motivation* – *efficiency*

- Direct investment in real-estate (other than ones own home) is mostly restricted to, but common among, the wealthy. Often these investments are inefficiently utilized, they are kept vacant because the potential rents are not worth the risk and trouble of dealing with tenants. Owners use such properties as a safe, real value store, or speculate on future price appreciation, or value the option of personal use
- It'd be better for the world if fewer of these properties were kept vacant, and if property management (which has clear economies of scale) were more ubiquitously professionalized

#### *motivation – agency*

- Tokenization can be used to finance very small scale projects, and can be accessible to would-be entrepreneurs by virtue of a purely local reputation
- If the crypto community means to "decentralize the economy" with the kind of liberatory valence we imply by that, it is not enough for high-tech startups to build "dApps" whose "decentralization" is a back-end implementation detail (and, in theory more than in practice, some guarantee of trustworthiness). We need for these tools to expand economic agency for people who otherwise might find entrepreneurship out of reach.
- Tokenized real-estate development can be a very straightforward form of real-world value creation, accessible to people who are not cryptobros.
  - The crypto community desperately needs to prove that its tools can generate widely recognizable value, soon. Or else they may be taken away from us, and restricted to the back-end systems of regulated banks.

- Suppose we plan a project with N units (which for now we will presume are identical)
- The entrepreneur sells tokens representing an interest in *M* units, with *M* < *N*.
- The entrepreneur agrees to retain her interest in the remaining *R* = *N* - *M* units until all obligations to tokenholders are extinguished.
- For each of the *M* tokenized units, the entrepreneur issues *k* tokens, so that the total float *F* = *k* x *M*

#### **Example:**

Suppose an entrepreneur plans to build 8 units. She will retain an interest in 2 units, and tokenize the remaining 6. Arbitrarily-ish, she decides that a unit will be represented by 100,000 tokens.

Then **N** = 8, **M** = 6, **R** = 2, **K** = 100,000, **F** = 600,000

- The entrepreneur sets a minimum level of finance she requires to complete the project, then auctions *F* tokens to the public. If her threshold is not met, the financing fails, the tokens are refunded, and the project is shelved.
- If an acceptable amount of funds are raised, she is in business. She attempts, and hopefully succeeds, at executing the project with the funds raised, and whatever other capital she has supplied or raised against her retained interest *R*.
- Any holder of k tokens has the <u>right, but not the obligation</u> to redeem those tokens for full ownership of a unit
- However, the expectation is *not* that tokenholders will actually redeem, although they have that right if they wish to exercise it. In our crowdfunded project, there may never be a tokenholder who holds *k* tokens (100,000 in our example)

- The main function of the option to redeem is to set a floor beneath the price of the tokens. Once (hopefully) the units are successfully built, the price of the tokens is unlikely to fall very much below their "fundamental value" given by (*MKT\_VALUEUNIT / k*).
  - If they did, anyone could purchase the underpriced tokens, redeem a unit, and flip it at its market value, earning a quick profit.
  - Actual real-estate takes time to sell, and the transaction costs are high, so this arbitrage won't create a hard floor at market value. But it should prevent token prices from falling very deeply below the expected floor.
- Unredeemed units (including her own *R* units she does not know which units may eventually be redeemed!), remain the property of the entrepreneur. She is responsible for maintaining those units. She earns revenue, and potentially profits, by renting them (whether in long-term leases or as overnight vacation rentals).

- Entirely at her discretion, she may set a "tip rate" that shares a portion of her profits with tokenholders.
  - If the rents are very lucrative and her tip rate is nonexistent or too low, tokenholders will have an incentive to accumulate k tokens and redeem, because the profitable rents will be worth more than the hassle of outright ownership.
  - If she sets a tip rate that is too high, she will be unable to cover the costs of ownership (repair and maintenance, insurance, taxes, HOA fees, etc) and will operate at a loss or allow the property, including her own units, to depreciate.
  - Ideally she sets a tip rate just high enough that the extra revenue that direct owners would enjoy is slightly less than the cost, including hassle, of direct administration. Tokenholders' hassle-avoidance is her source of continuing profit.
- Tokenholders profit from any appreciation of the market value of the units (which translates to appreciation of the token price) and any "tip rate" the entrepreneur chooses to pay. They risk potential depreciation of market value.

#### entrepreneur — simplified balance sheet



#### summary of interests

#### • Tokenholders...

- *i)* purchase tokens usually at a discount to their expected fundamental value if the entrepreneur succeeds at realizing the project, and so enjoy gains upon success
- *ii) maintain exposure to fluctuations in the market value of the property, as a granular and diversifiable portfolio asset*
- *iii) may enjoy a share of the cash-flows generated by the project in the form of a discretionary "tip rate" paid by the entrepreneur*
- *iv) enjoy an option to redeem on-demand and take direct ownership of units, either to earn larger cash flows (at cost of self-administration) or to enjoy direct use of units (i.e. to move in)*

#### • Entrepreneurs...

- *i)* get a project of their design financed without the financial risks of conventional bank leverage
- *ii)* enjoy immediate (book, unrealized) profits upon successful realization of the project, as the difference between the value of **R** units and the initial capital they've supplied
- *iii) earn continuing leveraged profits (without risk of default) from cash flows on all unredeemed units, net of costs and discretionary "tip rate"*

#### so many details, so many devils: form of organization

- The "entrepreneur" should not be a raw human, but some limited liability entity.
- In order to make redemption practical, the entrepreneur commits to forming a condominium association / HOA, and publishes its bylaws and rules, in advance of the token sale. The HOA becomes active, and charges fees to cover common costs only, as soon as units are available for use.
  - While most units remain unredeemed, the HOA will be effectively under the control of the entrepreneur, so care must be taken in how it is constituted. An unscrupulous entrepreneur could set very high HOA fees, then overcharge the HOA for maintenance work. The high fees would impair the market values of the units and tokens, until a majority of units were redeemed to retake control of the HOA. Buying LOTS of cheap tokens to redeem a majority of the units would be profitable, and the possibility of that some check against this kind of scam, but it's better to avoid it in the first place.

## so many details, so many devils: choice of unit

- Until units are actually redeemed, all units are owned by the entrepreneur. There is no distinction between the *M* units claimed by the tokenholder and the *R* units that are the entrepreneur's retained interest.
- In principle, it should always be the *redeemer's choice* which unit she redeems for. Otherwise, the entrepreneur might be tempted to skimp on the maintenance of "tokenholders' units" while investing generously in her own.
- This is complicated by the fact that, in reality, not all units will be identical. This simplest way to deal with this is by setting (in advance, before the token sale) different prices in tokens for redemption of the different units.
  - Then, instead of  $\mathbf{F} = \mathbf{k} \times \mathbf{M}$ , we have  $\mathbf{F} = \sum_{i=1...M} \mathbf{k}_i$
  - It's important that the relative prices be reasonable, or else there will be some incentive to redeem the most underpriced units, impairing other tokenholders. Prices in tokens must be assigned to all units, not just **M**
- An alternative approach is to let redemption yield a randomly chosen unit
  - but this may depress token value by some risk premium

## so many details, so many devils: termination

- The business model described here could continue in perpetuity, or until tokenholders force an end by redeeming all their units.
- In theory, the human entrepreneur can always exit by selling her interest in the business to some other operator.
- In practice, selling a closely-held business may be hard, and the entrepreneur may want a more straightforward way of moving on.
- This isn't hard to arrange.
  - a) At initiation, prior to the token sale, the entrepreneur commits to a minimum period of ordinary operation, after which she can give notice of an intention to liquidate.
  - b) Following the notice, tokenholders have a predefined period during which they may redeem.
  - c) After the notice period, the entrepreneur must continue to operate until all unredeemed units are liquidated in an orderly, value-maximizing manner to arms-length purchasers.
  - d) Proceeds are distributed pro-rata to unredeemed tokenholders and to the entrepreneur for her retained interest.

#### so many details, so many devils: last redemption

- Suppose some small fraction of the tokens get burned or are lost. Then once (*M* - 1) units have been redeemed, there will be no way to redeem the final unit, which means there will be no anchor or floor to give the remaining tokens value.
- Even before all other units are redeemed, the possibility of this might provoke a "run", wherein tokenholders race to accumulate enough to redeem for fear of being left stranded with difficult-to-value tokens.
- However, even without the capacity to redeem, tokens are given value by the potential payout at liquidation (see previous slide)
- There are several ways to address the last redemption problem
  - When nearly all units have redeemed, termination (as described previously) may be automatic, or may be forced by vote of some relatively small threshold of outstanding tokens
  - When nearly all units have redeemed, the entrepreneur offers new tokens to ensure the possibility of redemption, at a price reflecting a valuation slightly higher than an appraised market value of remaining units. The proceeds are held in reserve and paid-out to dangling tokenholders after the final redemption.

## so many details, so many devils: liquidity

- Tokens of small real-estate projects are unlikely to trade upon popular exchanges or be very liquid
- Most projects will have make use of *Bancor*-like schemes of seeing to their own liquidity. Tokenholders can sell into a "smart token" contract, depressing the price. Arbitrageurs should bring it back towards the floor defined by the market value of units. As long as tokenholders sell slowly, they should be able to get out at reasonable prices.
- However, <u>Bancor</u>-like schemes require a "reserve", funds set aside to make a market in the token. With each redemption, a proportional fraction of that reserve can be released (and the "smart token" contract recalibrated to keep the price and reserve ratio fixed).
- The reserve can be attributed to tokenholders, or to the entrepreneur.
  - In either case, the opportunity cost of the locked reserve may create some incentive to redeem (tokenholders) or terminate (entrepreneur) faster than they would have otherwise.

#### so many details, so many devils: bankruptcy

- Like any business enterprise, the entrepreneur may fail.
- For the purpose of liquidation in bankruptcy, tokenholders claims against *M* units are senior. The entrepreneur's claim to *R* units are residual, pure equity.
- If the failure happens prior to completion and operation of the units, then tokenholders are likely general creditors, there is no certain identifiable asset against which their claims can be secured.
- Ideally, once units are constructed and operational, tokenholders claim upon bankruptcy should convert to that of a secured creditor, with a security interest in fraction (*M*/*N*) of the value of the units. They are owed in-kind the units, not the value of funds originally invested, and should be as senior as they can be arranged to be in the hierarchy of claimants.

#### conclusion

- Being the first project to try something like this won't be easy. There are a lot of legal forms that would need to be carefully worked out.
- Obviously, there would also need to be a regulatory strategy, which is a whole different set of concerns I've omitted from this talk.
- But despite the devils and details that find their way into all complex, contractual arrangements, I think this model is very workable.
- Being the first project to try to get this right won't be easy.
  But being the tenth, or the ten-thousandth, might not be so hard.
- I think it is worth a try.

# appendix: why tokenize?

- There is a moment in financial history (no one knows precisely when) quite analogous to the biting of the apple in the Garden of Eden
- The forbidden knowledge which made us immensely powerful even while it consigned us to a purgatory made of bubble and fraud and bank failure was this:

#### If you give people a sufficiently liquid claim when you ask them to invest, they perceive themselves as simultaneously having and having invested their funds.

They part with their money much more easily. They feel no loss.

And in a sense they are right! Their money remains in-hand, only its riskprofile over time has changed. And the retained liquidity does matter! It genuinely helps investors manage their own idiosyncratic risks.

- If you can issue liquid, money-like claims, you can attract investment much, much more easily, and in much greater quantity than if you cannot.
- Historically, banks and the state had a near-monopoly on the issuance of liquid, money-like claims. Over the past century, very large firms (but only very large firms) have gained the privilege, as their paper (stocks, bonds) has become very liquid.
- Tokenization may extend that privilege much, much more widely.

