



Decoupling Land and Improvement Values

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Introduction

Recently, there has been increasing interest in the potential for land value taxes (LVT) [1] to help combat housing crises and wealth inequality. However, one of the recurring questions raised by skeptics of the proposal to collect land rent is whether land values can even accurately be evaluated. Critics assert that the market value of land cannot be accurately separated from the value of improvements such as buildings. If land values are inaccurately valued, any attempt to collect them would have the undesirable effect of falling on improvements and thus discouraging the productive use of land, as well as inducing horizontal inequities in tax obligations. One desirable solution to this problem would be to create a market mechanism for accurately establishing land values, with prior examples including periodic leasing [2] of land parcels, and Harberger mechanisms [3] for self assessment. This article aims to put the criticism of value inseparability to rest by demonstrating a mechanism whereby land values can be priced by market actors while also being cleanly decoupled from the value of improvements.

For the purposes of this article, the LVT is defined as the periodic market rent of unimproved land. It corresponds to what people would willingly pay to rent unimproved land for a given period. The LVT is not one value but can be thought of as contour lines of values over a surface in a given geographic area (GA) that change with market conditions. This time dependent surface will be referred to as LVT-s.

Because people construct relatively immovable improvements on land (e.g., a building or a house), having land ownership change hands almost always requires ownership of the improvements to change hands as well. This is where the separation between the value of the land and the improvements becomes critical. In an optimal situation, the value of improvements will be at market value when the rental land changes hands. The values of land and improvements need to be decoupled or else the owners of improvements would either lose too much or gain too much value from them. Indeed, Henry George's 19th century solution was to let owners enjoy some of the surplus of the land. However, there are better technological tools available



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today, and it is worthwhile to propose newer methods to get closer to LVT s.

Indeed, there have been numerous schemes proposed to evaluate the LVT-s ranging from property appraisal, historical data, or a combination of these, to more sophisticated artificial intelligence and machine learning methods applied in tandem with GIS. [4][5] Of these, property appraisals are still the most accepted and common method. While these methods may deliver accurate results and offer ease in implementation, they are inherently indirect and not directly subject to market revelation and thus subject to appeal. Furthermore, they have the weakness of being unable to react quickly to abrupt changes in the market.

In this article, a hypothetical society is proposed where land allocation is handled using a more direct method of valuation: the market itself will be utilized to determine both values of the unimproved land and the improvements, and thus appraisals are made unnecessary. A dynamic set of data is produced, which can be smoothed out over space to form the LVT-s. The proposal relies on a modified system of bidding and an algorithm to increase and decrease the rents over time. The rules are designed to deter manipulations of the market by bad faith actors.

The Criterion for Land Value

In order to proceed, the LVT-s has to be expressed in a more practical way. Because the supply of land is fixed and therefore land value only comes from demand, the LVT-s is the surface made by the rent where the rental payments for plots of land are at the maximum without prompting general abandonment. Or more technically, this can be expressed in the following manner. Consider a GA where all plots of land are for rent on a monthly basis. If R_{ij} are the rents per square area per month, where i and j are indices for specifying geographic location, then the surface formed by all R_{ij} describe the LVT-s if the following condition is met: all R_{ij} are at a maximum in the GA without initiating abandonment or the consideration of abandonment in any plot of land.

Pre-abandonment is therefore the subjective and central criterion, and the LVT-s is the surface made by the values right at pre-abandonment. Abandonment resulting from the inability to pay rent, as opposed to abandonment by choice or personal necessity (e.g., sudden change in health conditions), is highly undesirable and has to be avoided. This is because the improvements on the land are immovable, and



abandonment is when the tenant decides to forgo the value of the improvements due to the inability to pay. Looking at it another way, the rental payments should not eat into the value of the improvements and should not disincentivize the creation of more improvements. Thus, a method to measure the maximum of R_{ij} without triggering abandonment needs to be devised.

The Rules for Land Use

All plots of land are **rentals** and information about them are listed on a **public rental exchange board**. Rentals may be transferred by incumbent **tenants** to another willing party at any time. Rentals are pre-populated with zero values. **Zero-rent** rentals are subject to **direct bidding** for immediate occupation. Collected rental payments are redistributed as a **dividend** to all residents on a monthly basis.

Abandoned rentals are those that are unoccupied, and no payment of rent is being made. Abandoned rentals are subject to direct bidding for immediate occupation.

Occupied land rentals in the GA are either in the **locked** or **unlocked** state as opted by the incumbent tenant. The exceptions are zero-rent rentals which are always unlocked.

In the locked state, the tenant pays R_{ij} , and bidding by others on the rental is disallowed. In the unlocked state, the tenant pays cR_{ij} but bidding by others on the rental is allowed. Unlocked rentals that do not receive bids for t_u consecutive months switch into locked rentals and R_{ij} is updated and assigned the value cR_{ij} . (Here, suggested values are $c=0.92$ and $t_u=6$.)

Tenants can switch between locked and unlocked states after a period of t_s months from the last switching. Tenants do not have to unlock to sell their improvements and transfer the land rental. (A suggested value is $t_s=3$.)

A **hostile takeover** phase is entered from an unlocked rental if a higher bid R_{ij}' is made against the R_{ij} of an incumbent tenant. The higher bidder is called a **hostile** and secures the bid with a deposit of dR_{ij}' , which will be returned only after a successful transfer of the rental. The deposit goes to the dividend if the transfer is unsuccessful. (A suggested value is $d=0.1$.)

The incumbent tenant can then either



1. Stop the hostile takeover by switching the rental to locked state and accepting the lesser of R_{ij}' or R_{ij}'' (see below) for the rent, or 2. Transfer the rental to the hostile within t_t months upon negotiating a settlement for the improvements. R_{ij} is then assigned the new value R_{ij}' and the rental is locked. (A suggested value is $t_t=2$.) R_{ij}'' is the average of rents of nearby rentals and the new bid. Suggested formulae are the following:

$R_{ij}'' = (1/(n+1)) (\sum R_{ij,adj} + R_{ij}')$ (1) where, $R_{ij,adj}$ are the rents of adjacent rentals, or if there are no adjacent rentals,

$R_{ij}'' = (1/3) (R_{ij,1st} + R_{ij,2nd} + R_{ij}')$ (2) where $R_{ij,1st}$ and $R_{ij,2nd}$ are the rents of the first and second nearest rentals, respectively.

Delinquency happens when the rental is occupied but tenants are t_d months behind in rental payments. This opens the rental for direct bidding, which has to be settled within t_b months of the first bid. The rent is multiplied by a factor q every t_d consecutive months of no bids. Delinquent tenants are liable for the unpaid rent before they can challenge any bids. (Suggested values are $t_d=4$, $t_b=2$, $q=0.96$ and $t_d=2$.)

In summary, a rental may be abandoned, locked, unlocked, zero-rent, in hostile takeover, or in delinquency. These are all announced in the exchange board.

LVT-s algorithmic search:

In the GA, R_{ij} are **increased** monthly, unless any of the following criteria are true:

1. the rental is either unlocked or has been unlocked within t_{r+} months.
2. an adjacent rental or the next nearest rental has been unlocked within t_{a+} months.
3. an adjacent rental or the next nearest rental is abandoned or zero-rent.
4. there was a hostile takeover on the rental within t_{h+} months.

(Suggested values are $t_{r+}=6$, $t_{a+}=4$ and $t_{h+}=6$.)

R_{ij} are **decreased** monthly if:

1. an adjacent rental or the next nearest rental is abandoned, or if 2. half or more of the adjacent rentals or the next nearest rental is unlocked for t_a consecutive months. (A suggested value is $t_a=4$.)



Below are suggested formulae for increasing and decreasing the rent. To increase R_{ij} , increment by eR_{ij}''' . To decrease R_{ij} , decrement by fR_{ij}''' .

(Suggested values are $e=0.01$ and $f=0.02$.)

Here, R_{ij}''' is the average of the rents of the rental and nearby rentals $R_{ij}''' = (1/(n+1)) (\sum R_{ij,adj} + R_{ij})$, (3) where $R_{ij,adj}$ are the rents of adjacent rentals; or if there are no adjacent rentals

$R_{ij}''' = (1/3) (R_{ij,1st} + R_{ij,2nd} + R_{ij})$, (4) where $R_{ij,1st}$ and $R_{ij,2nd}$ are the rents of the first and second nearest rentals, respectively.

Suggested values may require adjustment to obtain a stable society.

Discussion

In the society rules presented above, the LVT-s is arrived at through probing by an algorithmic search process and through the participation of players by bidding. The algorithmic search process increases, decreases or does nothing to the rent depending on local unlocking, abandonment, and hostile takeover events. Thus, the algorithm is constantly updating the LVT-s based on the market data input by players each period.

Unlocking is used as a proxy for pre-abandonment and is therefore the indicator that the rent lies near the LVT-s (that is, within $\pm 100(1-c)\%$). In a society where land is a rental and the rent is kept near the LVT-s, there will always be a healthy amount of unlocked plots of land. Because the rent is kept near the LVT-s, the full market value of the improvements are retained.

Unlocking can be a way to lower one's rent. The decision to lock or unlock by an incumbent tenant is a choice between paying the full rent with the security of keeping the rental or paying a discounted rent with the risk of entering hostile takeover. That is, an unlocking decision is where the tenant deems that the benefit of having a slightly lower payment offsets the cost of the guarantee of tenure, the latter being 100% LVT.

Delinquency can be another way to lower one's rent. However, this is risky because the rental becomes open to direct bidding and one can lose market value of



improvements this way. As a means to lower rent, delinquency can be thought of as the incumbent re-bidding on the rent. This option can be useful, for example, during a financial crisis.

There are two types of bids in the rules. The first type is the direct bid. Direct bids apply to zero-rent rentals, abandoned rentals and delinquencies. Direct bids are perhaps the type of bid that most people are familiar with.

The second type of bid is through hostile takeover and applies to unlocked rentals. The bidding process within hostile takeovers is asymmetric in the sense that the bid of the hostile is pitted against an averaged value, which includes the bid of the incumbent. The asymmetry is by design and prevents predatory takeovers. It protects the incumbent from being ousted by an unreasonably high bid and thus from being forced to lose the market value of improvements on the rental. Indeed, a hostile takeover attempt may in fact lower an incumbent tenant's rent if the rent is already anomalously high. The deposit that is required from the hostile discourages frivolous bids.

In summary, although the times and coefficients may need to be optimized to reach stability, a fair land value rental system can be envisioned wherein the market rent of unimproved land can be separated from the value of the improvements. There is no apparent inherent reason the system cannot be made to reach steady state. Rents increase through bids and algorithmic search, and they decrease through unlocking, bids, delinquency, and algorithmic search. The rules are designed to determine the unimproved value of land in a dynamic way.

References

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