

Ether Las Vegas

EtherGuy

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1 Introduction

The first version of Ethereum Las Vegas has been put online about 3 days ago. It has been an entire hit, something I have not foreseen, when comparing it to other games created by me. It was meant as a small test to see how certain factors worked. The game has not been hyped at all before the release and the URL was simply dropped. People immediately got playing. The first jackpot was slightly more than 2 ETH and the game immediately got more transactions than any other game I have created. The jackpot got less and the interest seemed to get less too, but today a jackpot of 4.2 ETH got reached and took incredibly long.

This report will go over the results of seeing the game in live action and proposes new additions to the casino. Let's note that the original game will not be taken offline and will be kept hosted on the site, on the homepage for a long time while the new version is slowly rolled out.

2 Review of the original game

The game has clearly two phases. The first phase is where players who do not want to take much risk, or do not have much ETH, buy items and want them to be flipped. Their goal is simply card flipping and not reaching the jackpot. The later phase is people sniping the jackpot, which goes much slower than the quick flipping at the start. The two hour restart of the game seems to be too long since the initial phase is usually over in about 10 minutes. This should be reduced to simply one hour. The one hour time might also be long. If people really play against each other, then at some point they have to go to sleep and they will lose. People have to get a choice where they choose which jackpot they want to snipe. If they have not a lot of time, they might want to snipe jackpots with lower times. Games in the end always have people sniping in the last minute to extend duration of the time, probably hoping to make sure the other cannot play anymore.

Another problem in the game was not allowing people to buy their own items. This was created to prevent people accidentally buying two items. However, buying your own item is a nice way to get that jackpot ownership back: you

pay yourself a lot of money back and the rest goes in the pot. Of course, a small part is fee and flows away from the game. People can easily get around this by using another account, but this should be removed in the new game. People also complained that the base price of 1 finney (0.001 ETH) is too small. When looking at the gas (70k gas for buying an item) then this is a lot when compared to the price. At the gas price of 2 GWei the price of that gas is about 0.00014 ETH, so about 14% of the price. When this item gets flipped, they get 0.0012545 ETH. This means that if you pay more than 4 GWei for the first buy, you have actually lost money by buying that and have lost it by paying gas. This should not be the case and will be fixed by creating a reasonable price, or looking into the contract to see if gas can be lowered more.

A complaint about the game is that whales will snipe the jackpot. It is impossible to win against them. If they re-buy their own items the only loss they make is dev-fee (if they win) meaning they can win by not paying a lot. This is something which should be addressed, this kind of tactic has not been sensed beforehand.

3 Proposal of the new game

Let's look at changes of the game itself. Gameplay will not change. However, the game will get a few backend features and some new ideas for changing small parts of the game are proposed. The new game will get a **Closing Feature**, where the casino is closed for a small time and no transactions will be accepted. This will help people to cool down a bit if they have lost, which was the intention of the longer timer in the original game. This did not work: at the start people immediately bought to 'win' phase 1. Another feature added will be upgrading the casino. An upgrade of casino setting will only happen when a game is over, to prevent the owner of the casino to cheat. It is also possible to completely close a casino. If this is done, then the pot payout of the next game is set to 100%. This cannot be changed and then the last game will be played. Like this, no ETH will stay in that game and it can immediately be upgraded to a new game with new features. The new game will also allow to change settings of the game. Of course, this will only happen when the current game is over. This is done to tweak settings such as the timer and base price. A change can be called but will only happen if the game is finished.

The new game will allow multiple casino's. Four casino's will be created, all with different features. The idea behind every casino is to see how newer games work. Games with less large jackpots might be uninteresting for whales and hence being able to be played by shrimps too, aiming for jackpot. The basic aim for these casino is as following:

A normal one like the original will be created. Most settings will be cloned, yet the time will be taken down in order to make sure games like this do not take entirely long. If this is not liked then game can be increased to a hour again. The focus in the normal game is balanced: phase one at start and phase two at end. A quick game will be created. The focus here is mainly on flipping

itself with a quick reset. If the prices gets too high the jackpot is paid out and we start over again. The third game will have a test with less items. Profit in phase one is high, jackpot is less higher, the time will be around a hour. This is to see how games with less items work. The final game will be a very long game. This game will focus on the jackpot only. Profit will still be made every time a card flip, but not a lot. Games will last long on this one, given it is popular enough to get a decent pot in there.

All games share the game "winning rule" of the original: last buyer wins jackpot. There are no additional rules to be added. The contract currently has no support for this. In the future, rules will be changed and also these new rules will be tested.

4 Analysis of the game

In the previous report formulas where already shown to calculate important properties of each game. In here this is extended, particularly after observations in the current game. For instance, it is really interesting to see you can buy a "cheap" item to get access to the jackpot, which upgrades your price a lot. These formulas have been tested against a simulation and work. Let's first go over the rules of the Casino again. The time increase when the game is restarted will be removed. (2 hours for a new game when restarted in original, while round time is only 1 hour).

First, the game has to be started. This is done by buying a first item. At this point, the time to close the game is updated and set to the right time, seen from `block.timestamp`. The addition done here is set by a round time property.

Buy transactions pay fees. Any excess is returned to the sender. A part goes to the previous owner of the item. This is rejected if the item is at base price. A part goes to the developers. Another part goes into the pot. This means that at the start, almost everything which is put in goes to the pot. Every time a new item is successfully bought the pot owner goes to the buyer and the timer is reset plus the price of the item is increased. When the timer ends, the winner can pay out the pot and all prices are reset to the basic price. In the new casino the casino will have a feature to close for some time so people can get started for phase 1 again. After that, the game can be started again.

In the new contract we add another phase of the game: the upgrade phase. In this case an upgrade function has to be called to move the new settings to the current game. The developer has to call this function, but at weird times this might not happen and if people really want to play they can call this. Depending on how much is changed the gas of this call might be high.

5 Equations

To quickly evaluate new settings a simulation has been built to check the game. From here, equations were checked to quickly evaluate if new games might work, or if they have enormous blunders in there. Blunders might be losing money when someone flips your item, or almost no profit when winning the pot.

The minimum percent paid to previous owner is:

$$f_p > \frac{1}{I(1 - f_d)} \quad (1)$$

Here f_p is the fee to previous owner, I is the price increase in price (100% = 2 in that case) and f_d is the fee to developers. Lower fees will make people lose money if someone else buys, which will not encourage people to start the game or play the game. To calculate profit:

$$p_f = I(1 - f_d)f_p - 1; \quad (2)$$

Here p_f is the profit in percents at a flip. When this is negative, people lose money at a flip. In the current game we use 65% previous fee, 100% price increase and development fee is 3.5%. This results in profit of about 25.45% per player on flip.

A question one might ask is if the game goes on infinitely, is the pot then still interesting? The answer is yes (in most cases). We can calculate how much profit one makes if he wins the pot. To make this equation easier, we assume that the game is played logically. This means that all the cheap items are bought first. When we calculate the "winner" we assume that this is done after a new floor is created (all prices are the same) and this person buys the first item. Note that if a later person wins, then the pot is actually higher but the price stays the same. This means that the profit is actually more, so this equation gives a minimum. The amount of the own ETH going into the pot is included in the equation.

To calculate the pot at floor number r_{max} is:

$$p(r_{max}) = Li b_p (1 + f_j \sum_{r=1}^{r_{max}-1} I^r) \quad (3)$$

Here p is the pot, L is the one minus the development fee (called Left ETH) which is $1 - f_d$, where f_d is the development percentage. b_p is the base price, f_j is the percentage going to the jackpot (note that in the program, $f_p + f_j$ is 1 to make this easier to set). i is the number of items available to be bought.

To add items to this pot simply add a factor $p_f b_p I^r L$ to this pot, where $b_p I^r$ is the price of that item.

What's interesting now is seeing from an user side how much profit they can possibly make. Let's say you would be able to win a 10 ETH pot and only pay 1 ETH, then that is very interesting, but of course if you lose, you will lose 1 ETH. What is interesting is that the maximum profit will reach a certain limit

when r_{max} goes to ∞ (but practically reached after a few rounds of course). To calculate how interesting it is, we simply divide the pot (after buying the cheapest item) by the amount paid.

$$w(r) = f_t \left(\frac{p(r) + Lf_j b_p I^{r+1}}{b_p I^{r+1}} \right) \quad (4)$$

Here f_t is the amount of the pot the winner gets (rest stays in pot),

This equation returns a number which shows how much higher the pot you win will be after buying the cheapest item at floor r . If this is 5 it means you will get 5 times your payment back if you win the jackpot. To investigate this further, what happens when we take r to ∞ ? This has also been checked in the simulation to see the minimum profit you make when winning the jackpot:

$$w_{min} = Lf_t f_j \left(1 + \frac{i}{I-1} \right) \quad (5)$$

This means that games can theoretically go on forever. Usually this is the minimum profit of a jackpot and the profit converges to this. The biggest factor in this is the second factor: the number of items has therefore an insane influence. To get an idea at what profit the game starts, use:

$$w_{start} = f_t L \left(\frac{i + f_j I}{I} \right) \quad (6)$$

6 Game phases

The game will slowly be expanded with more game modes. Phases might be switched depending on what people want.

The first addition will be the creation of more casino's. If any property of this casino is "wrong" then this might be changed. The casino's will not be released at the same time, there is a small wait, in order to prevent a possible huge spam of TX to the contract. The original idea is to only change the settings of the original game, but other rules might also be added in response to complaints raised by users. These upgrades will happen in the future by releasing a new contract which allows new rules.

Another addition will be the ability of people to buy casino's. In this case they are allowed to raise fees, change casino settings, change items. Buying a casino costs a price. Price structure of this casino buying will have to be determined. If this is done, it must be made sure that the contract can be upgraded so people who have bought a casino will keep their casino in new contracts. These casino's can be interacted with directly via the site and can thus be shared immediately. All features are available.

The third addition will create a new layer in the game: dividends. People will be able to buy casino's and also be the owner of all casino's. In the first case, people will get dividend over the volume shared in the casino. In the second case, people will get dividend over all volume moved in the game. The price structure has to be determined here.

The fourth addition will allow "real" casino games. A pot is created for a daily raffle game. People can buy raffle tickets to play. Most of payment of raffle tickets will go to the pot. Also, games like Roulette and Dice will be added, where people can play against the casino or against each other. A maximum bet will be set to be sure people do not take the entire pot.

The final addition are new tests to the casino to expand this game idea. See the last section.

7 Casino features

This section is meant as a brain dump of casino feature ideas.

The main feature which might be changed in a casino is the price of items. Time dependency might be added. What if we make price rise or lower? Let's say that we make a price rise. First, the item price might double. Then, when the round time is over, the price will have trippled. This means that buying these items costs more and people will not snipe items. However, this still means that people self-buying their own items will not care and can still snipe. What is also possible is lowering the price. This might increase the time of phase one: people might wait until the price hits something nice, or they will buy an item immediately to be owner. Of course the price paid will be used as base price, meaning constant floors cannot be reached anymore. Depending on when people buy a bag the profit might also be insane; if someone immediately bought and we are looking at a profit of 40%, while price has gone 3x instead of 2x, we are looking at a profit of about 80%.

The idea to decrease self buying is also nice. An idea here is to not pay everything to the previous owner but share dividends to others. This means that loss of self-buying will be higher. However, this will also make the profit of phase one lower. It is unclear what influence this might have and should be tested.

Another idea is to add items to the game while it runs. If the game has taken 2 round times we are already in phase 2, but adding items to the game will be interesting if they start at base price. This means the winner of jackpot changes immediately, but it might also mean games take forever.