

After several plays of Lords of Waterdeep with the Scoundrels of Skullport expansion in, I decided to go back to the numbers and do a stochastic analysis of cards in order to check the balance of the new lords / the balance of a complete game, with both expansions in. Several issues arose, and I hope with this dissertation to have been able to address most. First of all, I'll do a short Summary, to highlight directly the suggested fixes for all the issues, and then I'll present the detailed stochastic analysis.

SUMMARY

01. When playing with the core game and both expansions (Skullport and Undermountain)

remove the following cards from the core game

- **Arcana** non plot quests to be removed: Host festival for Sune, Investigate aberrant infestation, Recruit for Blackstaff academy, Retrieve ancient artifacts; plot quests to be removed: Explore Ahghairon's tower, Recover the Magister's orb
- **Commerce** non plot quests to be removed: Loot the crypt of Chauntea, Safeguard Eltorchul Mage, Send aid to the Harpers, Thin the city watch; plot quests to be removed: Bribe the shipwrights, Infiltrate Builder's Hall
- **Piety** non plot quests to be removed: Create a shrine to Oghma, Discover hidden temple of Lolth, Recruit paladins for Tyr, Seal gate to Cyric's realm; plot quests to be removed: Defend the tower of luck; Produce a miracle for the masses
- **Skulduggery** non plot quests to be removed: Establish Harpers safe house, Prison break, Procure stolen goods, Raid on Undermountain; plot quests to be removed: Place a sleeper agent in Skullport, Fence Goods for Duke of Darkness
- **Warfare** non plot quests to be removed: Ambush Artor Morlin, Confront the Xanathar, Deliver weapons to Selune's Temple, Repel Seawraiths; plot quests to be removed: Recruit lieutenant; Bolster griffon cavalry

02. Use the following fixes for the new Lords of Watedeep

- **Halaster and Sangalor**: reduce the total bonus points they grant you at the end of the game to 4 points for expansion quest completed
- **Irusyl**: reduce the total points he grants you at the end of the game from 6 to 5 points per quest completed (you still decide which quest type counts for the purpose of scoring the extra points)

- **Trobriand:** when playing core LoW and no expansion in, Trobriand awards you 5 extra points / quest worth at least 11 points; with Skullport or Undermountain in, 5 extra points are awarded for each completed quest worth at least 13 points; when playing with both expansions in, 5 extra points are awarded for each completed quest worth at least 14 points
- **Danilo:** for 2p to 3p games, 3 points / quest completed + 5 bonus points; 4p to 6p games, 3 points / quest completed is fair
- **Xanathar:** raise his bonus to 7 points / corruption in his tavern

STOCHASTIC ANALYSIS

Rebalancing the Scoundrels expansion it's quite a huge task, for two different reasons:

- a) the game scales up and down in a horrible way. This is because certain spaces are vital for the game but can be restricted if too many play. Taking quests, for instance, is very easy when played 3p, and it could be a nightmare when played 6p; and so on. I'm trying to find here an overall balance for the Lords and the deck composition when playing with both expansions in, but sometimes the proposed values should be nerfed down accordingly to the number of players.
- b) to do a complete, proper analysis I had to go in the details of every single quest of the game. In order to do so, I considered that a single agent allows you to gain: 1 cleric / 1 wizard / 2 fighters / 2 rogues / 4 coins (buildings change this, but I'm assuming buildings represent a balanced unit per se - I cannot verify the balance for all elements of the whole game so that I'm assuming the gain for using a building is proportional to the "normal" gain from using spaces on the board). With this premise, I used the following equations to calculate the power of a quest (equations that actually proved to be good since similar quests – the 40 point quests in Undermountain, for example, gave me the same “final weight”):
 - i) "costs" were calculated as:

$$1 * (\text{number of clerics required}) + 0.5 * (\text{fighters}) + 0.5 * (\text{rogues}) + 1 * (\text{wizards}) + 0.25 * \text{coin}$$
 - ii) "benefits" were calculated as:

$(\text{number of victory points awarded}) + 1 * (\text{number of clerics required}) + 0.5 * (\text{fighters}) + 0.5 * (\text{rogues}) + 1 * (\text{wizards}) + 0.25 * \text{coin} + 3 * (\text{building*}) + 1 * (\text{actions - like getting 1 extra quest / intrigue and so on})$

*=the weight "3" was chosen due to the fact that getting a free building implies you don't use the agent to go shopping, you don't pay the money, you score some points)

Then, the power of the quest was calculated as "benefits value" - "costs value"

Final note: it has been difficult estimating the power of plot quests, so some approximations were done. Still, further considerations seem to prove that the "weight" of plot quests is not vital to a proper calibration of the decks. I'll explain this later in detail. Still remember, these are some sort of guidelines to invite friends to reflect further on some issues (at least, it's good to give an advice on what's going on)

So, let's start from the beginning, shall we?

We have 60 quests in vanilla LoW (12 for each type. Among these, 3 are plot, and 9 are non plot). Undermountain adds 30 (6 each, 2 plots + 4 normal) more, and the same for Skullport.

First important correction to the rules - All following considerations are done under this hypothesis

Rules instruct us, when playing with both expansion modules, to remove 30 **random quests** from the vanilla game deck.

Within this rule are present two elements that could skew the distribution:

- a) the number of quests removed for each type of quests in play
- b) within the same sub-deck of quests which are removed

a) induces an unbalance in the chance each of the lords could benefit from the existing quests: by adding Sk and Un to the mix, you have a core of 60 balanced quest types (12 cards each) coming from the expansion + a number of random quests for each type unless you remove exactly 6 quests per type from the vanilla LoW. This is not "extreme", since we still have quite some quests for each lord, but it could be indeed fixed simply by following this fix

Fix: when removing cards from the core set, remove 6 cards from each of the quest types in play (6 from Piety, 6 from Arcana and so on) so that the balance between the sub decks is preserved.

Now, let's look at exactly what quests should be removed. First of all, when we play only with Undermountain or Skullport, we have a total of 5 plot quests / type. If we play with both Undermountain and Skullport, these two expansions contribute with 2 plots each, so that to keep the ratio of plots vs normal quests constant, we need to remove 2 plot quests / type from the core deck. As said, it's very difficult to consider the impact on the game of plot quests because they heavily depend on the moment of the game you complete them (an example above all: the quest giving you the Lieutenant; it's good to pass early in the game, but not in the last two rounds), plus it's difficult to compare the weight of plots among the different type of quests. But. There are 5 plot quests that are perfectly balanced (the weight was calculated as if every quest is completed as if they could give you a bonus for further 4 quests; it'd not change if the same was calculated for 3 or 7 further quests: the weight would have been lower or higher, but still the same for all five. Additionally, since they grant a similar bonus - boost a specific quest type - their effect on the game is the same):

- Study the Illusk arch (Arcana, weight: 13)
- Establish new merchant guild (Commerce, weight: 13)
- Defend the tower of luck (Piety, weight: 13)
- Install a spy in Castle Waterdeep (Skulduggery, weight: 13)
- Quell mercenary uprising (Warfare, weight: 13)

So, when preparing the deck for a complete game (core + Undermountain + Skullport) remove all the plot quest from the core set but the 5 plots above listed.

That's clearly not enough: we need to remove 4 more / type. Here come bigger issues, since the sum of the weight of each type is not a constant (hence, basically, there is no balance between the different types of quests). This was solved by looking transversally at the quest, id est, I listed all the Arcana (Commerce and so on) quests from the core game and expansions and found out quests of that type from the core game whose weight is matched by an expansion quest, so that the one from the core could be eliminated without the total "weight" of that school type to be changed. Specifically, non-plot quests to remove are:

- - Arcana: Host festival for Sune, Investigate aberrant infestation, Recruit for Blackstaff academy, Retrieve ancient artefacts
- - Commerce: Loot the crypt of Chauntea, Safeguard Eltorchul Mage, Send aid to the Harpers, Thin the city watch
- - Piety: Create a shrine to Oghma, Discover hidden temple of Lolth, Recruit paladins for Tyr, Seal gate to Cyric's realm

- - Skulduggery: Establish Harpers safe house, Prison break, Procure stolen goods, Raid on Undermountain
- - Warfare: Ambush Artor Morlin, Confront the Xanathar, Deliver weapons to Selune's Temple, Repel Seawraiths

This should grant an overall balance of the deck (and each sub deck of quest types) to be preserved.

Since now on, I'll use the following notations:

LoW = vanilla Lords of Waterdeep

Sk = Skullport

Un = Undermountain

Now, let's give a look at the lords in deeper details. We have 9 Lords granting you extra points at the end of the game based on 2 quest types. What is the frequency these quests appear? Easy peasy, statistics tell us that:

- - LoW: $24/60 = 40\%$
- - LoW+Sk: $36/90 = 40\%$
- - LoW+Un: $36/90 = 40\%$
- - LoW+Un+Sk: $36/90 = 40\%$

So, these 9 lords are perfectly balanced regardless of whether (part of) the expansion is used. Same for Larissa, who works with buildings (she's not balanced in my opinion, but at least her balance is unaffected by using the expansion or not, so I'll leave her as she is in this analysis)

Problems arise with the new 6 lords.

Halaster and Sangalor

They grant you 4 points for each completed matching expansion quest and each matching expansion building in your possess (id est, Halaster gives you 4 extra points / Undermountain quest or building; same for Sangalor with Skullport quests and buildings). They cannot clearly be used with LoW only; as for the expansion, the frequencies of finding "good stuff" (quests or building offering you extra points at the end of the game) are

Halaster

- LoW+Sk: not allowed
- LoW+Un: $42/126 = 33\%$
- LoW+Un+Sk: $42/126 = 33\%$

Sangalor

- LoW+Un: not allowed
- LoW+Sk: $42/126 = 33\%$
- LoW+Un+Sk: $42/126 = 33\%$

So, it seems like these two lords are less likely to find quests / buildings able to satisfy their needs. But. What are the odds that no cards are good for me? Standard quest deck with expansion is 90 cards, 6 are already gone during setup, so it's 84. Considering an equal distribution among the cards in the players' hands (which cannot be since 6 cards can't be divided by five, but it's too a mess and one card more or less won't change the math too much) we have:

1st card on Cliffwatch Inn not being suitable for player A: $(84-35)/84$

2nd: $(83-34)/83$

3rd: $(82-33)/82$

4th: $(81-32)/81$

So the composed probability of not having any cards good in Cliffwatch Inn is: $1st * 2nd * 3rd * 4th = 12.45\%$. Hence the odds of having at least one card good for a standard lord during setup at Cliffwatch inn is $100 - 12.45 = 87.55\%$

Halaster and Sangalor's odds to have no interesting (for them) quest at Cliffwatch Inn (after dealing the starting hand and having given away with the starting hand on average 2 specific Sk or Un quests) is:

1st: $(84-28)/84$

2nd: $(83-28)/83$

3rd: $(82-28)/82$

4th: $(81-28)/81$

So again the composed probability of not having any cards good in Cliffwatch Inn is: $1st * 2nd * 3rd * 4th = 19.3\%$. Hence the odds of having at least one card good for Halaster / Sangalor during setup at Cliffwatch inn is $100 - 19.3 = 80.7\%$, which is actually a little lower.

The ratio between Halaster / Sangalor and the other lords odds to get a suitable quest on Cliffwatch Inn is then 1.09 in favour of the standard lords. This seems to prove the fact that both Halaster / Sangalor and the standard lords have similar odds of getting at least one good quest at Cliffwatch Inn.

Point is that there could be a consistent bonus deriving from buildings in play. Odds of not having any Sk or Un in play at the beginning of the game: 28.34%; hence, the odds for having at least one expansion building available for purchase at the beginning of the game is 71.65%. This clearly plays in favour of the two new lords.

So, even though the ratio between the frequencies for a "normal" lord and Halaster / Sangalor is 1.21 and this means that, in order to have the balance preserved, points scored by Halaster / Sangalor should be increased by 1.21 (id est, if we consider the 4 extra points awarded by the end of the game, $4 * 1.21 = 4.84$, so, a good fix for these two lords should be raising the bonus from completed quests / buildings to 5 points), the compound probability of having at least one good quest / building for them should be taken into account. By looking at these further data, it's evident how these frequencies skew the distribution in a different way.

So, the suggested fix is: reducing the total bonus points they grant you by the end of the game to 4 points for expansion quest completed.

Irusyl

This guy allows you to score 6 points per completed quest of a certain type. Even though statistics seem to prove the guy is balanced (the frequency for getting quests is 20%, which is half the frequency "normal lords", so that $4 * 1.5 = 6$ which are the points you're awarded at the end of the

game), empirical evidence proved that often Lords focus mostly on one type of quests, so that 6 points / quest could easily award 60 extra points by the end of the game against the usual 40 done on average by "normal" lords. **This suggests Irusyl should be nerfed down to 5 points / quest.**

Trobriand

This guy's totally crazy. He awards you 5 points / completed quest worth 10+ points. Let's look at the numbers:

- LoW: 27/60 cards are worth 10+ points = 45%
- LoW+Sk: 44/90 = 49%
- LoW+Un: 50/90 = 56%
- LoW+Un+Sk: 63% (under the hypothesis that the quest removal was done according to what above illustrated)

Nerfing him down to 4 points / completed 10+ point quest could not be a good choice. The real fix should derive from comparing the quest pool giving points at the end of the game. Let's go in deeper details: a normal lord could benefit from 36/90 cards at the end of the game to score 4 points each. This means there is a pool of $36 \times 4 = 144$ points for that lord. If Trobriand was to score 5 points / quest, he should have a restricted pool of $144 / 5 = 28.8$ quests. By doing a proper deck analysis, we notice in the core game 13 quests worth 13+ points, and 14 quests worth 13+ points both in Skullport and in Undermountain, so that, **playing with one expansion at a time, the proper fix for Trobriand is 5 extra points awarded / quest worth at least 13 points** (this gives both a total of 27 quests "good for him", which is not too distant from the ideal 28.8); when playing only with the core game, a normal lord can benefit of 24/60 quests giving him a total of 96 points; this means that, at a ratio of 5 points / quest, Trobriand should have a restricted pool of 19 quests max. This is exactly the number of 11+ point quests in the core set, so, **when playing core LoW and no expansion in, a good fix for Trobriand is 5 extra points awarded / quest worth at least 11 points**; finally, under the hypothesis of card removal as specified at the beginning of this post, **with both expansions in, then a good fix could be awarding 5 extra points / quest worth 14+ points completed at the end of the game** (26 match this description)

Danilo

Danilo is one of those who suffer the most with the poor scaling of the game. When you play 6p, you usually end up the game with very few quests, and it's also more difficult getting the proper

type of quest unless you are allowed to act in the earlier part of the turn. So that, Danilo's ability is great: he scraps the scum of out the dungeons, and uses it for the best. In 2p/3p games, the number of completed quests at the end of the game is usually very high, and it's not difficult getting the quests you need, so that actually Danilo becomes very weak.

A possible **fix for Danilo** in a 2p or 3p game could be awarding him of 3 points / quest completed and then give him a bonus 5 points. It should be balanced in 4p to 6p games.

The Xanathar

Among all the new Lords, the Xanathar is the one giving me the greatest headaches. Point is:

- a) there are too many ways to get rid of corruptions, so that other Lords can exploit Skullport and have clean hands at the end of the game
- b) the increment in the penalty for having corruption is not linear, but varies according to a power law, while the Xanathar bonus is linear. One possible **fix** (the one I feel to suggest as the best one) could be rising the final score for the Xanathar by a lot more points (7) so that he's actually encouraged to push on the accelerator. Otherwise, you could allow the Xanathar to return to the box before final scoring a number of corruptions (from his supply) equals to the number of quests he completed, or something similar. It's the most difficult lord to balance; if any of you plays any game with the Xanathar, please send me a GM with the detailed situation before final scoring (number of players in; long game or not; number of corruptions for each player; number of corruptions on the corruption track) and after the final scoring, so that I could have a consistent series of data to analyze and find a proper fix for this one.

Ok, here we go. I believe the analysis to be completed by now, and hopefully should grant everybody a better gaming experience.

If you have considerations on any of the points I touched, I'm always glad to receive feedback 😊

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