Hearthstone - Game Analysis

GoogleSheets Guide&Comments

https://playhearthstone.com/en-us/

Access the GoogleSheet file HERE:
https://docs.google.com/spreadsheets/d/1ziuQmP2XTDIGUFvi_R6GlClitmbPm47wAVpb1pAq7do/edit?usp=sharing

The list of cards was retrieved from reddit.com and it had to be considerably adjusted deleting all the irrelevant categories for the purpose of this research. This kind of deleted data included: heroes, special cards, easter eggs, display-only cards (used in the game to show effect happening), animation cards, placeholders, playtest version of some cards, etc...
Regarding the type of cards (Spells & Minions), for a matter of scoping, I decided to stick only to Minions in order to reverse engineer their cost structure.

The minion list contains around 1000 elements and it's updated to the "Journey to Un'Goro" expansion pack.

Attention:

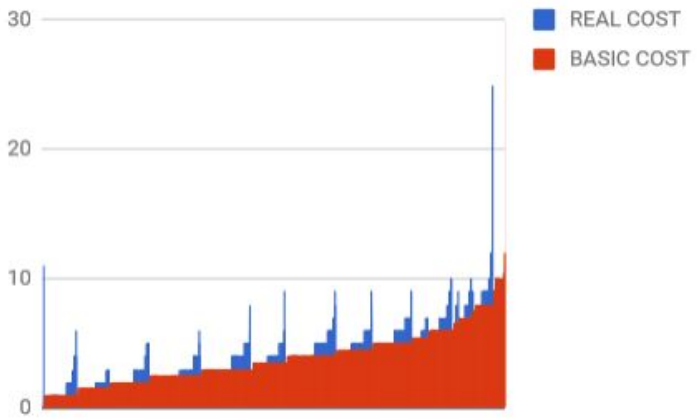
- **All the analysis and the graphs are displayed on the extreme right of the sheet**
- **In order to properly display some graphs, the respective column should be sorted from A to Z.**

First draft base for values

In order to draft the analysis I started looking at the values of Attack and Health of the cards. Creating an algebraic system of **10 classic vanilla cards without any effect of property**, It was clear that the basic relation between the Attack and the Health is an average number between the two, rounded down. Then, I created a column called **BASIC COST** to store the raw numbers, not rounded, for more precision in the further steps.

Basic Cost = AVERAGE(Attack, Health)

If this was the only calculus needed to get the card cost, than the Basic Cost and the Real Cost should always be the same. Obviously, this was not the case.



However, we can observe how the **growth of the basic cost is quite linear**. The Basic Cost graph shows clearly that the Attack/Health distribution in hearthstone is very balanced.
At the same time, the real cost presents periodic peaks, probably related with the card text. So for each level of Attack and Health, HS has a more expensive card that brings some interesting properties.
Therefore, to increase the precision of my analysis I had to take into consideration effects and properties as well. Before that, few steps were needed.

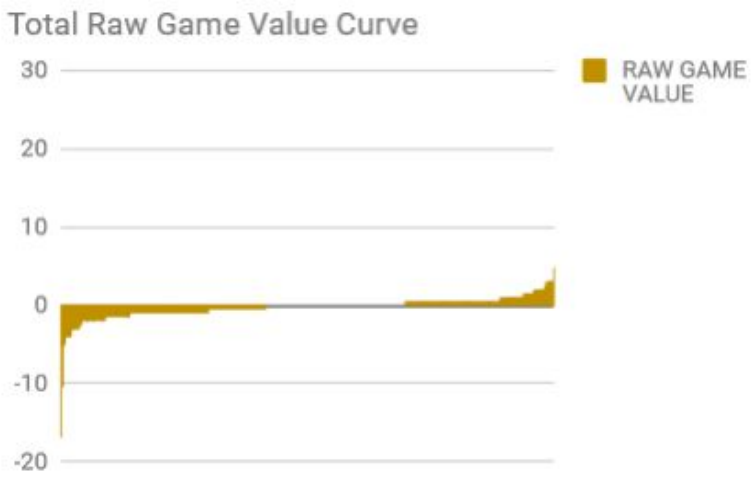
To start, I created a column called **RAW GAME VALUE** to understand if a card had a convenient cost only in relation with its Attack and Health. Then I created a **TEXT FACTOR** to sum to it and see if the **COMPLETE GAME VALUE** had a better curve. (See more about Text Factor in the following paragraphs)

Raw Game Value is a simple difference between the Basic Cost I calculated and Real Cost reported on the card.

Raw Game Value = Basic Cost - Real Cost

If the resulting **number is negative**, it means that the card should cost less that it does, so the card has a **bad basic power value**. On the opposite, if the **Game Value is positive**, it means that the card should cost more that it does, so the **basic power value is good**.

Assuming that Hearthstone is a perfectly balanced game, the Game Value should be 0 on every card. However, more than once the creators declared that in the game there are cards that are good and cards that are bad, on purpose, to spice up the meta. This means that there is no way every card will have a Game Value of 0. Thus, the game value curve should be mostly on zero, with small portions above it and underneath. These abnormal portions are one of the factors that define the meta.



At the current state, the curve resembled something similar to that, however, the analysis is still not taking into consideration effects and properties. Therefore, the next step to get a more precise game value was to **include a factor for the text of the card, considering the property and the modifiers**.

The expected result was to have less cards in both abnormal zones.
For the purpose of demonstrating this, the following manual tweaks were applied only to the Basic set cards, which are the cards that any HS players has on the first access of the game. The basic set represent a good testing ground as it has a nice mix of effect, properties, types and stats.

Converting text and properties into stats

According to pro players, dev interviews, forums, and my wide - yet less valuable - experience with the game, we can consider some rules to understand card texts.
A good overall rule of thumb is to **convert the effect into approximate statistics of Attack and Health**, which are more measurable and clear.

1. A card with **2 Attack and 2 Health** that has text **"Battlecry: deal 2 damage"**, it can be considered close to a **4 Attack and 2 Health**.

2. If a card has **1 Attack and 1 Health** but has text **"Battlecry: gain 2 Health for each Murloc on the battlefield"**, the calculus is trickier because you can't predict the actual gameplay situation. In these cases it is fair to assume a number of Murlocs that have to be on the battlefield for the card to be good, considering statistical probability and mana cost. However, cards like this one often become fair when there is at least two other cards that allows the synergy, and good when there is more than two.

3. This way of thinking is valid also for cards that have text : **“gain +2+2 at the end of each turn”.** This kind of cards has an ideal infinite value, however, when playing and deck-building we can consider the effect applied **only for one turn**. It is assumed that the opponent will remove your card in one turn.

4. If a **card has a type** (beast, dragon, demon etc..) it has a slightly increased value as it allows potential synergy even if the text is blank.

5. If a card reduce the cost of another, we can use the previously calculated ratio of 1 mana = 1 Attack + 1 Health.

Given these main cases, and more detailed and specific rules, I created a **TEXT FACTOR column** to be summed to the GAME VALUE column, to obtain a more realistic game value.

Here is a scheme of the main features converted to Text Factors.

- **No text = 0**
- **Beast, Dragon, Murolc, Demon, etc.. = 0.2**
- **Taunt, Stealth = 0.5**
- **Enrage, Windfury = 0.3**
- **Divine Shield = Attack Value**
- **“+X/+Y to a card” = Average(X,Y)**
- **“+X/+Y for each Type” = Average(X,Y)+0.5**
- **“+X to adiacent ones” = Average(2X,0)**

The results on the Basic Card set highlight a better distribution of the cards. Many cards, which were marked as bad using the raw value, became average or even good.

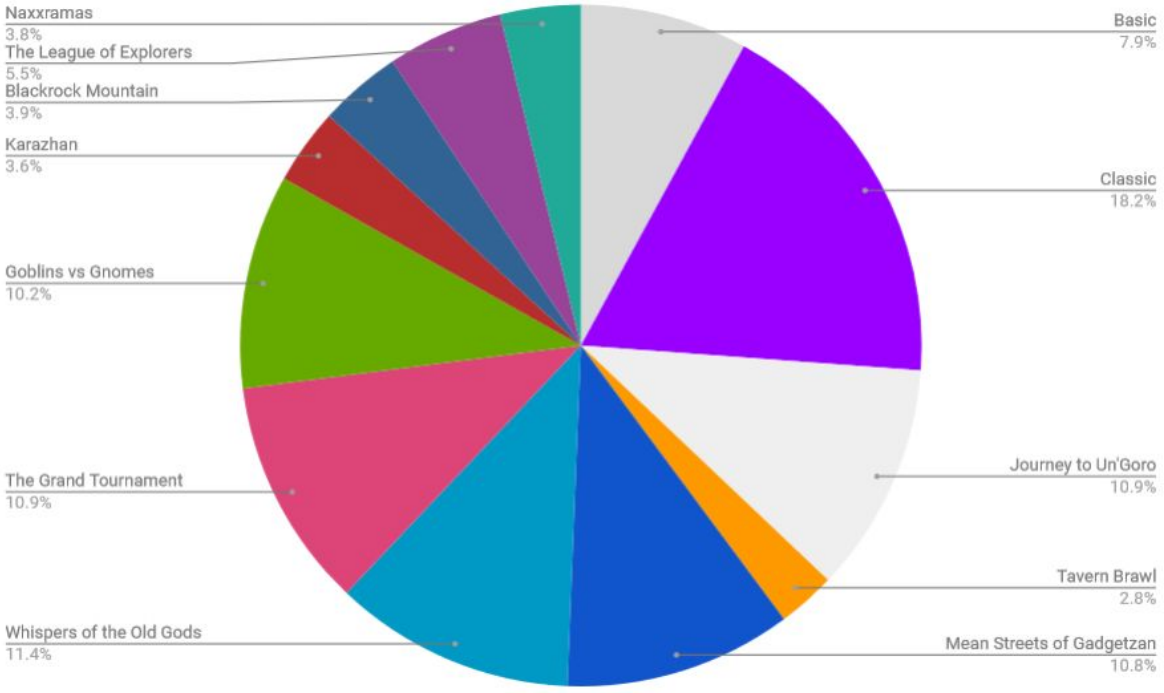
Complete Game Value = Text Factor + Raw Game Value

As shown in the graphic, the amount of bad cards decreased in favor of a more **linear Game Value curve**.

From this data, we can also see how is the value distribution for the Basic Set according to the classes.

As the graph shows, the neutral cards from the basic set are among the worst, which makes sense as they are mostly vanilla minions with no effect. On the other hand we can see how the overall value is balanced between the class cards, in favor of Warlok, Mage and Priest, which have cards that are often used even in the current meta.

As a last piece of analysis it interesting to see the very balanced distribution of cards among all the expansions or the card type.



Both the adventures (Naxxramas, Blackrock Mountain, The League of Explorers, Karazhan) and the expansion packs have a clear **constant amount amount of cards**.

Conclusions

Hearthstone is an extremely complex game and it is very hard to predict the actual value of a card without considering deck building, statistics and probability and the current meta of the game. However, this analysis wants to offer a foundation for a quick understanding of game values when it comes to Attack, Health, and common card text. Further steps would include a more precise mapping of the relations between Text Factor and Game Value, and between then Game Values and Classes/Expansions.