



Universitat
de les Illes Balears

21746 - Data Mining

Final Project

Steam Successful Indie Games Study

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Contents

1	Introduction	1
1.1	Explanation of the Attributes	1
1.2	Objectives	1
2	Procesing de data	1
2.1	Handling of NA values	4
3	Requeriments for Successful Indie Games	6
3.1	Obtain Unique values for different columns	6
4	Can a single game have enough influence to make other games have its tag?	11
4.1	Game study: Slay the Spire (Roguelike Deckbuilder)	11
4.2	Game Study: The Binding Of Isaac + The Binding Of Isaac Rebirth (Roguelike)	15

1 Introduction

1.1 Explanation of the Attributes

The dataset we will be working with contains a total number of 94948 observations and 47 columns or variables. The columns that will be used are described below:

- **appid**: Unique identifier of the game on Steam. [num]
- **name**: Name of the game. [text]
- **'released_date'**: Represents the date where the game was released. [time]
- **'required_age'**: Corresponds to the minimum age required to play the game. [num]
- **price**: How much the game costs. If its 0 it means that the game is Free to Play. [num]
- **dlc_count**: Amount of DLCs (Downloadable Contents) the game has. [num]
- **support_url**: URL to the support page of the game. [text]
- **windows**: Determines if the game runs in windows. [categorical]
- **mac**: Determines if the game runs in mac. [categorical]
- **linux**: Determines if the game runs in linux. [categorical]
- **metacritic_score**: Metacritic score based on critical reviews (reviews from professionals). By performing an investigation we think that a score of 0 means that when the scraping of the data was done there were no reviews for that game yet. [num]
- **achievements**: Number of achievements the game has. [num]
- **'recommendations'**: Amount of user recommendations. [num]
- **supported_languages**: List of languages that the game supports. **[NO SÉ QUE CATEGORÍA DARLE]**
- **packages**: Available packages for the game. It contains the name and a description of the package and the names, descriptions and subprices of the subpackages. **[LO MISMO QUE ARRIBA]**
- **Developers**: List of developers associated with the game. **[LO MISMO QUE ARRIBA]**
- **publishers**: List of publishers associated with the game. **[LO MISMO QUE ARRIBA]**
- **categories**: List of categories that the game has. **[LO MISMO QUE ARRIBA]**
- **genres**: List of genres that the game belongs to. **[LO MISMO QUE ARRIBA]**
- **positive**: Amount of positive votes the game has. [num]
- **negative**: Amount of negative votes the game has. [num]
- **estimated_owners**: Estimated owners of the game. [text]
- **average_playtime_forever**: Average playtime since March 2009 measured in minutes. [num]
- **average_playtime_2weeks**: Average playtime in the last two weeks measured in minutes. [num]
- **median_playtime_forever**: Median playtime since March 2009 measured in minutes. [num]
- **median_playtime_2weeks**: Median playtime in the last two weeks measured in minutes. [num]
- **peak_ccu**: Number of current users playing the day before the data was scrapped. [num]
- **tags**: List of tags the game has with its name and its key. **[NO SE QUE CATEGORIA DARLE]**
- **pct_pos_total**: Percentage of all reviews that are positive. [num]
- **num_reviews_total**: Number of the total reviews the game has. [num]

1.2 Objectives

TODO: ADD OBJECTIVES OF STUDY

2 Procesing de data

General look of the dataset

```
summary(steam)
```

```
##      appid          name       release_date   required_age
##  Min.   :    20  Length:94948   Length:94948   Min.   :-1.0000
##  1st Qu.: 887338 Class :character Class :character  1st Qu.: 0.0000
##  Median :1591145 Mode  :character Mode  :character  Median : 0.0000
##  Mean   :1707530                           Mode   :character  Mean   : 0.1783
##  3rd Qu.:2491702                           Class  :character 3rd Qu.: 0.0000
##  Max.   :3570420                           Class  :character Max.   :21.0000
##
##      price          dlc_count  detailed_description about_the_game
##  Min.   : 0.000  Min.   : 0.0000  Length:94948   Length:94948
##  1st Qu.: 0.990  1st Qu.: 0.0000  Class :character Class :character
##  Median : 3.990  Median : 0.0000  Mode  :character Mode  :character
##  Mean   : 6.911  Mean   : 0.5632
##  3rd Qu.: 9.990  3rd Qu.: 0.0000
##  Max.   :999.980  Max.   :3427.0000
##
##      short_description reviews      header_image      website
##  Length:94948   Length:94948   Length:94948   Length:94948
##  Class :character Class :character Class :character Class :character
##  Mode  :character Mode  :character Mode  :character Mode  :character
##
##      support_url      support_email      windows      mac
##  Length:94948   Length:94948   Length:94948   Length:94948
##  Class :character Class :character Class :character Class :character
##  Mode  :character Mode  :character Mode  :character Mode  :character
##
##      linux          metacritic_score metacritic_url      achievements
##  Length:94948   Min.   : 0.000  Length:94948   Min.   : 0.00
##  Class :character 1st Qu.: 0.000  Class :character  1st Qu.: 0.00
##  Mode  :character Median : 0.000  Mode  :character  Median : 2.00
##                                Mean   : 2.764  Mean   : 19.54
##                                3rd Qu.: 0.000  3rd Qu.: 19.00
##                                Max.   :97.000  Max.   :9821.00
##
##      recommendations      notes      supported_languages full_audio_languages
##  Min.   :    0  Length:94948   Length:94948   Length:94948
##  1st Qu.:    0  Class :character Class :character Class :character
##  Median :    0  Mode  :character Mode  :character Mode  :character
##  Mean   : 1022
##  3rd Qu.:    0
##  Max.   :4401572
##
##      packages      developers      publishers      categories
##  Length:94948   Length:94948   Length:94948   Length:94948
##  Class :character Class :character Class :character Class :character
```

```

##   Mode :character   Mode :character   Mode :character   Mode :character
##
##
##
##
##      genres           screenshots          movies        user_score
##  Length:94948       Length:94948       Length:94948      Min.   : 0.00000
##  Class :character   Class :character   Class :character  1st Qu.: 0.00000
##  Mode  :character   Mode  :character   Mode  :character  Median : 0.00000
##                                         Mean   : 0.03097
##                                         3rd Qu.: 0.00000
##                                         Max.   :100.00000
##
##      score_rank      positive      negative estimated_owners
##  Min.   : 98.00   Min.   :     0   Min.   :     0   Length:94948
##  1st Qu.: 99.00   1st Qu.:     0   1st Qu.:     0   Class :character
##  Median : 99.00   Median :     8   Median :     2.0   Mode  :character
##  Mean   : 99.13   Mean   : 1218   Mean   : 202.1
##  3rd Qu.:100.00   3rd Qu.:    51   3rd Qu.:    15.0
##  Max.   :100.00   Max.   :7480813  Max.   :1135108.0
##  NA's   :94909
##      average_playtime_forever average_playtime_2weeks median_playtime_forever
##  Min.   : 0.0       Min.   : 0.000       Min.   : 0.0
##  1st Qu.: 0.0       1st Qu.: 0.000       1st Qu.: 0.0
##  Median : 0.0       Median : 0.000       Median : 0.0
##  Mean   : 108.6     Mean   : 4.757       Mean   : 108.4
##  3rd Qu.: 0.0       3rd Qu.: 0.000       3rd Qu.: 0.0
##  Max.   :1462997.0  Max.   :18568.000     Max.   :1462997.0
##
##      median_playtime_2weeks   discount      peak_ccu
##  Min.   : 0.000   Min.   : 0.000   Min.   :0.000e+00
##  1st Qu.: 0.000   1st Qu.: 0.000   1st Qu.:0.000e+00
##  Median : 0.000   Median : 0.000   Median :0.000e+00
##  Mean   : 5.018   Mean   : 4.307   Mean   :9.285e+01
##  3rd Qu.: 0.000   3rd Qu.: 0.000   3rd Qu.:0.000e+00
##  Max.   :18568.000 Max.   :100.000   Max.   :1.212e+06
##
##      tags           pct_pos_total num_reviews_total pct_pos_recent
##  Length:94948       Min.   :-1.00   Min.   : -1   Min.   :-1.000
##  Class :character   1st Qu.:-1.00   1st Qu.: -1   1st Qu.:-1.000
##  Mode  :character   Median : 58.00   Median : 15   Median : -1.000
##                                         Mean   : 44.63   Mean   : 5.328
##                                         3rd Qu.: 84.00   3rd Qu.: 80   3rd Qu.:-1.000
##                                         Max.   :100.00   Max.   :8632939  Max.   :100.000
##
##      num_reviews_recent
##  Min.   : -1.00
##  1st Qu.: -1.00
##  Median : -1.00
##  Mean   : 16.88
##  3rd Qu.: -1.00
##  Max.   :96473.00
##

```

Explanation of first looks of it, bad formatting, NA's, negative values...

2.1 Handling of NA values

The attributes with missing values are:

```
na_counts <- steam %>% summarise_all(~ sum(is.na(.)))
```

```
print(na_counts)
```

```
##   appid name release_date required_age price dlc_count detailed_description
## 1      0     0           0          0     0       0                   0
##   about_the_game short_description reviews header_image website support_url
## 1            0           0         0         0       0                   0
##   support_email windows mac linux metacritic_score metacritic_url achievements
## 1            0     0   0   0       0           0                   0
##   recommendations notes supported_languages full_audio_languages packages
## 1            0     0           0           0       0                   0
##   developers publishers categories genres screenshots movies user_score
## 1            0     0           0           0       0           0
##   score_rank positive negative estimated_owners average_playtime_forever
## 1      94909      0     0           0           0
##   average_playtime_2weeks median_playtime_forever median_playtime_2weeks
## 1            0           0           0
##   discount peak_ccu tags pct_pos_total num_reviews_total pct_pos_recent
## 1            0     0   0           0           0           0
##   num_reviews_recent
## 1            0
```

The columns with missing values are as follows:

Los juegos con número de reseñas = -1 creemos que son porque el scrappear ha fallado durante su ejecución. Si vamos a trabajar con las reseñas podríamos decir en la presentación que vamos a probar de volver a intentar scrappear la información

```
## # tibble [88,982 x 30] (S3: tbl_df/tbl/data.frame)
## $ appid                  : int [1:88982] 2556940 449940 1287250 866510 ...
## $ name                   : chr [1:88982] "! Shakabula *" "! That Bastard Is Trying To Steal Our Go...
## $ release_date            : Date[1:88982], format: "2023-10-13" "2016-03-03" ...
## $ required_age            : int [1:88982] 0 0 0 0 0 0 0 0 0 ...
## $ price                  : num [1:88982] 14.99 2.99 19.99 1.99 0.99 ...
## $ dlc_count               : int [1:88982] 0 0 0 39 0 0 0 1 3 0 ...
## $ windows                 : chr [1:88982] "True" "True" "True" "True" ...
## $ mac                     : chr [1:88982] "False" "False" "False" "False" ...
## $ linux                   : chr [1:88982] "False" "True" "False" "False" ...
## $ metacritic_score        : int [1:88982] 0 0 0 0 0 0 0 0 0 ...
## $ achievements             : int [1:88982] 0 0 9 4997 2021 0 0 19 13 5 ...
## $ recommendations          : int [1:88982] 0 0 0 495 0 0 0 108 0 0 ...
## $ supported_languages      : chr [1:88982] "[{'English'}]" "[{'English'}]" "[{'English', 'Simplified Chinese'}]" ...
## $ packages                : chr [1:88982] "[{'title': 'Buy ! Shakabula *', 'description': '', 'subs...
## $ developers               : chr [1:88982] "[{'Skermunkel'}]" "[{'WTFOMGames'}]" "[{'Andreev Worlds'}]" "[{'...
## $ publishers              : chr [1:88982] "[{'Skermunkel'}]" "[{'WTFOMGames'}]" "[{'Andreev Worlds'}]" "[{'...
## $ categories              : chr [1:88982] "[{'Single-player', 'Full controller support', 'Steam Cloud...]
```

```

## $ genres : chr [1:88982] "[‘Action’, ‘Indie’, ‘RPG’, ‘Early Access’]" "[‘Action’, “Indie”, “RPG”, “Early Access”]"
## $ positive : int [1:88982] 0 57 45 410 25 83 37 126 0 0 ...
## $ negative : int [1:88982] 4 78 34 180 32 18 102 10 0 0 ...
## $ average_playtime_forever: int [1:88982] 0 312 0 360 0 0 244 0 0 0 ...
## $ average_playtime_2weeks : int [1:88982] 0 0 0 0 0 0 0 0 0 0 ...
## $ median_playtime_forever : int [1:88982] 0 391 0 378 0 0 244 0 0 0 ...
## $ median_playtime_2weeks : int [1:88982] 0 0 0 0 0 0 0 0 0 0 ...
## $ peak_ccu : int [1:88982] 0 0 0 6 0 0 0 0 0 0 ...
## $ tags : chr [1:88982] “{‘Early Access’: 213, ‘Action’: 193, ‘RPG’: 187, ‘JRPG’: 165, ‘Strategy’: 145, ‘Puzzle’: 135, ‘Sports’: 125, ‘Horror’: 115, ‘Adventure’: 105, ‘Sci-Fi’: 95, ‘Horror-Adventure’: 85, ‘Strategy-Horror’: 75, ‘Puzzle-Strategy’: 65, ‘Sports-Horror’: 55, ‘Adventure-Horror’: 45, ‘Sci-Fi-Horror’: 35, ‘Strategy-Puzzle’: 25, ‘Puzzle-Sports’: 15}”
## $ pct_pos_total : int [1:88982] -1 55 61 71 55 82 55 91 95 66 ...
## $ num_reviews_total : int [1:88982] -1 68 62 495 18 101 20 108 281 12 ...
## $ estimated_owners_min : int [1:88982] 0 50000 0 100000 0 0 100000 20000 0 0 ...
## $ estimated_owners_max : int [1:88982] 20000 100000 20000 200000 20000 20000 200000 50000 0 0 ...

##      appid          name       release_date   required_age
## Min. : 20  Length:88982    Min. :1997-06-30  Min. :-1.0000
## 1st Qu.: 852782 Class :character  1st Qu.:2018-12-05  1st Qu.: 0.0000
## Median :1522535 Mode  :character  Median :2021-10-29  Median : 0.0000
## Mean   :1655079                  Mean   :2021-04-04  Mean   : 0.1826
## 3rd Qu.:2429338                  3rd Qu.:2023-12-14  3rd Qu.: 0.0000
## Max.  :3542350                  Max. :2025-03-10  Max. :21.0000

##      price        dlc_count       windows        mac
## Min. : 0.000  Min. : 0.0000  Length:88982  Length:88982
## 1st Qu.: 0.990 1st Qu.: 0.0000  Class :character  Class :character
## Median : 4.990 Median : 0.0000  Mode  :character  Mode  :character
## Mean   : 7.349 Mean   : 0.5957
## 3rd Qu.: 9.990 3rd Qu.: 0.0000
## Max.  :999.980 Max.  :3427.0000

##      linux      metacritic_score achievements recommendations
## Length:88982  Min. : 0.00  Min. : 0.00  Min. : 0
## Class :character  1st Qu.: 0.00  1st Qu.: 0.00  1st Qu.: 0
## Mode  :character  Median : 0.00  Median : 5.00  Median : 0
## Mean   : 2.91  Mean   : 20.67  Mean   : 1013
## 3rd Qu.: 0.00  3rd Qu.: 20.00  3rd Qu.: 0
## Max.  :97.00  Max.  :9821.00  Max. :4401572

##      supported_languages packages      developers      publishers
## Length:88982  Length:88982  Length:88982  Length:88982
## Class :character  Class :character  Class :character  Class :character
## Mode  :character  Mode  :character  Mode  :character  Mode  :character
## 

##      categories      genres      positive      negative
## Length:88982  Length:88982  Min. : 0  Min. : 0.0
## Class :character  Class :character  1st Qu.: 1  1st Qu.: 0.0
## Mode  :character  Mode  :character  Median : 10  Median : 2.0
## Mean   : 1267  Mean   : 208.3
## 3rd Qu.: 59  3rd Qu.: 17.0
## Max.  :7480813  Max. :1135108.0

##      average_playtime_forever average_playtime_2weeks median_playtime_forever
## Min. : 0.0  Min. : 0.000  Min. : 0.0
## 1st Qu.: 0.0  1st Qu.: 0.000  1st Qu.: 0.0
## Median : 0.0  Median : 0.000  Median : 0.0
## Mean   :115.6  Mean   : 4.998  Mean   : 115.5

```

```

## 3rd Qu.: 0.0      3rd Qu.: 0.000      3rd Qu.: 0.0
## Max.   :1462997.0    Max.   :18568.000    Max.   :1462997.0
## median_playtime_2weeks peak_ccu           tags          pct_pos_total
## Min.   : 0.000      Min.   :0.000e+00  Length:88982    Min.   :-1.00
## 1st Qu.: 0.000      1st Qu.:0.000e+00  Class :character 1st Qu.:-1.00
## Median : 0.000      Median :0.000e+00  Mode  :character  Median : 60.00
## Mean   : 5.277      Mean   :9.778e+01   Mean   : 45.39
## 3rd Qu.: 0.000      3rd Qu.:0.000e+00   3rd Qu.: 84.00
## Max.   :18568.000     Max.   :1.212e+06   Max.   :100.00
## num_reviews_total estimated_owners_min estimated_owners_max
## Min.   :-1       Min.   : 0       Min.   : 0
## 1st Qu.:-1       1st Qu.: 0       1st Qu.: 20000
## Median : 15      Median : 0       Median : 20000
## Mean   : 1320    Mean   : 59038   Mean   : 143056
## 3rd Qu.: 81      3rd Qu.: 0       3rd Qu.: 20000
## Max.   :8632939  Max.   :200000000  Max.   :5000000000

```

3 Requirements for Successful Indie Games

Create helper function for extracting unique elements from entries with a list of values. All lists follow the same pattern: ['el1', 'el2', ...] being [] for empty lists.

Create helper function for extracting unique tags. These are formatted differently and follow dictionary-like pattern where each element is a key-value pair being [] for empty entries.

3.1 Obtain Unique values for different columns

```

## [1] "Captions available"          "Co-op"
## [3] "Commentary available"        "Cross-Platform Multiplayer"
## [5] "Family Sharing"              "Full controller support"
## [7] "HDR available"               "In-App Purchases"
## [9] "Includes level editor"       "Includes Source SDK"
## [11] "LAN Co-op"                  "LAN PvP"
## [13] "MMO"                        "Multi-player"
## [15] "Online Co-op"                "Online PvP"
## [17] "Partial Controller Support" "PvP"
## [19] "Remote Play on Phone"       "Remote Play on Tablet"
## [21] "Remote Play on TV"          "Remote Play Together"
## [23] "Shared/Split Screen"        "Shared/Split Screen Co-op"
## [25] "Shared/Split Screen PvP"    "Single-player"
## [27] "Stats"                      "Steam Achievements"
## [29] "Steam Cloud"                "Steam Leaderboards"
## [31] "Steam Timeline"              "Steam Trading Cards"
## [33] "Steam Turn Notifications"    "Steam Workshop"
## [35] "SteamVR Collectibles"        "Tracked Controller Support"
## [37] "Valve Anti-Cheat enabled"    "VR Only"
## [39] "VR Support"                 "VR Supported"

## [1] "360 Video"                  "Accounting"          "Action"
## [4] "Adventure"                  "Animation & Modeling" "Audio Production"
## [7] "Casual"                      "Design & Illustration" "Documentary"
## [10] "Early Access"                 "Education"          "Episodic"

```

```

## [13] "Free To Play"           "Game Development"      "Gore"
## [16] "Indie"                  "Massively Multiplayer" "Movie"
## [19] "Nudity"                 "Photo Editing"          "Racing"
## [22] "RPG"                    "Sexual Content"        "Short"
## [25] "Simulation"            "Software Training"    "Sports"
## [28] "Strategy"               "Tutorial"              "Utilities"
## [31] "Video Production"       "Violent"                "Web Publishing"

## [1] "1980s"                   "2.5D"
## [3] "2D"                      "2D Fighter"
## [5] "2D Platformer"           "360 Video"
## [7] "3D"                      "3D Fighter"
## [9] "3D Platformer"           "3D Vision"
## [11] "4 Player Local"         "4X"
## [13] "6DOF"                   "8-bit Music"
## [15] "Abstract"               "Action"
## [17] "Action Roguelike"        "Action RPG"
## [19] "Action RTS"             "Action-Adventure"
## [21] "Addictive"              "Adventure"
## [23] "Agriculture"            "Aliens"
## [25] "Alternate History"     "Ambient"
## [27] "America"                "Animation & Modeling"
## [29] "Anime"                  "Arcade"
## [31] "Archery"                "Arena Shooter"
## [33] "Artificial Intelligence" "Assassin"
## [35] "Asymmetric VR"         "Asynchronous Multiplayer"
## [37] "Atmospheric"            "ATV"
## [39] "Audio Production"       "Auto Battler"
## [41] "Automation"             "Automobile Sim"
## [43] "Base-Building"          "Baseball"
## [45] "Based On A Novel"       "Basketball"
## [47] "Battle Royale"          "Beautiful"
## [49] "Benchmark"              "Bikes"
## [51] "Birds"                  "Blood"
## [53] "BMX"                    "Board Game"
## [55] "Boomer Shooter"         "Boss Rush"
## [57] "Bowling"                "Boxing"
## [59] "Building"               "Bullet Hell"
## [61] "Bullet Time"            "Capitalism"
## [63] "Card Battler"           "Card Game"
## [65] "Cartoon"                "Cartoony"
## [67] "Casual"                 "Cats"
## [69] "Character Action Game"  "Character Customization"
## [71] "Chess"                  "Choices Matter"
## [73] "Choose Your Own Adventure" "Cinematic"
## [75] "City Builder"           "Class-Based"
## [77] "Classic"                "Clicker"
## [79] "Co-op"                  "Co-op Campaign"
## [81] "Coding"                  "Cold War"
## [83] "Collectathon"           "Colony Sim"
## [85] "Colorful"                "Combat"
## [87] "Combat Racing"          "Comedy"
## [89] "Comic Book"              "Competitive"
## [91] "Conspiracy"              "Controller"

```

```
## [93] "Conversation"
## [95] "Cozy"
## [97] "Creature Collector"
## [99] "Crime"
## [101] "CRPG"
## [103] "Cute"
## [105] "Cycling"
## [107] "Dark Comedy"
## [109] "Dark Humor"
## [111] "Deckbuilding"
## [113] "Design & Illustration"
## [115] "Detective"
## [117] "Difficult"
## [119] "Diplomacy"
## [121] "Dog"
## [123] "Drama"
## [125] "Dungeon Crawler"
## [127] "Dwarf"
## [129] "Dystopian"
## [131] "Early Access"
## [133] "Education"
## [135] "Electronic Music"
## [137] "Emotional"
## [139] "Episodic"
## [141] "Experience"
## [143] "Exploration"
## [145] "Faith"
## [147] "Fantasy"
## [149] "Farming Sim"
## [151] "Feature Film"
## [153] "Fighting"
## [155] "Fishing"
## [157] "FMV"
## [159] "Football (American)"
## [161] "Foreign"
## [163] "FPS"
## [165] "Funny"
## [167] "Gambling"
## [169] "GameMaker"
## [171] "Gaming"
## [173] "Golf"
## [175] "Gothic"
## [177] "Great Soundtrack"
## [179] "Gun Customization"
## [181] "Hacking"
## [183] "Hardware"
## [185] "Hentai"
## [187] "Hex Grid"
## [189] "Historical"
## [191] "Hockey"
## [193] "Horses"
## [195] "Idler"
## [197] "Immersive"
## [199] "Indie"
## [201] "Inn"
## [203] "Instrumental Music"
## [205] "Interactive Story"
## [207] "Investigation"
## [209] "Item Collection"
## [211] "Jigsaw"
## [213] "Job Simulator"
## [215] "Kiddie Game"
## [217] "LARP"
## [219] "Laser Tag"
## [221] "Legal"
## [223] "Lore"
## [225] "Lovecraftian"
## [227] "Ludo"
## [229] "Maze"
## [231] "Mechanics"
## [233] "Memory Game"
## [235] "Metroidvania"
## [237] "Microgame"
## [239] "Mind Game"
## [241] "Modding"
## [243] "Monetization"
## [245] "Multiplayer"
## [247] "Mythology"
## [249] "Narrative"
## [251] "Niche"
## [253] "Non-Linear"
## [255] "Novelty"
## [257] "Obstruction"
## [259] "Open World"
## [261] "Parody"
## [263] "Puzzle"
## [265] "Quest"
## [267] "Racing"
## [269] "Rhythm"
## [271] "Roleplay"
## [273] "Romantic"
## [275] "RPG"
## [277] "Rush"
## [279] "Sandbox"
## [281] "Science Fiction"
## [283] "Sci-Fi"
## [285] "Self-Promotion"
## [287] "Sexual Content"
## [289] "Shooter"
## [291] "Simulation"
## [293] "Social"
## [295] "Sports"
## [297] "Strategy"
## [299] "Survival"
## [301] "Suspense"
## [303] "Tactical"
## [305] "Tetris"
## [307] "Theater"
## [309] "Thimbleweed Park"
## [311] "Time Travel"
## [313] "Top-Down"
## [315] "Tower Defense"
## [317] "Tragedy"
## [319] "True Crime"
## [321] "Turn-Based"
## [323] "Twinkie"
## [325] "Underwater"
## [327] "Urban"
## [329] "Videogame"
## [331] "Virtual Reality"
## [333] "Virtua Fighter"
## [335] "Virtuous"
## [337] "Vocaloid"
## [339] "Vox"
## [341] "Wargame"
## [343] "Western"
## [345] "Whimsical"
## [347] "Wild West"
## [349] "World War II"
## [351] "Yakuza"
## [353] "Zelda"
## [355] "Zombie
```

```

## [201] "Intentionally Awkward Controls"           "Interactive Fiction"
## [203] "Inventory Management"                    "Investigation"
## [205] "Isometric"                            "Jet"
## [207] "Job Simulator"                         "JRPG"
## [209] "Jump Scare"                           "Kickstarter"
## [211] "LEGO"                                 "Lemmings"
## [213] "Level Editor"                          "LGBTQ+"
## [215] "Life Sim"                            "Linear"
## [217] "Local Co-Op"                          "Local Multiplayer"
## [219] "Logic"                                "Loot"
## [221] "Looter Shooter"                      "Lore-Rich"
## [223] "Lovecraftian"                        "Magic"
## [225] "Mahjong"                             "Management"
## [227] "Mars"                                "Martial Arts"
## [229] "Massively Multiplayer"                "Masterpiece"
## [231] "Match 3"                             "Mature"
## [233] "Mechs"                               "Medical Sim"
## [235] "Medieval"                            "Memes"
## [237] "Metroidvania"                        "Military"
## [239] "Mini Golf"                           "Minigames"
## [241] "Minimalist"                          "Mining"
## [243] "MMORPG"                             "MOBA"
## [245] "Mod"                                 "Moddable"
## [247] "Modern"                             "Motocross"
## [249] "Motorbike"                          "Mouse only"
## [251] "Movie"                               "Multiplayer"
## [253] "Multiple Endings"                   "Music"
## [255] "Music-Based Procedural Generation" "Musou"
## [257] "Mystery"                            "Mystery Dungeon"
## [259] "Mythology"                           "Narration"
## [261] "Narrative"                           "Nature"
## [263] "Naval"                               "Naval Combat"
## [265] "Ninja"                               "Noir"
## [267] "Nonlinear"                          "Nostalgia"
## [269] "NSFW"                                "Nudity"
## [271] "Offroad"                            "Old School"
## [273] "On-Rails Shooter"                  "Online Co-Op"
## [275] "Open World"                          "Open World Survival Craft"
## [277] "Otome"                               "Outbreak Sim"
## [279] "Parkour"                            "Parody"
## [281] "Party"                               "Party Game"
## [283] "Party-Based RPG"                   "Perma Death"
## [285] "Philosophical"                     "Photo Editing"
## [287] "Physics"                            "Pinball"
## [289] "Pirates"                            "Pixel Graphics"
## [291] "Platformer"                         "Point & Click"
## [293] "Political"                          "Political Sim"
## [295] "Politics"                            "Pool"
## [297] "Post-apocalyptic"                  "Precision Platformer"
## [299] "Procedural Generation"             "Programming"
## [301] "Psychedelic"                        "Psychological"
## [303] "Psychological Horror"              "Puzzle"
## [305] "Puzzle-Platformer"                 "PvE"
## [307] "PvP"                                "Quick-Time Events"

```



```

## [417] "Twin Stick Shooter"          "Typing"
## [419] "Underground"                 "Underwater"
## [421] "Unforgiving"                "Utilities"
## [423] "Vampire"                   "Vehicular Combat"
## [425] "Video Production"           "Vikings"
## [427] "Villain Protagonist"        "Violent"
## [429] "Visual Novel"                "Voice Control"
## [431] "Volleyball"                  "Voxel"
## [433] "VR"                         "VR Only"
## [435] "Walking Simulator"           "War"
## [437] "Wargame"                    "Warhammer 40K"
## [439] "Web Publishing"              "Well-Written"
## [441] "Werewolves"                 "Western"
## [443] "Wholesome"                  "Word Game"
## [445] "World War I"                "World War II"
## [447] "Wrestling"                  "Zombies"

```

From steam's Categories, Genres and Tags, 3 subsets have been created with samples interesting for this study. Given steam's laxity at classifying these values, the 3 subsets have been created with our own interpretation. Additionally, tags that refer to non-game software have been ignored.

Thankfully the task of filtering indie games is already provided by steam with the Tags and Genres Indie, Crowdfunded and Kickstarter. From the original dataset, only Indie games are obtained.

Prepare data for determining successful games

Cluster the data:

```

##  [1] "appid"                      "name"
##  [3] "price"                       "dlc_count"
##  [5] "windows"                     "mac"
##  [7] "linux"                       "achievements"
##  [9] "recommendations"             "supported_languages"
## [11] "positive"                    "negative"
## [13] "average_playtime_forever"    "median_playtime_forever"
## [15] "peak_ccu"                    "pct_pos_total"
## [17] "num_reviews_total"           "estimated_owners_min"
## [19] "estimated_owners_max"        "estimated_revenue"
## [21] "success_cluster"

```

4 Can a single game have enough influence to make other games have its tag?

4.1 Game study: Slay the Spire (Roguelike Deckbuilder)

```

## [1] "Slay the Spire"

## [1] "2019-01-23"

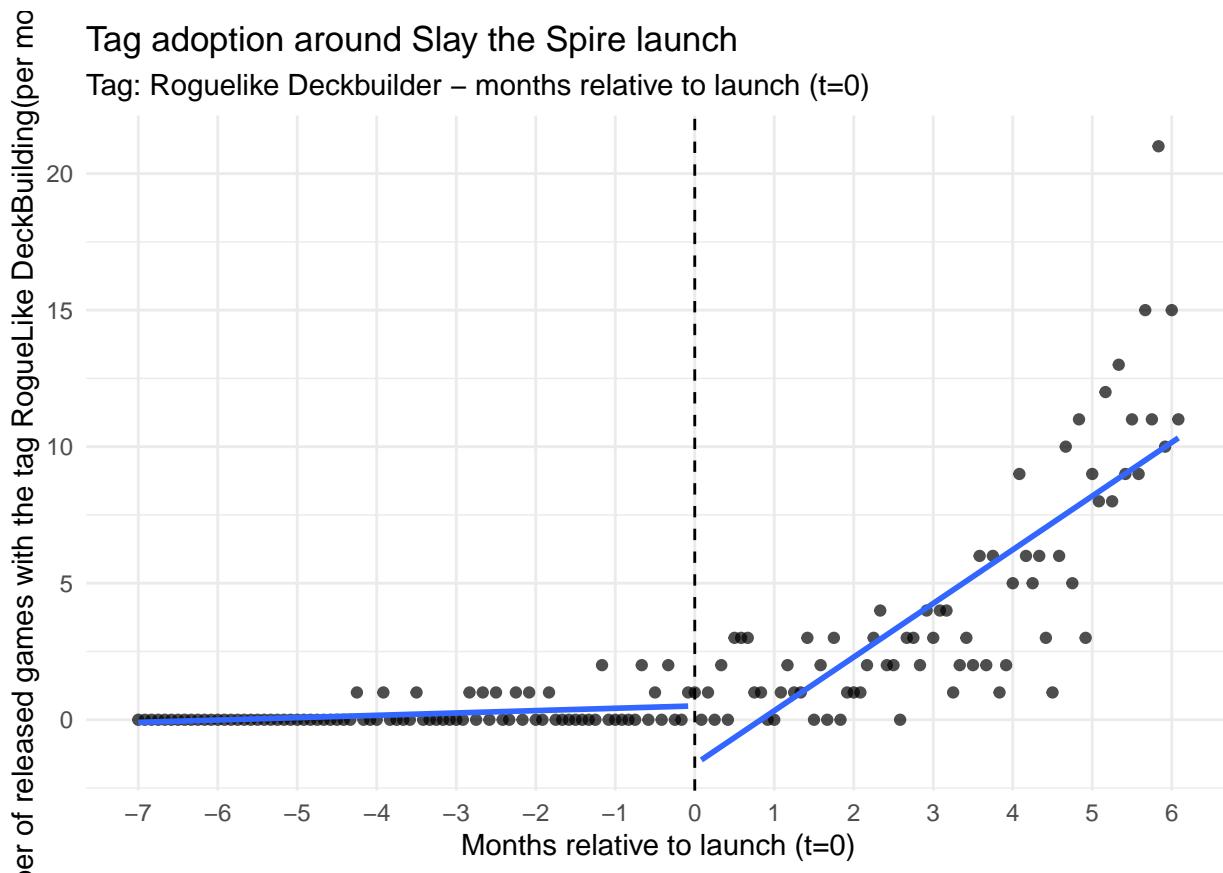
##
## Call:
## lm(formula = freq ~ t + post + t:post, data = ts_slayTheSpire)

```

```

## 
## Residuals:
##   Min     1Q Median     3Q    Max 
## -6.2087 -0.4368 -0.1021  0.5213 11.1710 
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 0.529412  0.403337  1.313 0.191278    
## t           0.007563  0.008292  0.912 0.363151    
## post        -2.164115  0.599569 -3.609 0.000414 ***  
## t:post      0.156203  0.013316 11.731 < 2e-16 ***  
## --- 
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 
## 
## Residual standard error: 1.876 on 154 degrees of freedom 
## Multiple R-squared:  0.7433, Adjusted R-squared:  0.7383 
## F-statistic: 148.7 on 3 and 154 DF,  p-value: < 2.2e-16

```



```

## 
## Call:
## lm(formula = freq ~ t + post + t:post, data = ts_slayTheSpire)
## 
## Residuals:
##   Min     1Q Median     3Q    Max 
## -6.2087 -0.4368 -0.1021  0.5213 11.1710 
## 
```

```

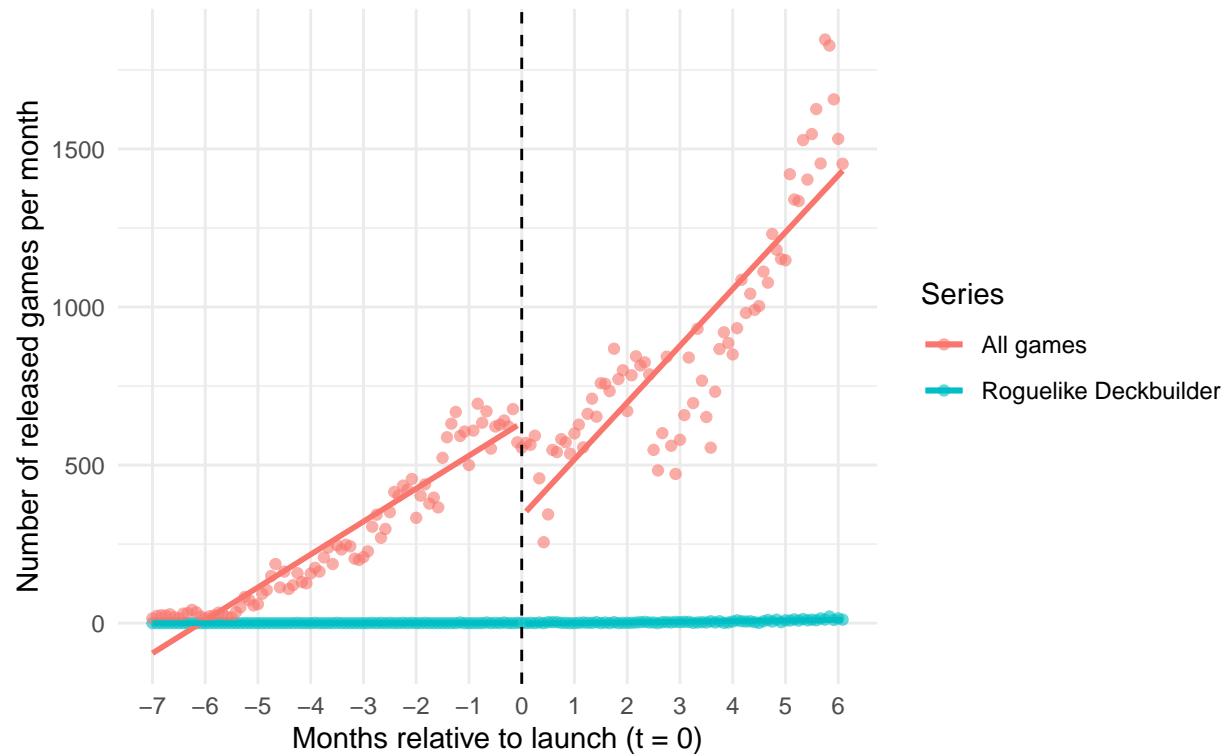
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 0.529412  0.403337  1.313 0.191278  
## t          0.007563  0.008292  0.912 0.363151  
## post      -2.164115  0.599569 -3.609 0.000414 *** 
## t:post     0.156203  0.013316 11.731 < 2e-16 *** 
## ---      
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 1.876 on 154 degrees of freedom
## Multiple R-squared:  0.7433, Adjusted R-squared:  0.7383 
## F-statistic: 148.7 on 3 and 154 DF,  p-value: < 2.2e-16

## 
## Call:
## lm(formula = freq ~ t + post + t:post, data = ts_global)
## 
## Residuals:
##    Min     1Q   Median     3Q    Max    
## -427.10 -66.85  -1.87  81.84 474.64  
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 630.1863  28.6368 22.006 < 2e-16 *** 
## t          8.6137   0.5887 14.631 < 2e-16 *** 
## post     -291.8553  42.5691 -6.856 1.61e-10 *** 
## t:post     6.3578   0.9454  6.725 3.24e-10 *** 
## ---      
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 133.2 on 154 degrees of freedom
## Multiple R-squared:  0.9061, Adjusted R-squared:  0.9042 
## F-statistic: 495.2 on 3 and 154 DF,  p-value: < 2.2e-16

```

Slope comparison around Slay the Spire launch

Target tag vs overall Steam release trend (monthly bins)



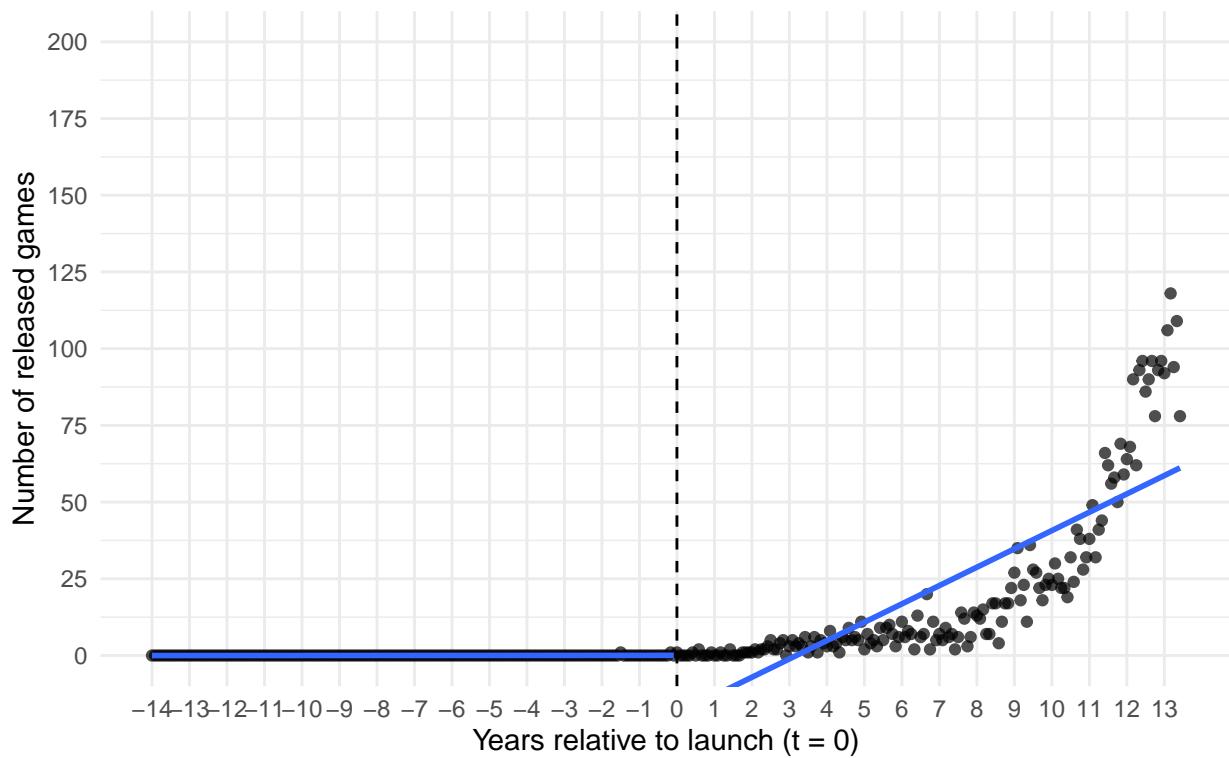
```
##
## Call:
## lm(formula = freq ~ t * post * series, data = combined)
##
## Residuals:
##      Min       1Q   Median       3Q      Max 
## -427.10    -4.05   -0.12    4.33  474.64 
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 630.1863   20.2513  31.118 < 2e-16 ***
## t            8.6137    0.4163  20.689 < 2e-16 ***
## post        -291.8553   30.1039 -9.695 < 2e-16 ***
## seriestag   -629.6569   28.6396 -21.986 < 2e-16 ***
## t:post       6.3578    0.6686   9.509 < 2e-16 ***
## t:seriestag -8.6061    0.5888 -14.617 < 2e-16 ***
## post:seriestag 289.6912   42.5733   6.805 5.29e-11 ***
## t:post:seriestag -6.2015    0.9455 -6.559 2.29e-10 ***
## ---      
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 94.18 on 308 degrees of freedom
## Multiple R-squared:  0.9488, Adjusted R-squared:  0.9476 
## F-statistic: 815.6 on 7 and 308 DF,  p-value: < 2.2e-16
```

4.2 Game Study: The Binding Of Isaac + The Binding Of Isaac Rebirth (Roguelike)

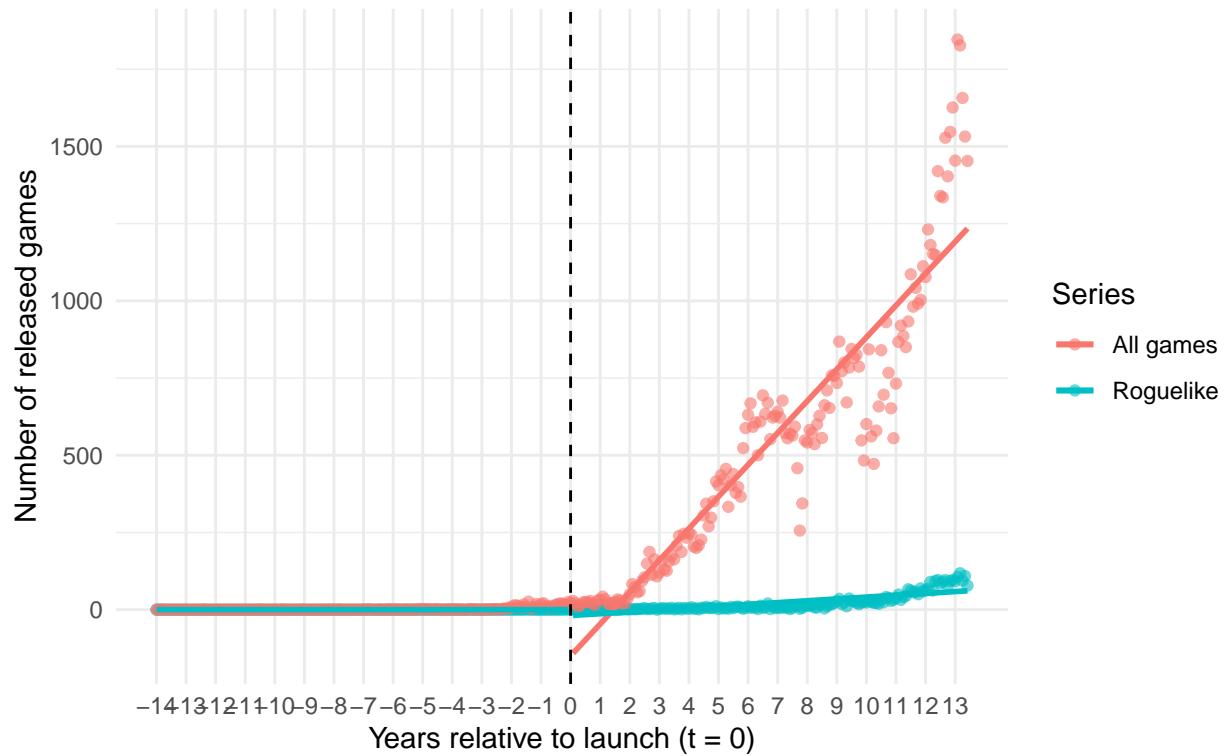
```
## [1] "The Binding of Isaac"  
  
## [1] "2011-09-28"  
  
## [1] "The Binding of Isaac: Rebirth"  
  
## [1] "2014-11-04"
```

Tag adoption around The Binding Of Isaac

Tag: Roguelike – months relative to launch (t=0)

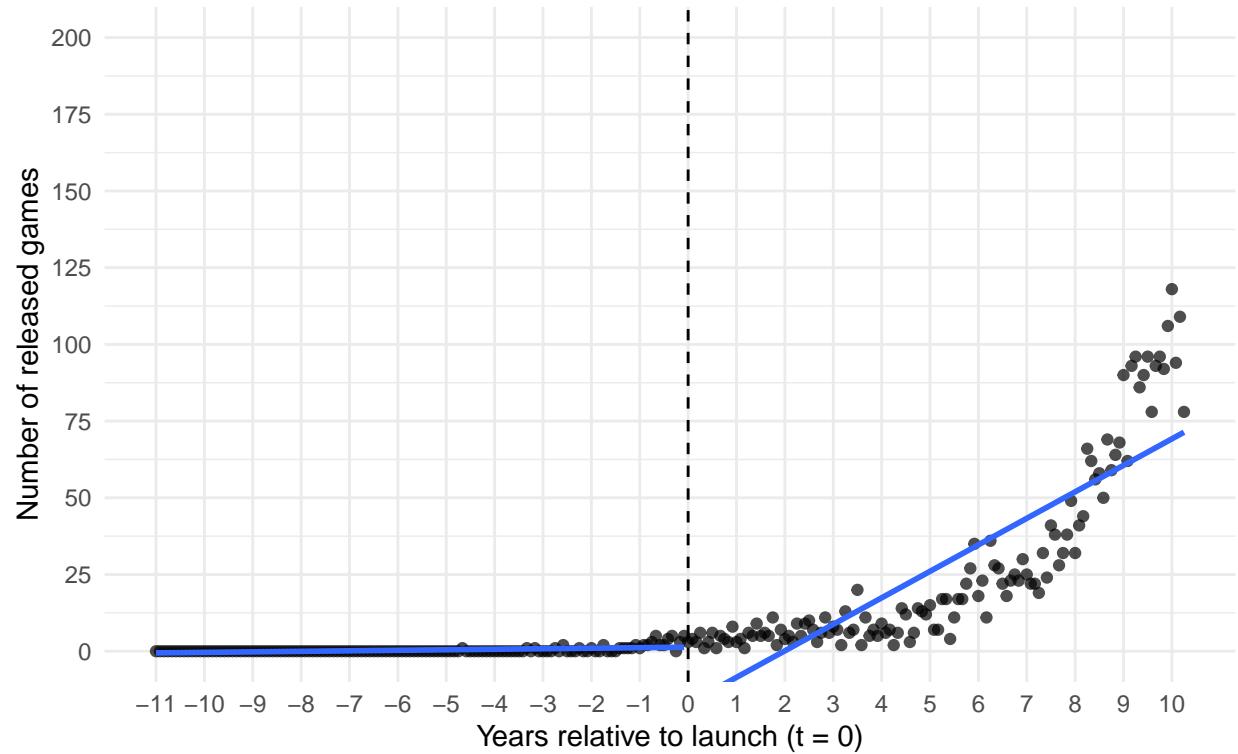


Slope comparison around The Binding of Isaac launch
Target tag vs overall Steam release trend (monthly bins)

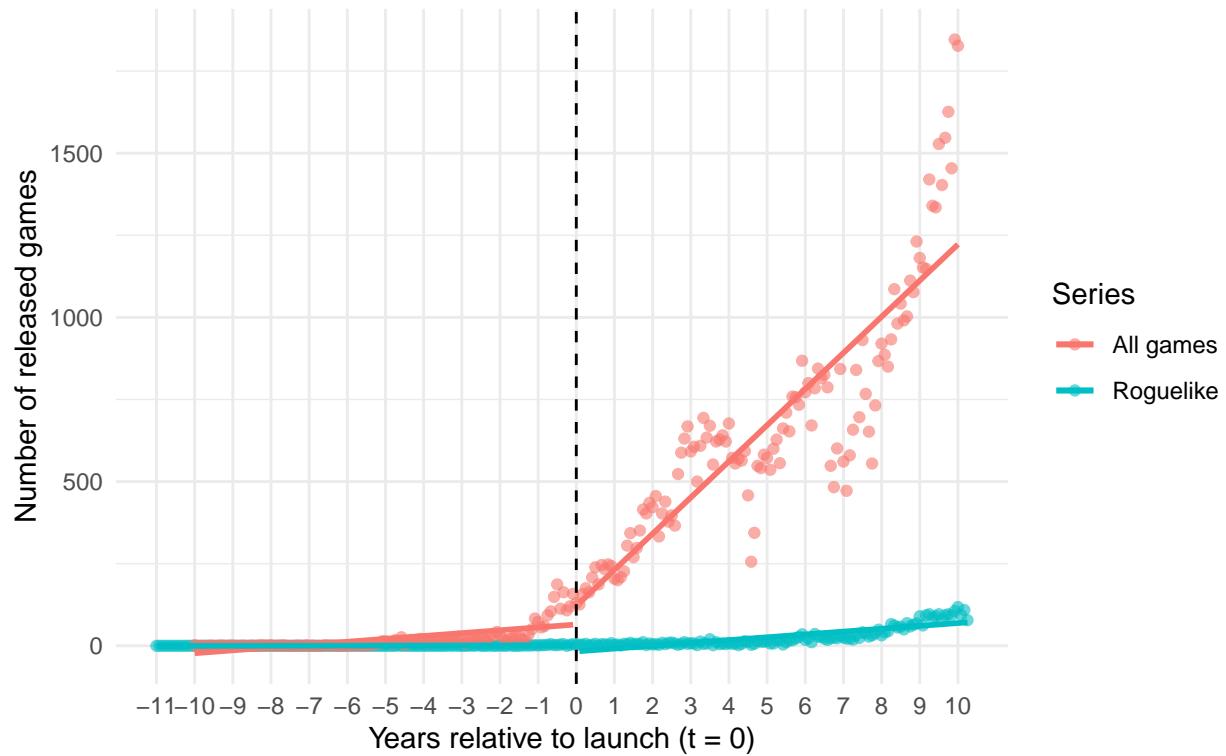


Tag adoption around The Binding Of Isaac REBIRTH

Tag: Roguelike – months relative to launch (t=0)



Slope comparison around The Binding of Isaac Rebirth launch
Roguelike tag vs overall Steam releases



```
## [1] "Terraria"
```

```
## [1] "2011-05-16"
```

Tag adoption around Terraria

Tag: Open World Survival Craft – months relative to launch (t=0)

