



Research into the impact of casino games on player markers of harm

Summary findings

NOVEMBER 2021



Executive Summary

Building on the foundations of a complementary Responsible Gambling engagement earlier in the year, Future Anthem and Gamesys partnered to analyse the extent to which player Markers of Harm may be related to the games that players choose to play.

Anthem's Safer Play machine learning models were executed against **36 million Gamesys gaming sessions** to identify potential markers of harm exhibited by players.

A full investigation of the extent to which slot games may be correlated with markers of harm was conducted on these game sessions, to identify any links between games and player risk.

No statistically significant correlation was found between player markers of harm and the experience that different games provide, modelled on three key output measures of games: Volatility; Return to Player (RTP); Hit Rate.

Our analysis indicates that these structural characteristics are not associated with behavioural 'markers of harm'. We also found no evidence that specific risk indicators, such as staking up, were linked to specific games within the category.

It is important to note that many games have either higher or lower proportions of potentially risky sessions than the norm – but no pattern was found of shared characteristics between these games. Also, the range of games offered on Gamesys' sites has quite a different composition to many other operators, hence these results may not necessarily be representative of the industry as a whole.



"Identifying potential markers of harm within player game sessions is a core area of focus for Future Anthem. We are delighted to have undertaken this research with Gamesys to begin to explore the potential for linkages with the games themselves. We look forward to undertaking further research on games and game design to help build a body of data led evidence in this key area."

**Chris Conroy, Chief Data Officer,
Future Anthem**

Future Anthem and Gamesys partnership

This research initiative builds on a successful engagement earlier in the year between Future Anthem and Gamesys that used Future Anthem's Safer Play detection system to risk-score each game session on over 2 billion transactions across Gamesys' portfolio of UK casino and bingo brands. Analysis of the results compared players' use of responsible gambling tools, combined with Gamesys' own responsible gambling prediction models, demonstrating that the two approaches to player risk complement each other to detect potentially problematic gameplay accurately and early.

Underlining Gamesys' commitment and proactive approach to responsible gambling, both companies proceeded with this R&D engagement to further research the impact of games on Markers of Harm. The initiative has also been supported by Blueprint Gaming and Roxor Gaming – key suppliers to Gamesys.

Gamesys — a heritage of difference

When considering the results of this research, it should be noted that the Gamesys portfolio of gaming brands exhibit some particular qualities when compared to other UK gaming operators:

- The number of games available to players is often demonstrably lower than other UK gaming sites
- Games are selected by an experienced team that has often rejected games considered as "risky" due to their inherent features
- A substantial majority of game play comes from games that were originally built exclusively by and for Gamesys brands

As a consequence, the results of this research may differ when considered for other gaming brands and portfolios of games.

368 games

Anthem identified and scored

36 million gaming sessions

5 million hours of play

2 billion spins

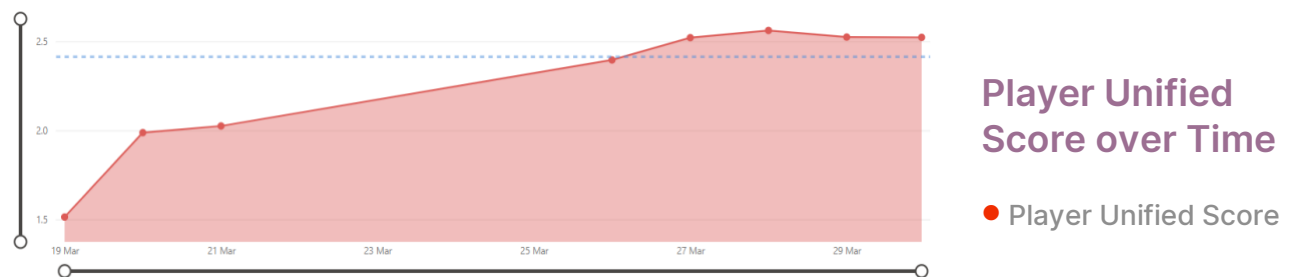
800k players

Data Science Approach

Modelling Markers of harm

Future Anthem's Safer Play product uses state of the art AI to proactively detect in-session wagering behaviours that indicate players may be exhibiting markers of harm, creating a score for every game session for every player (a game session being from game launch to game close). Additionally, a trajectory model is applied on top of these granular session scores, which provides a unified score for every player at any point in time, which is tracked against a risk threshold.

Markers of Harm form a key part of UK Customer Interaction Guidance, having been identified by a significant body of academic research over a number of years (references in appendix).



4 key markers are identifiable from bet-by-bet level data.

Markers of Harm

Intensity

Session length
and spin speed

Frequency

When sessions
occur

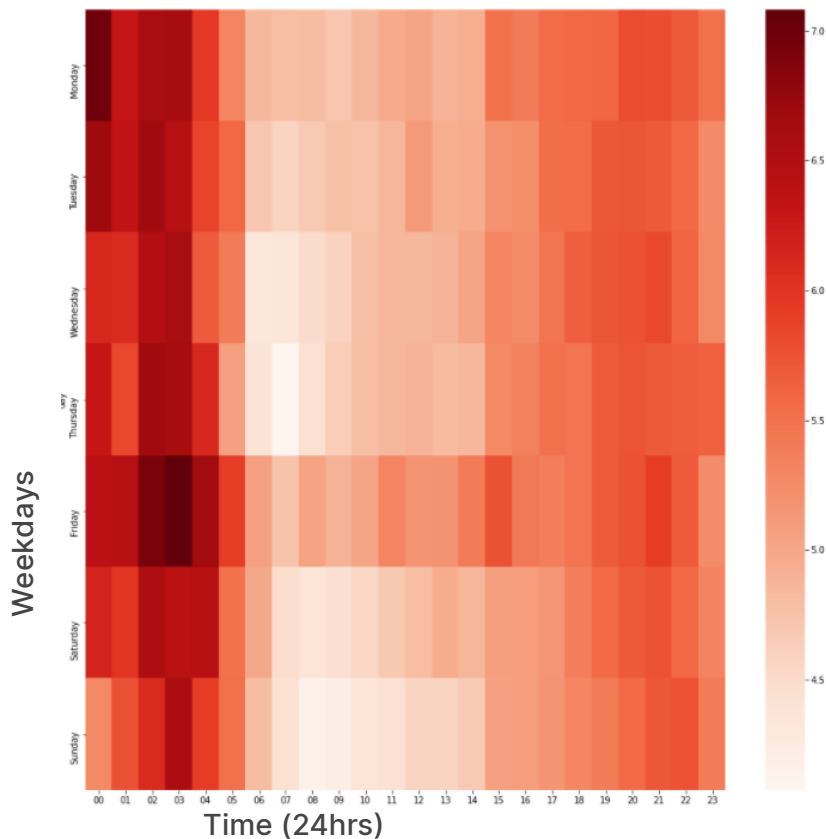
Variability

Across many
metrics, intra and
inter session

Trajectory

Is the player's
behaviour across
other markers
worsening over
time?

Research Results



Time of day

Game session level scoring allowed an investigation of player markers of harm by time of day – while previous research has highlighted risks associated with overnight play, we wanted to understand to what extent this was.

Overnight play – 12am to 6am – was found to be 36% riskier than other times of the day.

Markers of Harm and Games

There has been a significant regulatory focus over the last few years on whether player risk is associated with specific slot games and features of slot games, however there is a dearth of research in this area, in large part because traditional Responsible Gambling (RG) risk models tend to focus on aggregations of player gameplay and wallet-based activities.

The collaboration between Future Anthem and Gamesys described above provided a platform from which to investigate the link between games and risk, where Future Anthem created risk scores across 36 million player games sessions.

Games have a vast array of features, with a very large number of combinations of these features. To understand any potential linkage between games and risk, the research considered three key output measures which capture the effective combination of a game's features:

- Volatility
- Hit Rate
- Return to Player (RTP)

Volatility

Often also called variance or dispersion, volatility refers to how much chance is involved in playing a particular casino game. When it refers to slots, the term is used to let players know how often they can expect the slot to pay out, and how large they can expect that pay-out may be.

A slot with low volatility will reward players with frequent wins for low to mid-sized pay outs, while a slot with high volatility will reward players with much larger wins at a more sporadic interval.

The higher the volatility a slot the less often it will pay out.

High volatility slots have historically been assumed to be riskier for players, as it's believed players may stake more in the pursuit of a big win.

Hit rate

In slots this is the probability of a player stopping on a winning combination of reels that give any sized pay-out. A more straightforward way of putting it is that a slot will pay out 50 percent of the time if it has a hit rate or frequency of 50 percent.

The hit rate, however, does not determine how much a player can win. The slot can have a high hit rate but end up paying a sum that is smaller than the player's stake, especially for wins from the lower value reels.

Volatility is linked to the hit rate, but the volatility of a game reveals more regarding the nature of pay outs. Typically, slots that have low volatility have higher hit rates with low pay outs on hits. Slots that have high volatility reward players with a lot more, but they have low hit rates.

Return to player (RTP)

This is a measure of how much a slot machine pays back to its players for each denomination wagered over time. It is most commonly expressed as a percentage value, for example if a slot machine was designed to have an RTP of 95% players would theoretically get 95% of their total wagers if they played ad infinitum. Of course, players results will vary positively and negatively over the course of their wagering.

It can be said that every single slot game can be described as a function of these three components: Volatility, Hit Rate and RTP. Therefore, this research was designed to understand if there is any correlation between either any of these components or any combination of these components and risky play.

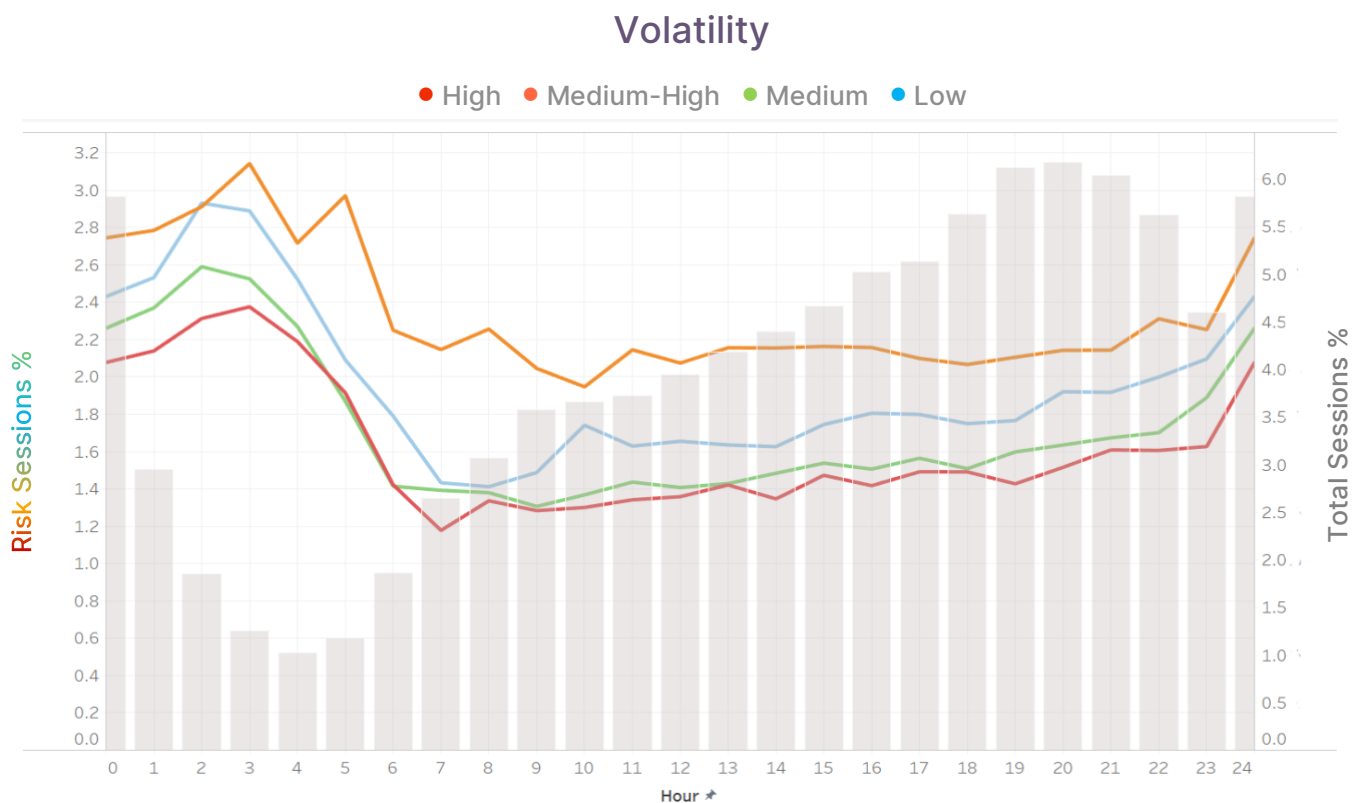
Modelling: Volatility

Volatility was calculated for each of the 368 games, then grouped into four categories (low, medium, medium/high, high).

Investigations to identify any correlation between volatility and markers of harm were performed on the 36 million game sessions that Anthem had run through its RG models.

The games which exhibited the highest proportion of markers of harm were medium high, 13% greater than medium games. As such, the highest volatility games did not show the highest proportion of markers of harm.

Statistical significance testing was then applied which showed that changes in game volatility are not statistically correlated with player markers of harm.

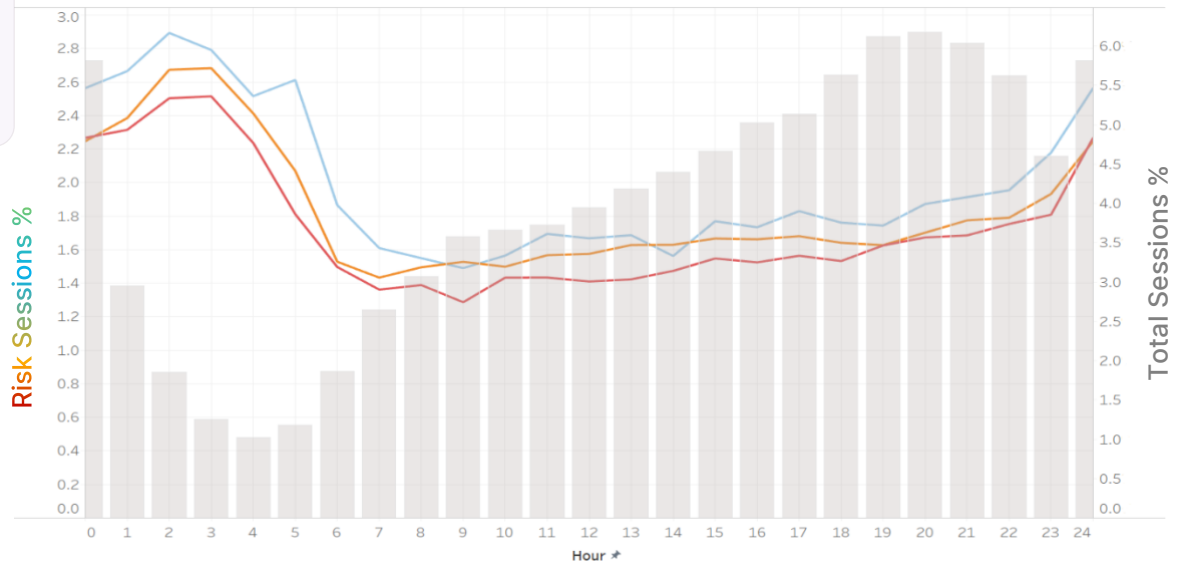


Modelling: Hit Rates and RTP

A similar exercise was carried out on hit rates, which were grouped in three bandings (6-20%; 20-35%; 35-65%). Again, there was no statistical relationship between hit rate and games, nor between RTP and games as shown in these graphs:

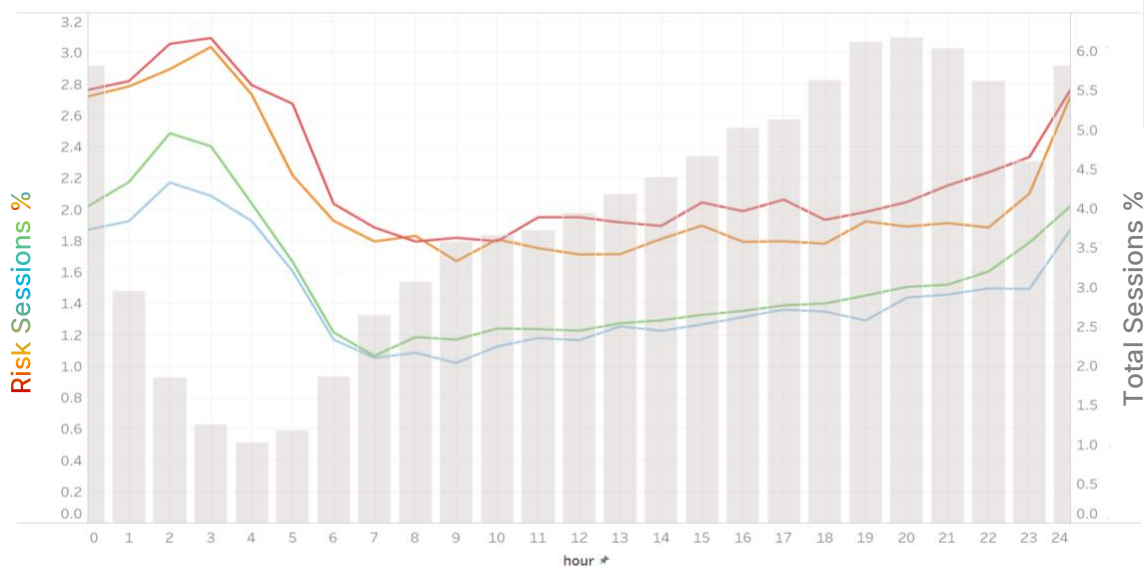
Hit Rate

- 35% — 65%
- 20% — 35%
- 6% — 20%



RTP

- 96.1% — 97.75%
- 95.6% — 96.09%
- 95.0% — 95.59%
- 88.1% — 94.99%

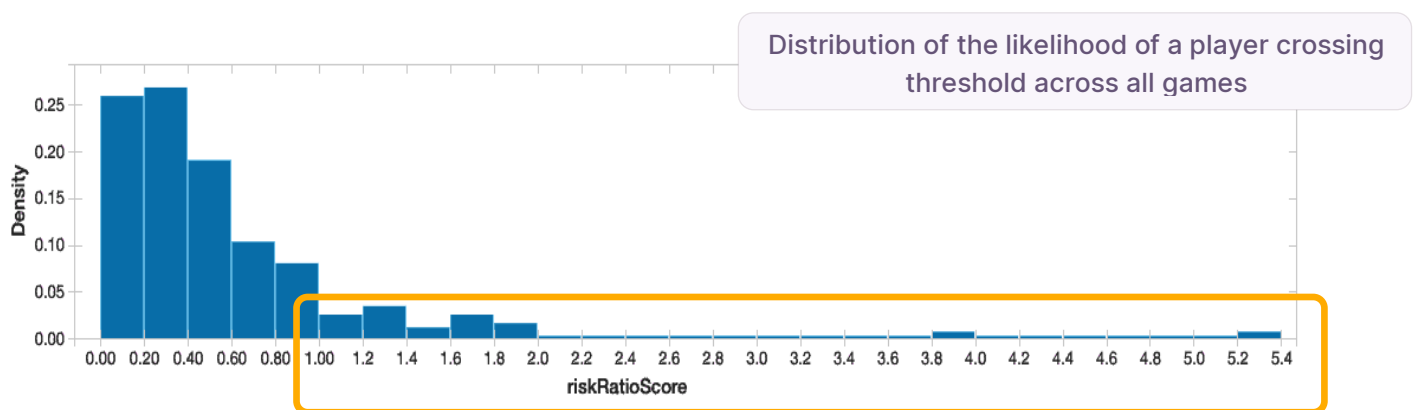


Game Popularity

Due to the lack of strong signals on the correlations between game outcomes and the unified score, the research introduced a metric that aims to measure the popularity of a game.

This metric - called game popularity - analysed favourite games that are played multiple times by the same player as well as games played multiple times by all users. Players are more likely to see popular games on the game page and therefore the research aimed to investigate if these games were more likely to be associated with elevated levels of risky play.

Overall, we found this not to be the case, popular and unpopular games could be associated with both elevated and reduced levels of risky play. We did find that players are as likely to display markers of harm playing their own personal favourite game as well as playing others.



The histogram above shows the probability of a player crossing Anthem's unified risk score threshold on all games. For example, examining the first blue bar on the left we can ascertain that just over 25% of games will have a probability between 0 and 0.2% that a session on them will cause a player to cross the unified score threshold. When examining the results, the research found games which have a much larger probability (circled in orange) tend to be more unpopular, displaying lower rates of activity. However, there was no discernible pattern among individual features or combination of features of these games.

In common with most operators a relatively small number of popular games on the Gamesys platform attract the majority of overall play.

Markers of harm were no more prevalent during play on the most popular games than on all play. We did observe however that these games were more similar in terms of RTP and volatility than games in general. For instance, these games have 74% reduced range on volatility and a 256% reduced range on RTP compared to the wider game list.

As these games dominate the overall gaming sessions it is possible that they cause correlation signals from more unpopular games to be eclipsed.

Risk Markov Chain

The research also looked at how players transition between the risk sessions. Below you can see the probability of a player moving and staying on a risk label. Once a player has a high-risk session, they are over seven times more likely to have another high-risk session compared to a player who has just had a safe session.



While there were some games that were more likely to have player transitioning from one risk category to another, there was no pattern or shared characteristic among them that correlated with risky play.

Player example

A representative player

By way of example, an unknown player's data had a larger than average number of sessions classified as risky by Anthem's algorithms. This player plays on average once a day. They play a wide variety of games with a couple of regular favourites. They have displayed a wide variety of markers of harm - including erratic play, high volume of stakes, large increase on average max stake, playing intensely, staking up / loss chasing and playing at unsociable hours.



The visuals below are two actual game sessions from this unknown player. This player has been flagged as exhibiting markers of harm during both sessions, but these two games have very different profiles.

At a glance both sessions show obvious staking up behaviour over the course of the session however the first game has a low volatility + high hit rate construction while the second has the opposite. While this is only a single example the data shows that this type of behaviour is representative for the dataset which is that players can display markers of harm across all games.

Figure 1 - Low Volatility + High Hit Rate Game

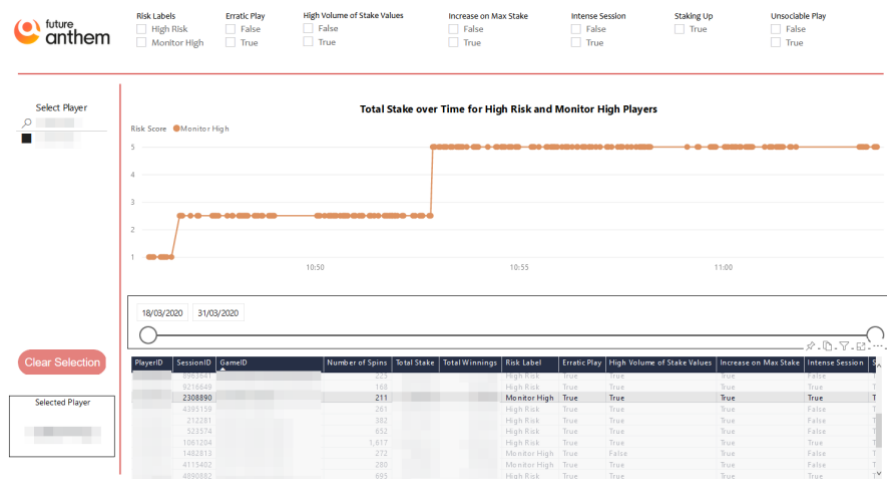
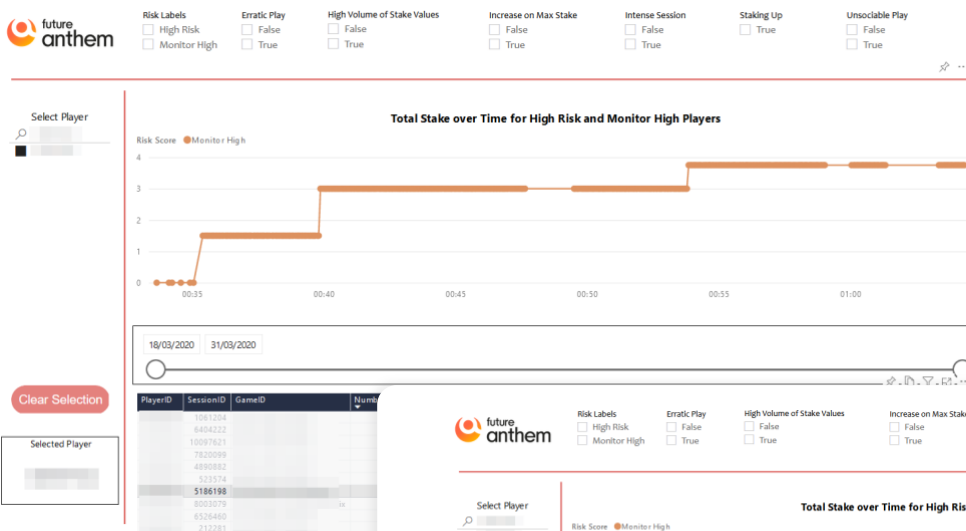


Figure 2 - High Volatility + Low Hit rate Game

Conclusion

Players versus Games — analysing risk

The results of the modelling contained in this research suggest that volatility, hit rate and RTP are not the main drivers of risk within online slot players.

Our finding that structural game characteristics such as volatility are not obviously correlated with increased session risk, it is consistent with findings from previous studies (see reference section) that highlight the multivariate nature of risk and the heterogeneity of problem gambling.

This initial piece of research focused on the core characteristics of slots games; volatility, hit rate and RTP however further work will investigate how other game features like number of reels, bonus modes and pay lines affect the level of risk.

While there is no correlation found between markers and harm and these game components mentioned, we did find examples of specific games that had a larger probability of risk occurring on them. While this could be due to a multitude of reasons such as promotional activity, acquisition offers or other unknowns not presented in the gameplay data, risk scoring games in this manner could be used to recommend games that are less likely to display markers of harm to players who are showing early signs of risky play.

It is important to state that whilst there is no correlation with the three game output measures tested, there may still exist relationships between markers of harm and facets of casino games. Future Anthem plans to undertake additional research into individual game features, and combinations of game features, especially where in game events can be tracked at player game session level.

5 tips from the research

1. Be extra vigilant monitoring early morning sessions
2. Be aware that once a player has one high risk session, they are over 7x more likely to have another high-risk session
3. There are specific games which overall tend to have a higher prevalence of risk occur on them - be aware of them and try to understand why this is the case.
4. Monitor players who drastically change their playing behaviour i.e., large increase in usual max stake or sessions much longer than average
5. Send risk scores back to game studios so they can investigate what features may drive more risky play.

Next steps

Risk Score Your Players

Future Anthem is committed to improving the player experience for everyone.

Following this pioneering research, we are pleased to support Safer Gambling Week by offering to score up to 2 billion bets at our cost so you can risk-assess your players and games – all you need to do is [register your interest](#).

Participating operators and studios will also be included in our next RG research initiative upon request.

Benefits of participating include:

- Comprehensive view of which of your players are at risk and those displaying high levels of risk regularly
- How many risky sessions occur across your portfolio and changes over time
- What a risky session looks like with staking behaviour graphed for easy review
- Explainability with what markers of harm are occurring within these risky sessions
- Identifying sessions longer than one hour, how many there are, and which ones are displaying markers of harm
- The times and days when risky sessions occur
- Risk prevalence by game

Take the next step in your Safer Play journey today and discover the science of the possible. [Register your interest](#) and one of our Game Data Science experts will be in touch shortly.

Terms and conditions apply.

Take advantage of Game Data Science

Build a player centric universe that is enjoyable and sustainable

Anthem Personalise

Retain your players with 1-2-1 player experience across your gaming activities

Anthem Safer Play

Proactively detect players at risk of problem gambling based on in-game betting behaviours

Anthem Amplifier

Apply data to product design and operational decisions to optimise game performance

If you would like to participate or contribute to Anthem's research on games, game design and player risk, please get in contact with research@futureanthem.com and our expert team will consider your request.

About Future Anthem

Future Anthem is the market leader in Game Data Science. Powered by Microsoft Azure, our highly scalable Anthemetrics AI platform delivers actionable intelligence to help our customers grow responsibly with measurable improvements that enhance the player experience for everyone. Our data products personalise and protect the player experience in real-time. We also enable gaming operators and studios to apply data to product design decisions and to optimise performance. Future Anthem was announced as EGR's 2021 Rising Star and has recently been selected to join the TechNation Applied AI 3.0 cohort.

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