TANGAM SYSTEMS

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BACCARAT REVENUE MANAGEMENT

Yield-management strategies to drive Baccarat performance

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EXECUTIVE SUMMARY

With the global rise of the Baccarat family of games, maximizing the game's performance through yield management seems to be on every table games executive's agenda. The term "optimum table games utilization" is used widely but due to its complex relationship with revenue and expenses – has often been misunderstood or misinterpreted - causing detrimental effects on the game's profitability. Common questions in the area of Baccarat yield management strategy include: (1) What is the optimal utilization model? (2) How does one account for the unique gaming behavior of Baccarat patrons including run-chasing, hot/cold table action and social dynamics? (3) What factors impact patron net contribution (profit per patron)?

Tangam Systems analyzed data from 19 casinos across four geographic markets. The analysis revealed insights which include the impact of utilization on player seating distribution, unoccupied tables, play-time, game speed, and ultimately their combined impact on profit. This article illustrates some of the insights in the context of a specific casino, based on head-count and player ratings data representing over 75,000 player visits in a $1000 (HKD) minimum bet mass-market Baccarat segment.

Applying the impact of optimal utilization for this patron segment into financial terms, a minor utilization level correction from 4 to 3 players results in an additional $4 million HKD in profit for every 100,000 patron visits – a 6% improvement in profits. Conversely a departure from the optimal utilization from 3 to 2 leads to a $2.5 million HKD reduction in profit, an opportunity loss of 4%.

Patron data reveals that the distribution of patron seating plays a unique role in the determination of optimal utilization. For example, when the average utilization for the patron segment is 4 patrons per table, the actual seating distribution of players shows that 22% of players are playing at tables with occupancies 9 or higher, and only 19% of players experience a table occupancy of 3-4 patrons per table, while 9% of tables are unoccupied. The negative effects of table occupancy on game speed have been well documented; this study also demonstrates that increases in table occupancy beyond a certain point result in measurable reductions in patron play-time of up to 20%. For the dataset in question, the combined result of these variables translated to per-patron net contribution (profit) peaking at $693 (HKD) per visit, at an optimal target average utilization of 3 – inclusive of labor rates and tax reductions. There is a 16% decline in net contribution going from average utilization level of 3 to 5 – a situation that can occur on a gaming floor during peak demand periods if spreads or limits are not managed diligently. Conversely, there is an 18% decline in net contribution going from utilization level of 3 to 1, as revenue gains are not enough to offset the increased labor expense consumed per patron.

In the development of an effective yield management strategy casino operators must include the following activities: (1) Segment the patron base and measure/analyze the impact of utilization on play time, actual distribution of player occupancy, unoccupied tables and game speed. (2) Build net contribution models incorporating the multiple dimensions subject to utilization, for each patron segment. (3) Apply these net contribution models to manage the game mix, table spread and table limits in order to maximize overall net contribution. When player supply exceeds table or labor availability, these net contribution models can be used to quantify opportunity costs with respect to each patron segment, and to adjust spreads/pricing to cater to the most valuable patron segments at the appropriate utilization levels.

INTRODUCTION

With the continuing rise of the Baccarat family of games and its significance to the bottom line for many casinos, table games executives are often evaluated on their ability to maximize yield on Baccarat games. In this highly competitive environment, it is no wonder that one of the most frequently asked questions the Tangam Systems team hears from casino executives is "How can we apply yield management strategies to maximize Baccarat performance?" This article seeks to shed light on some common concerns, and to provide data-driven insights into Baccarat revenue management, particularly surrounding the following questions:

- What is the optimal utilization model for the management of Baccarat games?
- How does one account for the unique gaming behavior of Baccarat patrons including run-chasing, hot/cold table action and social dynamics?
- What factors impact patron net contribution (profit per patron)?

The classical definition of yield management is to optimize resource utilization by ensuring inventory (table game seats) availability to patrons with the highest expected net revenue contribution, and securing the greatest total net contribution (profit) from the entire customer base. A casino's yield management activities can be broadly separated into strategy and execution. The elements of strategy include aggregating multiple sources of data, segmenting the game/patron base, modeling net contribution (profit) for each segment and assembling effective prediction and optimization models. Execution of the strategy on the other hand includes the diligent application across all levels of the organization – from upper management, to floor staff. The use of appropriate tools plays an integral part in effective execution of table games strategy, and must include; measuring results, establishing accountability, continuous training and cultivating a culture of data-driven decision making. The effective execution of strategy is a complex discussion and, is regrettably outside the scope of this article - the focus here is primarily on strategy.

There are many variables to consider in the revenue management of table games. To begin to understand the variables, a simple thought experiment is provided below.

Situation: Imagine that a casino is expecting 8 Baccarat players next Wednesday afternoon. How many tables should we schedule to open in order to service those 8 players?

SCENARIO 1: LABOR-SAVING PRIORITY

Assuming each Baccarat table has 8 spots, an operator that prioritizes reduction of labor costs might suggest opening one table - so that each player has a spot, and only a single dealer is required. The experienced operator however, would immediately recognize that with 8 players on a single table, the game pace would slow down, with each player making fewer bets, the net result is a reduction in per-patron revenue. Furthermore, with a crowded table and no other table options, players who are seeking a more comfortable experience will likely play for less time, the net result is a reduction in per-patron play-time and revenue. We see here that utilization has a direct impact on game speed and play time, and consequently the number of bets placed by a player during her visit.

SCENARIO 2: GAME SPEED PRIORITY

For an operator that is focused on maximizing revenue, regardless of labor costs, it may seem reasonable to open 8 tables with the intention of spreading the 8 players out evenly - one patron per table. The notion is that each player would have a faster game pace, which would lead to more bets, and that a more comfortable gaming experience might in turn lead to longer play-time. This practice is common in VIP pits. While the intention is good, the likely outcome on the main gaming floor is that the operator will observe the development of a 'hot' table, with four players enjoying the social experience of chasing a 'run', a second table may host two players, a third and fourth table entertain a single player each, while the remaining four tables sit unoccupied – incurring labor costs with no associated revenues. We see here that the unique social behavior of Baccarat players, in both 'grouping' and 'run-chasing', has an impact on the measurement of utilization and a downstream effect on total gaming area profitability.

As seen in the above illustration, managing the gaming floor to either extreme - 1 table, or 8 tables - results in reduced gaming revenue. The key to identifying the ideal table spread is to develop a profit-centric yield management strategy that serves to maximize the net contribution of patrons.

DEVELOPING A YIELD MANAGEMENT STRATEGY

In the development of an effective yield management strategy, an operator must consider many factors, at the game level, table level, area level, and across the property.

To illustrate how these factors affect profits we present data from a real casino. Data has been 'anonymized' to preserve casino confidentiality. The data and analysis presented in this article are from a specific patron segment of interest – $1000 (HKD) minimum bet Baccarat tables (approx. equivalent to $150 USD minimum bet) on the mass market gaming floor, where players touch the cards (squeeze games). The statistics used in this illustration were generated from head count data and player ratings representing over 75,000 Baccarat patron visits[i].

Utilization and Player Distribution

Imagine a manager standing in the middle of a gaming area with 30 Baccarat tables. She sees five 'hot' tables packed with standing players betting two deep, another eight tables have 4-6 players each, yet another eight tables have 1-2 players each, and nine tables sit unoccupied. Traditional notions of target utilization do not appear to be relevant. How can one plan to spread games with a single 'target occupancy' when players continuously spread in irregular formations? Because of the inherent limitations of observational data, Tangam Systems turns to statistical examinations of data records to illustrate the situation. Figure 1 below depicts a graphical representation of the 'experienced table occupancy' of Baccarat players. Furthermore, this metric is broken down for the average utilization of the gaming floor at large – the gaming area's average utilization.

> "This article illustrates yield management by applying methods to a specific game type, price point and gaming area: Baccarat, $1000 HKD, main gaming floor.

Given such an uneven distribution of table utilization, the expectation of a gaming manager to walk the floor and make spread decisions is understandably difficult. Visualizations such as the one depicted in Figure 1 allow gaming managers to visualize what is really happening on their casino floors.

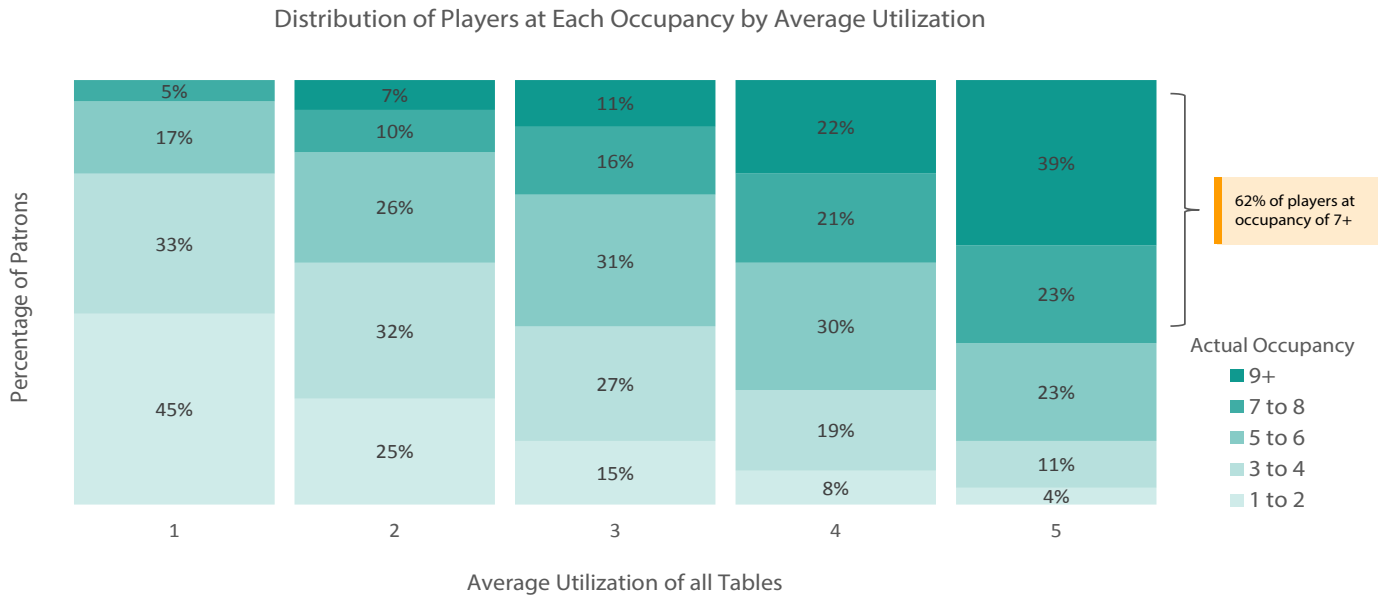

Figure 1: Actual utilization experienced by players as a function of average area utilization"

The horizontal axis at the bottom of Figure 1 represents the average utilization of all Baccarat tables in a given gaming area, calculated as the total number of Baccarat players in the area divided by the total number of Baccarat tables in the area. For a given average utilization level, the corresponding vertical bar is further divided into different colors to show the percentage of players experiencing each table-utilization level. The colors are as per the legend on the right of the graph. Note that when the average utilization is 5 players per table, 4% of players are experiencing a low table-occupancy of 1-2 players, 11% of players are experiencing a moderate table-occupancy of 3-4 players, 23% of players are experiencing an occupancy of 5-6 players, and 62% of players are betting on crowded tables at occupancies 7 or higher.

The Incidence of Unoccupied Tables

It is interesting to note that when the average utilization is 3 players per table in Figure 1, the actual seating distribution shows that 58% of players are seated at tables with over 4 patrons (of which 11% of players are seated at completely packed tables with 9+ patrons), whereas only 27% of players are sitting at the intended occupancy level of 3-4 players per table. Based on this metric alone, an operator may be inclined to increase table spread in the area to reduce overcrowding and increase game speed. However, what the decision fails to consider is the incidence of empty tables that will cost for every minute that they sit unoccupied.

Figure 2 below illustrates the percentage of tables that sit unoccupied at each average utilization level.

These unoccupied tables incur a labor cost and reduce the net contribution per patron. Operators must incorporate the actual occupancy distribution of Baccarat patrons and the percentage of tables that sit unoccupied in their analysis and calculation of the net contribution per patron.

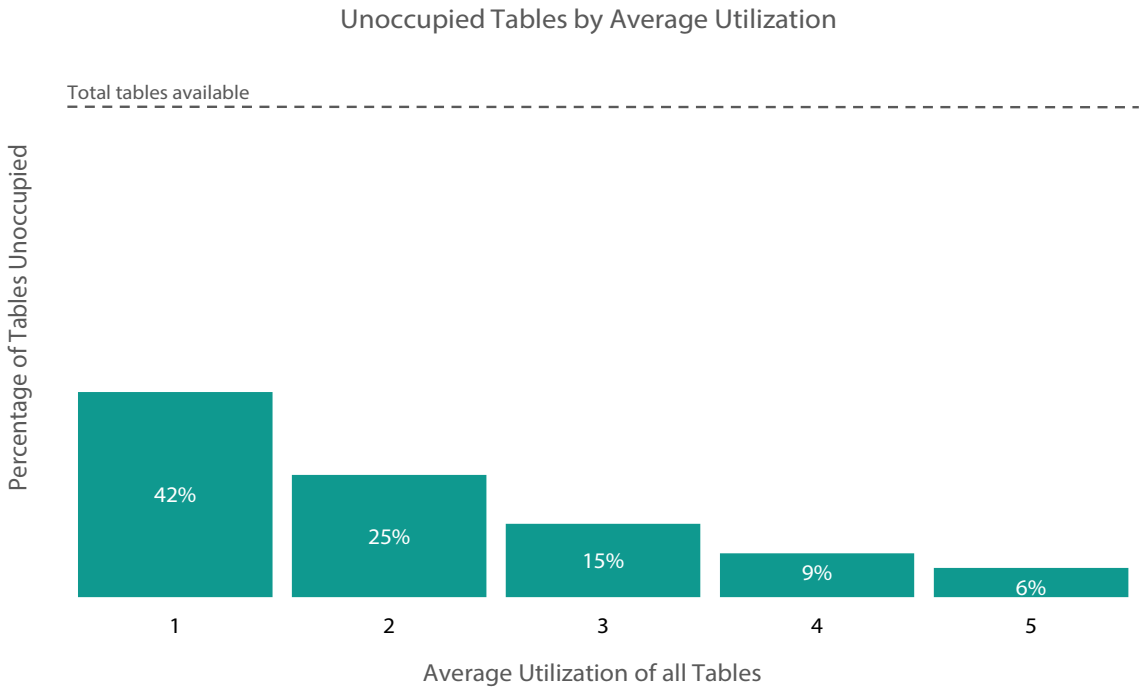

Figure 2: Percentage of tables unoccupied as a function of average utilization level [iii]

The horizontal axis at the bottom of Figure 2 represents the average utilization of all baccarat tables in a given gaming area. For a given average utilization level, the corresponding vertical bar shows the average percentage of tables in the gaming area that sit unoccupied. For instance, when the average utilization of all the tables is 3 players per table, 15% of all tables will remain unoccupied. Because this is an aggregate figure, the specific tables that are unoccupied will continuously change as players circulate the gaming floor.

Utilization and Game Speed

Table games managers generally understand that as more players join a table, the game pace slows down, and that the downstream effect is that patrons make fewer bets during their time playing. Figure 3 below shows the impact of table utilization on game speed.

If we revisit our initial example of 8 Baccarat players visiting a gaming floor on a Wednesday. The gaming manager's decision to open one table implies that each player would get to make 25 bets per hour on average, or 200 bets per hour in total. In contrast, if the manager opened two tables, and five players sat at one table and three sat at the second table. This would result in 307 bets per hour from the same eight players, which is a 54% increase compared to the single-table scenario. Note that while it is tempting to conclude that increased game speed directly translates to revenue gain, the real revenue gain will depend on the extent to which patrons are time constrained or budget constrained, as well as dependencies on local/tourist markets and the other aforementioned dimensions ie. play-time, player distribution etc. Utilization significantly impacts game speed and consequently the number of bets placed. Operators must include game speed measured against utilization in their calculation of net contribution for each game/patron segment.

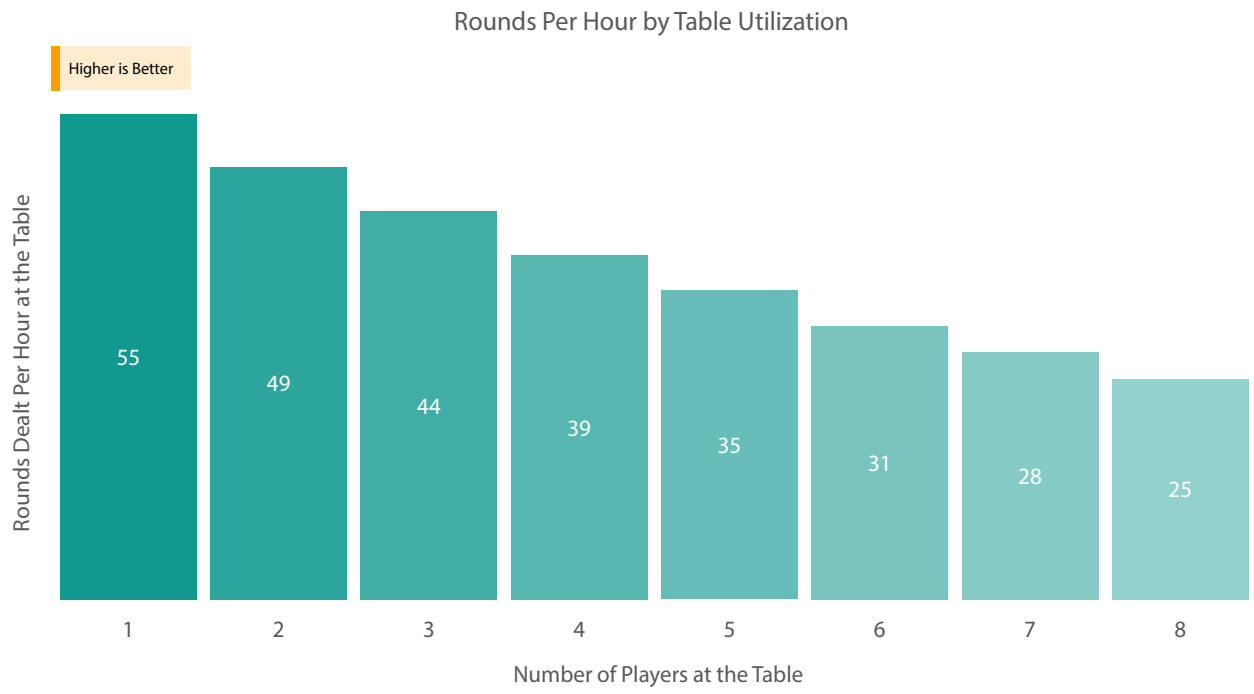

Figure 3: Game speed as a function of table utilization

Figure 3 above shows the number of rounds per hour (RPH) dealt on a Baccarat table as a function of the experienced table occupancy. As expected, higher table occupancies results in fewer rounds dealt per hour for each patron.

Utilization and Play Time

The thrill of chasing a run with a group of friends or players, and 'willing' luck to lend a winning hand, are social elements that many Baccarat players enjoy. Group social dynamics is an integral part of the Baccarat experience. But does that mean one should operate a Baccarat pit at 100% utilization in the name of offering a social experience[iv]? At what point does a social environment turn into an overcrowded one, where players are knocking elbows to place bets?

Once again, we turn to the data to gain insight into the outcome of overcrowding Baccarat tables. Figure 4 below demonstrates the impact of high utilization on play time.

Although players like the option of joining a busy table to bet on a 'run', they are negatively affected when forced into a crowded area. It is interesting to note that play time is lower at a utilization of 3 players per table compared to 5 players per table. This is not surprising, as a portion of the patron base is likely budget constrained. For these budget constrained players, a lower utilization implies a faster game speed and results in reduced play time. It is important to note that the above graph will look different for different patron segments and different properties/markets/day of week, depending on whether the patrons are budget constrained, time constrained, or experience sensitive. As an example, play-time trends of patrons visiting Macau from Hong Kong might look different from those visiting from other parts of mainland China. Operators must include play time measured against utilization in their model of net contribution for each patron segment. Overcrowding results in decreased play time, reduced number of wagers from the patron base, and missed profits.

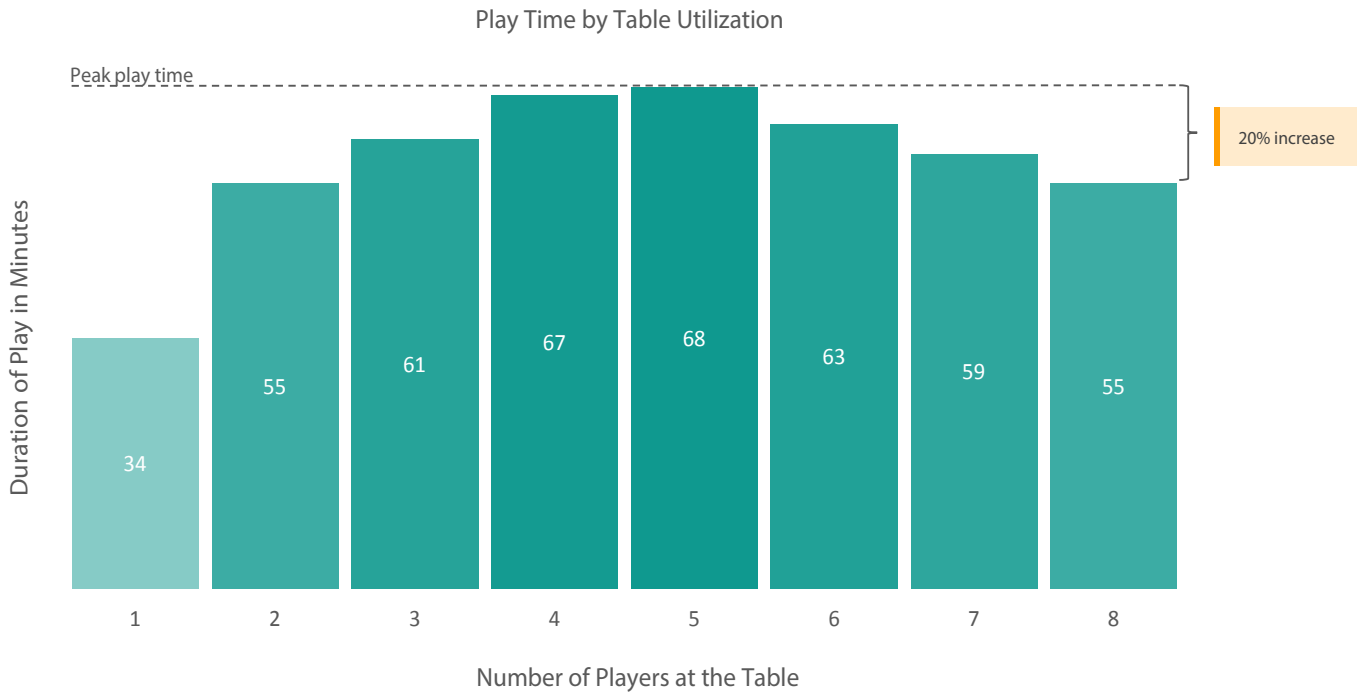

Figure 4: Play time per visit as a function of table utilization

Shows the average play time per visit, at different table utilization levels. Play time peaks at 5 players per table. Reducing average utilization from 8 to 5 results in a 20% increase in play time. The trend suggests that an overcrowded gaming area negatively affects patron experience.

UTILIZATION AND NET CONTRIBUTION PER PLAYER

The preceding sections have sought to explore some of the key variables in the complex relationship between table utilization and profitability. The next step is to combine the presented dimensions to calculate the net contribution per patron visit and to identify an optimum target average utilization.

The theoretical win from a patron per visit can be calculated from the house edge, average wager, and occupancy dependent play time and game speed. Any gaming taxes on gross revenue and reinvested complimentaries must be subtracted from this theoretical win.

The expense side of the equation must attribute the appropriate portion of the consumed labor cost to the patron as well as the labor cost of operating the unoccupied tables. The carrying cost of unoccupied tables is typically calculated as the total number of unoccupied tables distributed amongst the player base of that particular segment.

The net result of removing expenses, gaming taxes and complimentaries from revenue is a per-patron profit value, also known as net contribution per player visit. Figure 5 below shows the net contribution chart for the examined mass market Baccarat patron segment, as per the following data points.

- Table minimum = $1000 HKD (~$150 USD)
- Average wager = $2250 HKD (~$300 USD)
- House Edge = 1.3%
- Labor cost of operating a table = $140 HKD / hour (~$18 USD / hour)
- Play time, rounds per hour and player occupancy distribution as per Figures 1 - 4
- Gaming tax = 40% of gross win
- Comp rate is not included in this calculation, 0%
- 75,000+ distinct visits, and the associated headcount and ratings information

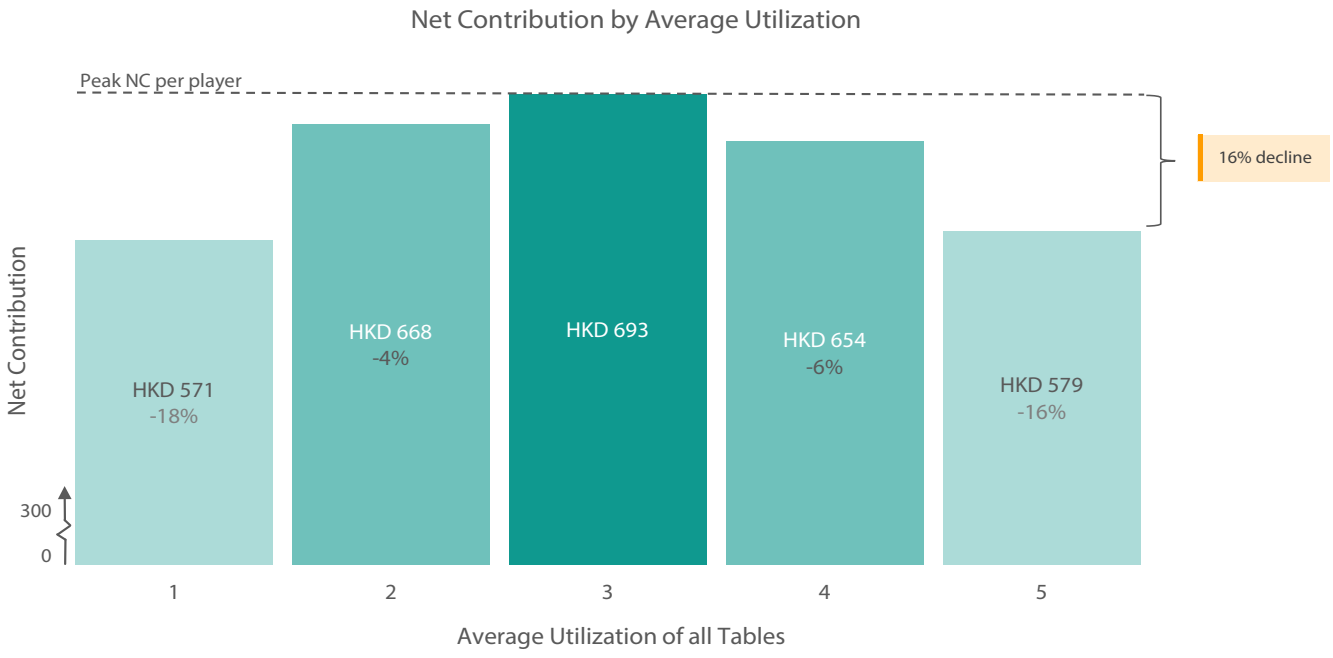

Figure 5: Net contribution (NC) per player visit as a function of average utilization

Figure 5, above shows the variation in net contribution per player visit as a function of the average utilization in the gaming area. As seen above, net contribution peaks at HK$693 when the average utilization is 5 players per table. Departures from the target average of 3, to either lower or higher occupancies, results in a decline in net contribution.

Aggregating all previous variables into this single output, Figures 5 demonstrates that as utilization increases beyond 3 players per table, game speed and play-time reductions result in lower revenues. This in turn decreases net contribution despite the lower consumed labor cost by each patron at the higher utilization level. There is a 16% decline in net contribution per patron going from average utilization level of 3 to 5 – a situation that could occur on a gaming floor during peak demand periods if spreads or limits are not managed diligently.

Conversely, a decrease in average utilization per table below 3 also results in reduced net contribution. The seating distribution reveals that overspreading results in more unoccupied tables. For the few players that sit at lower occupancies their play-time is decreased. The revenue gain is not meaningful enough to offset the increased labor expenses and therefore net contribution per-patron declines.

To put it in perspective, imagine that the casino operator is expecting 100,000 player visits from this patron segment for a given period of time. The achievable net contribution from these visits is approximately $70 Million HKD if the operator is able to consistently maintain an average utilization of 3 at most times. However, if the operator fails to execute the yield management strategy, average utilization for this patron segment could drift substantially. A drift in the average utilization from 3 to 5 would result in a missed opportunity of HK$11.4 Million or 16% of the achievable net contribution from the 100,000 player visits. In the converse example, an operator who allows an overspread-drift to an average utilization of 1, reduces net contribution by HK$9.7 Million or 18% of the achievable net contribution.

It is important to note that the net contribution chart presented is specific to one patron segment and for a specific property. Analysts can appreciate that Figures 1-5 will look different depending on the property, market and patron segment. Understandably, the strategies and analysis presented here can also be applied to other games and patron segments.

PUTTING THE NET CONTRIBUTION MODELS INTO PRACTICE

This article demonstrates that utilization has a significant impact on profits. In order to reap maximum returns, it is strongly recommended that casino management perform similar analysis and net contribution modeling for each of their games and patron segments. The application of net contribution charts in planning the game mix, table spread and table limits will vary depending on the market conditions.

Most Las Vegas based casinos operate in a competitive environment where player supply does not typically exceed the availability of tables. In these markets the operator's focus should be on segmenting and predicting demand. The operator must open the right number of tables at the right prices, and be able to make real time adjustments to spread/pricing as player supply fluctuate throughout the day. Management should capture the maximum net contribution from each patron segment without overspending on labor.

In most Macau casinos player supply often does exceed the availability of tables, and labor is often in short supply. It is simply not possible for the operator to offer games at the optimal utilization level to each available patron segment because there are not enough tables or labor available. The operator's focus here is to allocate the limited resources in a manner that serves the most profitable patron segments at the appropriate utilization levels so as to maximize total net contribution. The operator should evaluate the opportunity cost for each patron segment in order to decide which opportunities to forego. The net contribution charts (as shown in Figure 5) can help the operator in making these decisions.

> "It is strongly recommended that casino management perform similar analysis and net contribution modeling for each of their games and patron segments.

As an example, an operator might evaluate the opportunity cost trade-offs during a peak demand period and decide to operate the Blackjack games at sub-optimal utilization of 6 players per game, in order to allocate scarce labor towards operating the Baccarat games at the optimal utilization level of 3 players per game. If the demand for Baccarat games continues to grow in a certain gaming area on a busy night, the operator can raise the limits on the games and forego optimal utilization with the lower limit patron segment in order to satisfy the optimal utilization target for the higher limit patron segment. Assistive software tools can greatly help with these types of complex decisions.

Operational decisions involving trade-offs based on opportunity cost are not limited to Asian casinos alone. Casinos in North America face similar situations on busy weekends or during special events, when player supply exceeds the supply of tables. Data-driven table games operators can employ net contribution charts to determine the allocation of tables and floor space to patrons with the highest expected net revenue contribution.

As indicated earlier, data-driven strategy is key – but strategy is only as good as its execution. Appropriate execution at all levels of the organization is essential in improving the profitability of table games – a topic which will be explored in future articles from Tangam Systems.

BACCARAT REVENUE MANAGEMENT

TAKE-AWAYS

1. Segment the patron base and measure/analyze the impact of utilization on play time, actual distribution of player occupancy, percentage of unoccupied tables and game speed.

2. Build net contribution models incorporating the multiple dimensions subject to utilization, for each patron segment.

3. Manage the game mix, table spread and pricing decisions in order to maximize overall net contribution. When player supply exceeds table availability, use these net contribution models to quantify opportunity costs, make trade-offs, and adjust spreads/pricing to cater to your most valuable patron segments.

Yield management is a complex science and this is only an introductory article. For those readers who enjoy advanced analysis and modeling, the end notes contain more factors[v] to consider when designing your yield management strategy.

i If a player played on multiple tables during his visit, those multiple rating sessions were combined into one, so that the statistics are on a 'per-visit' basis.

ii There was insufficient data at a utilization level of 1 to converge on reliable values

iii There is insufficient data at a utilization levels of 0 and 1 to converge on reliable values

iv Even when the average utilization is almost 100%, there will be tables with clusters of players betting two levels deep, while other tables are moderately occupied or unoccupied.

v The following are some additional factors that an analyst might analyze: budget constrained players vs. time constrained players, players who do not wager on every hand, bet elasticity of different patron segments, procedures that can be implemented at the table to minimize inactive time, table signage to highlight 'runs' and its impact on utilization.

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ABOUT TANGAM SYSTEMS

TYM OVERVIEW

Tangam's Table Games Yield Management (TYM) is a business intelligence software tool that helps operators improve their table game mix, table spreads, staffing levels, schedules and betting minimums management.

TYM provides (i) recommendations on how to change the game mix to capture unmet profit opportunities, (ii) predictive analytics to adjust your table spread and schedules based on customer demand patterns, (iii) a spread optimizer to generate optimal schedules based on your business rules and labour constraints, and (iv) real time prompts to floor staff to open or close more games and adjust betting minimums as player demand fluctuates throughout the day.

The results are a 5%-15% increase in profitability, improved efficiency, and a ten-fold increase in productivity for your analysts. TYM offers better player experiences by providing an appropriate occupancy level for players of different games / betting tiers and game availability to your most profitable customer segments.

Headquartered in Ontario, Canada, TYM was developed by a multi-disciplinary team of individuals who have decades of experience in software engineering, casino operations and statistics/mathematics. Since TYM's market launch in 2010 its install base has doubled every year, and now includes casino operators in Macau, United States, Australia, New Zealand and Canada.

Patents: United States 8512146 "Casino table game yield management system"

United States 8016665 "Table game tracking"

Canada 2713064 "Casino table game yield management system"

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