Research Note: Forecasting Macau's Gaming Revenue and Its Seasonality

IpKin Anthony Wong

Abstract

The gaming literature has identified a number of factors that have driven the growth of Macau's casino industry. At the same time, however, questions remain as to future prospects for the growth of the enclave's gaming revenue – and specifically, whether this type of growth can be sustained. A forecast of Macau gaming revenue and an examination of its seasonality can assist scholars and practitioners alike in developing a better understanding of seasonal variation (a significant consideration in the volatile world of gaming) and the future outlook of the world gambling capital. The objective of this article is to investigate these trends, and to provide macro-level insights into the future of the world's new "gambling capital."

Keywords: gaming revenue, Macau, forecasting, seasonality, Las Vegas

Introduction

The Macau Special Administration Region (SAR), China, the world gambling capital, has hit yet another jackpot and set a new world-record high in gaming revenue. With close to 60% increase in gaming revenue year-on-year, Macau has generated about US$24 billion in 2010 (Gaming Inspection and Coordination Bureau, 2011). This figure now far exceeds those emerging from Macau's rival city of Las Vegas. This surge in Macau's gaming revenue may be attributed to the fact that it is the only jurisdiction in China that allows casino gambling, coupled with its rapid development and concentration of gaming facilities (Wong & Rosenbaum, 2011). Currently, the enclave has 33 casinos, many of them established within the past six years. They include an array of integrated casino resorts (e.g., City of Dreams, MGM Grand, the Venetian, and Wynn) with a variety of entertainment, accommodation, and dining options; and a number of smaller casinos (e.g., Altria, Grand Lisboa, Ponte 16, and Star World; GICB, 2011). These new gaming facilities have helped the SAR to beat the global competition and lead the world in attracting gamblers.

Other reasons that contribute to the growth of Macau's gaming revenue include the zone's geographic proximity to other Asia Pacific regions, a Chinese affinity for casino gambling, the rapidly growing economy in China, increasing levels of disposable income for Chinese consumers, a relaxed travel policy in mainland China, an influx of capital due to the global quantitative easing policy, and marketing efforts to lure VIP gamblers (e.g., Gu, 2006; Loi & Kim, 2010; Mellen & Okada, 2006; Zeng & Forrest, 2009). All of these factors are likely to continue driving the growth of Macau's gaming income in the foreseeable future.

Against this backdrop, a forecast of Macau's gaming revenue and an examination of its seasonality may be able to help casino operators, investors, and hospitality practitioners gain a better understanding of the seasonal variation and the future outlook of the world's new "gambling capital." Hence, the objective of this article is to investigate the seasonality of the SAR's gaming revenue as well as to provide a five-year forecast in its growth trajectory. An accurate account of the future prospects of industry

IpKin Anthony Wong
Assistant Professor
Institute for Tourism Studies
Colina de Mong-Ha
Macau, China
Phone: 853-8506-1360
Fax: 853-8506-1283
E-mail: anthonywong@ift.edu.mo

demand and the seasonal fluctuations associated with that demand will be imperative to the success any organization affiliated with this region (Barsky & Nash, 2006; McGowan, 2009; Song & Witt, 2006). This article also provides methodological insights into how a time series decomposition forecasting method can be applied to gaming revenue projections.

Literature Review

Most hospitality service providers would agree that forecasting plays a central role in the planning process. Providing an accurate account of future demand and revenue inflow helps decision makers to establish priorities, better serve customers, and monitor organizational performance (Aghazadeh, 2007; Jeffrey & Barden, 2001). While a general trend prediction may provide managers a growth trajectory for future business prospects, seasonal variations may better assist these managers to gain a finer understanding of market demand, consumer behaviors, and effectiveness of marketing efforts (Bauer, 2005; Jeffrey & Barden, 2001). In addition, the literature shows that seasonality can have substantial impacts on the customer experience (Barsky & Nash, 2006). High season puts pressure on serving staff and facilities, which in turn could hamper customer service and experience. It is also difficult to maintain a high level of service during peak periods (Barsky & Nash, 2006).

Especially with time series trend analyses, it becomes essential to account for seasonal differences (Frechtling, 2001; Render, Stair, & Hanna, 2009). Consideration of seasonality is especially important in analyzing gaming revenue (Cargill & Eadington, 1978; Eisendrath, Bernhard, & Lucas, 2008; McGowan, 2009). A popular method in forecasting gaming revenue when both trend and seasonality are considered is the multiplicative decomposition method (McGowan, 2009). The method first calculates the seasonal indices and then estimates a trend line using the decomposed data. A forecast is then made by adjusting the predicted value with the corresponding seasonal index (Frechtling, 2001; Render, et al., 2009). Although time is often the most important factor in forecasting, other research indicates that gaming revenue is also influenced by visitor arrivals (Mellen & Okada, 2006), and hence all of these factors are considered in the current study.

A popular method in forecasting gaming revenue when both trend and seasonality are considered is the multiplicative decomposition method.

Methods

Data were collected from the Macau Statistics and Census Service (2011) between 2005 and 2010. The decision to select this six-year dataset was twofold: the data were available on the MSCS database only within this six-year period; and the year 2004 marks the beginning of the new era of liberalized casino gambling in Macau, as the first Vegas-style casino was established in the middle of that year. Prior to data analysis, multiple forecasting models were explored in order to examine the growth trajectory. Findings indicate a curvilinear relationship between time and gaming revenue (see Figure 1), and hence a quadratic regression model is able to produce the best results. The findings also reveal that tourist arrivals have a strong relationship with gaming revenue ($r = .65$) which is consistent with prior research (Mellen & Okada, 2006); hence, this variable is also included in the model.

Figure 1. Forecast of Gaming Revenue between 2005 - 2015
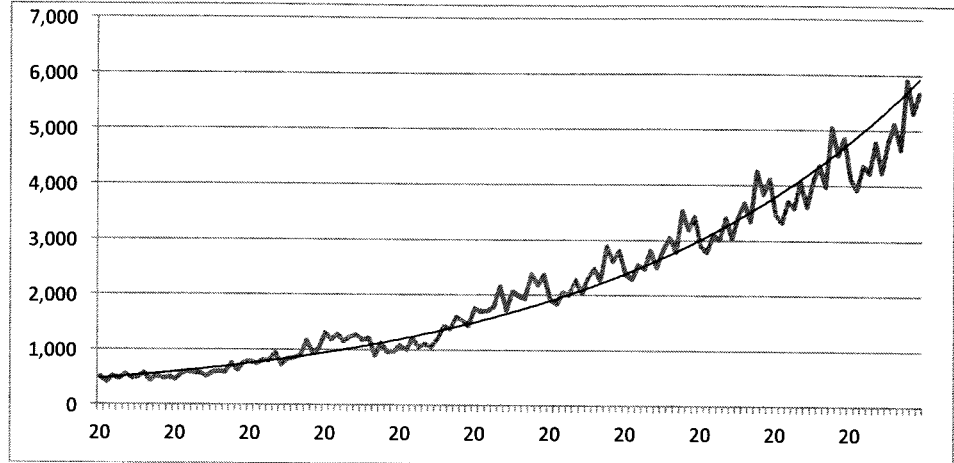
Note: Values represent monthly estimates in million USD.
The smooth line represents a trend trajectory without seasonal adjustment; the other line represents the observed monthly data from 2005 to 2010 and a decomposed trend projection with seasonal adjustment from 2011 to 2015.

In order to develop a more accurate forecast from the quadratic model, the monthly seasonal factor is calculated and controlled. This study used the multiplicative decomposition seasonal time series method. This method allows seasonal adjustment of a trend projection. To gain finer estimations of the monthly revenue fluctuations, monthly data (instead of quarterly data) were used to estimate the seasonal indices and monthly revenue for each month between 2011 and 2015. Table 1 summarizes the steps of the time series decomposition method used in this study.

Table 1. The Process of Decomposition

Steps	Procedure

1	Calculate seasonal index:
	    a. Average monthly revenue = total average annual revenue / 12
	    b. Seasonal index = average annual revenue / average monthly revenue

2	Deseasonalize the revenue by dividing each monthly revenue by its seasonal index
3	Estimate a trend projection line using the deseasonalized revenue
4	Forecast the revenue for future periods using the trend line
5	Multiply the forecasted revenue from the trend line by the appropriate seasonal index to adjust seasonal variations

Findings

Table 2 presents estimations of the seasonal indices on a monthly basis. The results reveal that except for May, the month of Labor Day golden week holidays, the first halves of these years recorded below-average gaming revenue. In contrast, except for September, the second halves of the year received above-average revenue inflow. Gaming revenue was particularly strong in the fourth quarter, and especially in October during the Chinese National Day golden week. Another interesting finding from Table 2 reveals that Macau's gaming industry is not recession-proof, as gaming revenue showed a decline during the first few months (September 2008 to June 2009) of the recent global financial crisis. And yet, these data suggest that the enclave was able to withstand the impact of a crisis, and rebounded within a year.

Table 3 reveals results of the time series decomposition trend projection model. The findings indicate a strong relationship between *time²* and gaming revenue ($b = .205, p < .001$), while the relationship between *time* and gaming revenue is not significant when

$time^2$ is controlled; hence a quadratic relationship is warranted. In addition, tourist arrival is also significantly related to gaming revenue ($b = 688.596, p < .001$). The curvilinear model estimates that the growth of gaming revenue is exponential rather than linear; and it predicts that by 2015 revenue will reach US\$57 billion, which represents a 19.24% compound annual growth rate. The forecast error (mean absolute percent error, or MAPE) suggests that the estimation contains about 16% error, which is equivalent to US\$159.63 million per month in mean absolute deviation (MAD). In sum, the results indicate that the proposed forecast model is reasonably accurate, with a modest MAPE, and fits the data fairly well, with $R^2 = .95$.

Table 2. Gaming Revenue and Seasonal Index (Million USD)

	Major Events	2005	2006	2007	2008	2009	2010	Seasonal Indices
January	--	490	461	780	1,303	1,081	1,756	.93
February	Chinese New Year golden week	401	563	745	1,180	999	1,692	.88
March	--	517	595	799	1,278	1,202	1,708	.96
April	Easter	468	576	801	1,150	1,050	1,787	.92
May	Labor Day golden week	552	569	942	1,235	1,109	2,146	1.03
June	--	475	515	728	1,262	1,043	1,720	.91
July	--	495	586	825	1,171	1,207	2,056	1.00
August	--	568	601	844	1,214	1,420	1,987	1.05
September	--	430	584	899	890	1,377	1,923	.96
October	Chinese National Day golden week	525	748	1,162	1,120	1,589	2,372	1.19
November	Grand Prix, Food Festival	478	627	929	956	1,539	2,182	1.06
December	Christmas	493	766	1,026	969	1,431	2,360	1.11
Total		**5,892**	**7,190**	**10,481**	**13,728**	**15,048**	**23,688**	--

Note: Estimation method = multiplicative season-trend decomposition.
Mean absolute deviation (MAD) = 159.63, mean absolute percent error (MAPE) = .16.

Table 3. Forecast of Gaming Revenue between 2011 – 2015 (Million USD)

	2011	2012	2013	2014	2015
January	1,908	2,377	2,895	3,474	4,108
February	1,836	2,285	2,779	3,325	3,929
March	2,051	2,545	3,095	3,702	4,360
April	1,998	2,476	3,008	3,588	4,229
May	2,275	2,808	3,409	4,063	4,778
June	2,031	2,506	3,029	3,612	4,242
July	2,303	2,831	3,424	4,076	4,780
August	2,473	3,039	3,674	4,364	5,116
September	2,264	2,780	3,345	3,974	4,660
October	2,885	3,530	4,253	5,047	5,903
November	2,611	3,191	3,840	4,545	5,320
December	2,801	3,421	4,107	4,858	5,675
Total	**27,436**	**33,789**	**40,858**	**48,628**	**57,100**

Note: Estimation method = multiplicative season-trend decomposition.
Quadratic regression parameter estimation: $-822.454 + 5.068$ (time) $+ .205$ (time^2) $+ 688.596$ (million tourist arrival).
$R^2 = .95$.

Discussion

This study provides casino operators, speculators, and hospitality practitioners alike a clear basis for conjecture on the future gaming inflow of Macau. During this period, the enclave witnessed a fourfold increase of gaming revenue, from less than US$6 billion in 2005 to close to US$24 billion in 2010. This represents a striking 26.10% compound annual increase. Revealingly, the number of table and slot games also shows a fourfold increase. The development of casino gambling in Macau may reflect what have happened in Las Vegas since the 1970s, as the progress of Macau's gaming market seems to mimic the history of Sin City (Mellen & Okada, 2006). While it took more than three decades to build Las Vegas into its current capacity, however, it only took Macau a few years to transform into a world gambling mecca after its casino gambling industry was liberalized.

Meanwhile, in Las Vegas, gaming infrastructure development and revenues have stagnated. There are even signs that the city's gaming revenue is on the decline, as tourists are spending less money on gambling (Eadington, Wells, & Gossi, 2010; Las Vegas Convention & Visitors Authority, 2010). In contrast, Macau shows evidence of unprecedented growth in the gambling business. The estimations suggest an exponential annual increase, at an average of about US$7 billion in revenue, or a compounded annual rate of change of 19.24%. If this rate holds, the former fishing village is likely to generate US$57 billion gaming revenue by 2015 – more than three times that of the entire Las Vegas operations including Clark County, Las Vegas Strip, Downtown, and Boulder Strip.

In sum, Macau rise has been unprecedented, and shows few signs of slowing. However, these demands are contingent upon seasonal factors. Casino operators may use the seasonality-oriented findings of this research to fine-tune their operations and marketing strategies – for example, by offering gamblers extra value such as free room upgrades, complementary food and beverages, and additional entertainment options during low seasons, while redirecting them to less-crowded affiliated casinos during high seasons. In addition, managers can gain more insights into human resource planning by recruiting more staff for peak periods while encouraging them to take their annual leave during non-peak months. Results of this research can also help decision makers justify their return on investment in the Macau SAR. If, as these projections suggest, this gaming market will expand in revenue by an average of US$7 billion a year during the next five years, Macau's properties represent a highly desirable investment opportunity indeed.

To focus specifically upon seasonality variables, the findings of this study suggest that August, November, and December receive higher than average gaming revenue inflow. While August and December are traditional peak travel periods for most of the world's destinations, November seems to be a particularly important month for Macau. Notably, during November, Macau hosts two major events (the Macau Formula Three Grand Prix and the Food Festival), and both events draw a significant numbers of tourists. Hence, these findings also suggest a linkage between large leisure events and casino gambling. This hypothesized relationship may also help justify the rationale of building large entertainment and convention centers inside casino complexes. An alternative explanation is that such leisure events are able to attract visitors who seek excitement and pleasure as their primary travel motive. Since gamblers often crave these very attributes in gambling (Cotte, 1997; Lam, 2007), it follows that some event visitors are likely to gamble in order to fulfill these needs. Future research is needed to investigate this relationship through empirical studies, however.

To focus specifically upon seasonality variables, the findings of this study suggest that August, November, and December receive higher than average gaming revenue inflow.

This article provides the gaming literature with a timely update on the relationship between contextual factors and sales revenue in Macau. Although it may seem intuitively reasonable to believe that gaming revenues would surge during golden week holidays, the results of this study suggest that this assumption may not be always valid in respect to casino gambling. On the one hand, gaming revenue peaks in October during the National

Day golden week, but on the other hand, gaming revenue reaches a low ebb during the most important event for Chinese, the Chinese New Year. These findings can help casino managers clarify misperceptions of the impacts of the Chinese golden week holidays.

Seasonality findings of this article reveal a marked contrast in gambling behaviors between the American and Chinese markets. While the casino industry in the United States often records a higher than average gaming revenue in the first half of the year (McGowan, 2009), the casino industry in Macau receives above average revenue inflow during the second half of the year. Although these developments can be attributed to weather conditions and other factors (Cargill & Eadington, 1978), to the best of the author's knowledge no detailed analyses exist of the specific factors that contribute to these seasonal variations in Macau. Because of this, future research could perhaps undertake qualitative inquiries to study the reasons behind these variations. An in-depth examination of the underlying rationales of these fluctuations would assist managers and scholars alike in their efforts to understand the role of contextual factors in casino gambling.

While the casino industry in the United States often records a higher than average gaming revenue in the first half of the year the casino industry in Macau receives above average revenue inflow during the second half of the year.

Although this research follows a systematic approach in time series forecasting, one significant limitation is that it does not take into consideration shocks or major incidents (e.g., financial crises, travel restrictions, and new casinos). In addition, we should consider that other factors may hinder future growth, including overcrowding (Macau welcomed 25 million tourists in 2010 to a land mass which only measures about 29 Km^2 [MSCS, 2011]), stagnant domestic and international transportation systems, a labor shortage, and competition from other Asian destinations such as Singapore and Manila (and possibly Taiwan and Japan).

Also, as of this writing, mainland China is tightening up its monetary policy to confront the inflow of money from quantitative easing. These negative factors may weaken, neutralize, or even negate the positive impacts of development of new casinos. Despite these uncertainties, the concentration of an integrated Vegas-style cluster of casino expositions and the Chinese proclivity towards casino tourism and gambling (Wong & Rosenbaum, 2011) should continue to sustain an unprecedented growth opportunity for the casino industry in the long run. Of course, the gaming industry in Macau (and indeed, the broader Asian region) will eventually reach a mature stage. As the growth of this market is supply-driven (Mellen & Okada, 2006), the SAR should follow the trend of its Las Vegas counterpart with stagnated growth when the development of its gaming infrastructure on the Cotai Strip is fully completed.

References

Aghazadeh, S. M. (2007). Revenue forecasting models for hotel management. *Journal of Business Forecasting, 26*(3), 33-37.

Barsky, J., & Nash, L. (2006). Hotel seasonality impacts guest experience. *Hotel & Motel Management, 221*, 14.

Bauer, K. (2005). KPIs: Seasonality in context. *DM Review,15*(10), 12-57.

Cargill, T. F., & Eadington, W. R. (1978). Nevada's gaming revenues: Time characteristics and forecasting. *Management Science, 24*(12), 1221-1230.

Cotte, J. (1997). Chances, trances, and lots of slots: Gambling motives and consumption experiences. *Journal of Leisure Research, 29*(4), 380-406.

Eadington, W. R., Wells, R. H., & Gossi, D. (2010). Estimating the impact of California tribal gaming on demand for casino gaming in Nevada. *UNLV Gaming Research & Review Journal, 14*(2), 33-45.

Eisendrath, D., Bernhard, B. J., & Lucas, A. F. (2008). Fear and managing in Las Vegas: Estimating the effects of September 11th on Las Vegas Strip gaming volume. *Cornell Quarterly. 49*(2), 145-162.

Frechtling, D. C. (2001). *Forecasting tourism demand: Methods and strategies*. Oxford, UK: Butterworth-Heinemann.

Gaming Inspection and Coordination Bureau. (2011). Monthly gaming revenue. Retrieved February 7, 2011, from http://www.dicj.gov.mo/web/cn/information/DadosEstat_mensal/index.html

Gu, Z. (2006). Product differentiation: Key to Macau's gaming revenue growth. *Journal of Revenue & Pricing Management, 4*(4), 382-388.

Jeffrey, D., & Barden, R. R. D. (2001). Multivariate models of hotel occupancy performance and their implications for hotel marketing. *International Journal of Tourism Research, 3*(1), 33-44.

Lam, D. (2007). An exploratory study of gambling motivations and their impact on the purchase frequencies of various gambling products. *Psychology & Marketing, 24*(9), 815-827.

Las Vegas Convention & Visitors Authority. (2010). 2009 Las Vegas visitor profile study. Retrieved October 6, 2010, from http://www.lvcva.com/press/statistics-facts/index.jsp

Loi, K.-I., & Kim, W. G. (2010). Macao's casino industry: Reinventing Las Vegas in Asia. *Cornell Hospitality Quarterly, 51*(2), 268-283.

Macao Statistics and Census Services. (2011). Gross gaming revenue. Retrieved February 7, 2011, from http://www.dsec.gov.mo/TimeSeriesDatabase.aspx?KeyIndicatorID=15

Macau Statistics and Census Services. (2011). Visitor arrivals. Retrieved February 7, 2011, from http://www.dsec.gov.mo/TimeSeriesDatabase.aspx?KeyIndicatorID=27

McGowan, R. (2009). The competition for gambling revenue: Pennsylvania vs. New Jersey. *Gaming Law Review & Economics, 13*(2), 145-155.

Mellen, S. R., & Okada, S. S. (2006). Forecasting market-wide gaming revenue (win) for the Macau Special Administrative Region. *HVS International Journal*, 1-9.

Render, B., Stair, R., & Hanna, M. (2009). *Quantitative analysis for management* (10th ed.). Upper Saddle River, NJ: Prentice Hall.

Song, H., & Witt, S. F. (2006). Forecasting international tourist flows to Macau. *Tourism Management, 27*(2), 214-224.

Wong, I. A., & Rosenbaum, M. S. (2011). Beyond hardcore gambling: Understanding why mainland Chinese visit Casinos in Macau. *Journal of Hospitality & Tourism Research, (in press)*.

Zeng, Z., & Forrest, D. (2009). High rollers from Mainland China: A profile based on 99 cases. *UNLV Gaming Research & Review Journal, 13*(1), 29-43.