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Common Global and Local Drivers of RevPAR in Asian Cities

Crocker Liu Ph.D.

Cornell University, chl62@cornell.edu

Pamela Moulton Ph.D.

Cornell University, pm388@cornell.edu

Daniel C. Quan Ph.D.

Cornell University, dq22@cornell.edu

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Common Global and Local Drivers of RevPAR in Asian Cities

Abstract

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Keywords

hotels, revenue per available room (RevPAR), Asia

Disciplines

Business | Hospitality Administration and Management

Comments

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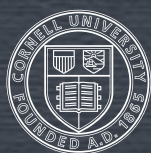


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Center for Hospitality Research
Cornell University
School of Hotel Administration
537 Statler Hall
Ithaca, NY 14853

Phone: 607-255-9780

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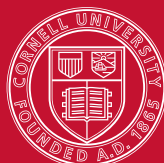
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EXECUTIVE SUMMARY

This study examines the common global and local factors that drive changes in revenue per available room (RevPAR) in eight major Asian cities. We find that RevPARs for these cities tended to move together until about 2009, after which the RevPARs began diverging significantly. The study tests economic variables that capture both local and global factors and which explain most of the changes in RevPAR in each city. One factor, the number of tourist arrivals, is always positively associated with RevPAR changes in the eight cities. Other factors that drive RevPAR in most of the eight cities are inflation, Chinese consumer confidence, U.S. consumer confidence, and Chinese real-estate development (as a proxy for China's GDP). Most of these gateway cities are more heavily influenced by global factors than local factors. At one extreme, global factors explain over 90 percent of the changes in RevPAR in Seoul. At the other extreme, local factors explain 66 percent of the changes in RevPAR in Bangkok. These similarities and differences give hoteliers and investors a window into the factors that drive their properties' revenues and allow a more accurate risk assessment.

ABOUT THE AUTHORS



Crocker H. Liu, Ph.D., is a professor of real estate and the Robert A. Beck Professor of Hospitality Financial Management at the School of Hotel Administration at Cornell University. He previously taught at New York University's Stern School of Business (1988-2006) and at Arizona State University's W.P. Carey School of Business (2006-2009) where he held the McCord Chair. His research interests are focused on issues in real estate finance, particularly topics related to agency, corporate governance, organizational forms, market efficiency and valuation. Liu's research has been published in the *Review of Financial Studies*, *Journal of Financial Economics*, *Journal of Business*, *Journal of Financial and Quantitative Analysis*, *Journal of Law and Economics*, *Journal of Financial Markets*, *Review of Finance*, *Real Estate Economics* and the *Journal of Real Estate Finance and Economics*. He is

currently the co-editor of *Real Estate Economics* and is on the editorial board of the *Journal of Property Research*. He also previously served on the editorial boards of the *Journal of Real Estate Finance and Economics* and the *Journal of Real Estate Finance*.

Pamela C. Moulton, Ph.D., CFA, is an assistant professor at the Cornell University School of Hotel Administration (pmoulton@cornell.edu). Her teaching and research interests include financial markets and market microstructure, with a special interest in liquidity. Moulton's publications include papers on time variation in liquidity, international cross-listings, and optimal trading strategies. Her current research focuses on return predictability and institutional and individual investor behavior. Moulton's research has been published in several academic journals, including the *Journal of Finance*, the *Journal of Financial Economics*, the *Journal of Accounting and Economics*, the *Journal of Financial and Quantitative Analysis*, and the *Journal of Financial Markets*. Prior to her academic career, Moulton worked in research for more than a dozen years at various Wall Street investment banks, including Deutsche Bank, where she was a Managing Director and Global Co-Head of Relative Value Research. From 2003 to 2006 she was a



Managing Director and Senior Economist at the New York Stock Exchange, where she focused on equity market microstructure research. She was previously on the faculty of the Graduate School of Business Administration at Fordham University.

Daniel C. Quan, Ph.D., is the Singapore Tourism Board Distinguished Professor in Asian Hospitality Management. His teaching and research interests include real estate and real estate finance, with a special emphasis on securitization and structured finance. Prior to his Cornell appointment, Quan was the chief mortgage economist at the Board of Governors of the Federal Reserve in Washington, D.C. He was responsible for monitoring and reporting on all matters relating to both the primary and the secondary mortgage markets for both the residential and the commercial sector. Before joining the Federal Reserve Board, he held academic appointments at the University of Texas, Austin's McComb School of Business, UCLA's Anderson School of Business, University of British Columbia and Uppsala University. Quan attended the University of British Columbia, the London School of Economics and the University of California at Berkeley where he received his PhD in business administration in finance and real estate. He serves on the editorial boards of several academic journals and is a board of director member for the Asian Real Estate Society. His publications include papers on auction theory, international performance of commercial real estate, role of information in real estate markets, and the pricing and hedging of risk in the hospitality industry.



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Common Global and Local Drivers of RevPAR in Asian Cities

by Crocker H. Liu, Pamela C. Moulton, and Daniel C. Quan

This study examines the economic drivers of revenue per available room (RevPAR) for eight major Asian cities. Given that RevPAR is used by the lodging industry as a key determinant of a hotel's performance, we examine the regional and global factors driving RevPAR in these cities. We calculate how much of the overall changes in RevPAR are explained by local factors and how much by broader factors. These issues are especially important in light of the recent financial crisis, in which global factors caused RevPAR to plummet around the world.¹ We also see this examination of factors driving RevPAR as instrumental for understanding hotel market fundamentals and for quantifying risk.

¹ For an analysis of the impact of the financial crisis on U.S. hotel performance, see: Cathy A. Enz, Renáta Kosová, and Mark Lomanno, "The Impact of Terrorism and Economic Shocks on U.S. Hotels," *Cornell Hospitality Report*, 11 (5) 2011; Cornell Center for Hospitality Research.

Asian city hotel index composition

	Properties			Rooms		
	Census	Sample	Percent Coverage	Census	Sample	Percent Coverage
Shanghai	899	156	17.4%	172,405	52,866	30.7%
Beijing	876	190	21.7%	168,584	51,134	30.3%
Hong Kong	164	51	31.1%	57,129	22,786	39.9%
Tokyo	340	85	25.0%	83,073	30,431	36.6%
Seoul	115	25	21.7%	25,858	9,147	35.4%
Taipei	113	9	8.0%	18,296	3,393	18.5%
Singapore	187	65	34.8%	47,530	27,604	58.1%
Bangkok	239	77	32.2%	59,754	22,752	38.1%
Average			24.0%			35.9%

About the Sample

All data are collected by STR Global, which calculates averages of data provided by individual hotel properties that use such data for their benchmarking needs. The periodic ADR figures are calculated as the ratio of the total sample revenue divided by the total sample rooms for all participating hotels in each city. Since the number of sample hotels increases over time, this average is calculated on a changing sample. Hotels seldom exit the sample once they become a data provider, and thus the ADR figures should provide an increasingly accurate measure.

Exhibit 1 provides information on the coverage for each city as of 2012. The census figures represent the total number of hotels and rooms in each market. On average, the sample contains information for 24 percent of all hotel properties and 36 percent of all hotel rooms in each market. The coverage ranges from 9 percent of all properties in Taipei, representing 19 percent of all rooms, to 35 percent of the properties in Singapore, or 58 percent of all rooms.

One reason that we are interested in comparing the effects of local factors on RevPAR with the influence of global factors is that the global drivers have broader profitability consequences for hotel operators who manage an international portfolio of hotels. It is often said that “when the U.S. sneezes, the world catches a cold.” In our Asian context, the global factors can also capture the extent to which Asian cities catch a cold if *China* “sneezes.” On the other hand, by assessing local RevPAR factors, international hoteliers can reduce country risk by expanding their hotel portfolios across countries not subject to the same type of local risk.

Data

This study makes use of a new dataset of monthly average daily hotel rates (ADRs) and occupancy rates collected by STR Global for the following eight major Asian cities: Bangkok, Beijing, Hong Kong, Seoul, Shanghai, Singapore, Taipei, and Tokyo, as explained in the description and table above. From this dataset we calculate monthly RevPAR as the product of the monthly ADR and the monthly occupancy rate. Although

we analyze RevPAR in this study, an analysis of ADR yields similar results.

One challenge of analyzing RevPAR over long periods is that RevPAR tends to be cyclical and highly seasonal. For example, ADR and occupancy are strong during the Asian New Year in January or February of each year, and China’s other “golden days” also affect travel patterns.² By analyzing monthly year-over-year percentage changes, we implicitly control for the normal seasonal patterns, allowing us to focus on the underlying economic drivers of RevPAR for different cities. The year-over-year percentage change is calculated as the current-month’s observation divided by the observation from 12 months earlier, minus one. In this study, we analyze year-over-year changes in RevPAR as well as year-over-year changes in our independent vari-

² See: Peng Liu, Qingqing Lin, Lingqiang Zhou, and Raj Chandnani, “Attitudes of Chinese Outbound Travelers: The Hotel Industry Welcomes a Growing Market,” *Cornell Hospitality Report*, Vol. 13, No. 4 (2013) Cornell Center for Hospitality Research.

ables. Those variables are: monthly data on the consumer price index, the number of international tourists, the trade balance (exports versus imports), and the exchange rate for each of our eight cities, as well as the consumer confidence index and interest rates for China and the U.S. (from CEIC Data), and the MSCI Asia stock index denominated in U.S. dollars (from Datastream).³ The countries represented in the MSCI Asia stock index are China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, and Thailand. We obtain the investment index of real estate development for China from the China Statistical Information and Consultancy Service Center.

Economic Rationale for Explanatory Variables

As we discuss next, we select and attempt to quantify the major local and global supply and demand factors. We explain our motivation for including each variable and how we expect each one to affect RevPAR through the demand for or supply of hotel rooms. In searching for appropriate explanatory variables, we are guided by a combination of economic theory, previous empirical work, and our need for proxies that are available at least at a monthly frequency, since we have only 60 months in our RevPAR time series.

Local Variables

International tourist arrivals. International tourist arrivals should have a positive impact on RevPAR, as they directly affect the demand for hotel rooms and are a proxy for inbound tourism in general.⁴

Trade balance. Economic growth should also have a positive impact on the demand for hotel rooms, and Canina and Carvell are among those who find that hotel demand increases with an increase in GDP.⁵ Unfortunately, GDP growth figures are available only quarterly, but the trade balance (exports minus imports) is available monthly and can be used as a proxy for GDP growth. From macroeconomics, we know that GDP is equal to $C + I + G + (X - M)$, where C is private consumption, I is private investment, G is government spending or consumption, X is exports, and M is imports. Thus, the trade balance (X - M) is one of the four components of GDP. We expect RevPAR to increase as the

³ A service of Internet Securities, Inc. (trading as ISI Emerging Markets), CEIC Data is a comprehensive source of 1.2 million macro-economic, industrial, and financial time series and statistics from over 50 countries (<http://www.securities.com/products/ceic.html>); Datastream is a service of Thomson Reuters (http://thomsonreuters.com/products_services/financial/financial_products/a-z/datastream/).

⁴ For example, see: Renáta Kosová and Vrinda Kadiyali, "Inter-Industry Employment Spillovers from Inbound Tourism," Cornell University, Johnson School Research Paper Series No. 57-2011.

⁵ Linda Canina and Steven Carvell, "Lodging Demand for Urban Hotels in Major Metropolitan Markets," *Journal of Hospitality & Tourism Research*, 29 (3) 2005: 291-311.

trade balance increases, since economic growth is likely to generate more business travel, increasing hotel demand.

Inflation. Inflation, as measured by the consumer price index, is included in our analysis to ascertain whether RevPAR growth in each market is able to at least keep pace with inflation and thereby maintain hotel profit margins.⁶ From a U.S. perspective, Church observes that "over the past 20 years, the average annual rate of inflation for the United States has been roughly 3.1 percent. Over the same time period, the average annual nominal growth rate of ADR has been around 3.5 percent."⁷ If a similar relationship holds for the Asian countries in our sample, then one would expect that ADR growth should increase with an increase in inflation, leading to RevPAR growth (to the extent that occupancy remains constant or increases). Although the rate of inflation should generally result in at least comparable increases in hotel room rates, severe inflation might have a countervailing influence on this relationship. As Choice Hotels International advises in their 10-K filed on February 29, 2008: "Severe inflation could contribute to a slowing of the national economy. Such a slowdown could result in reduced travel by both business and leisure travelers, potentially resulting in less demand for hotel rooms, which could result in a reduction in room rates and fewer room reservations, negatively affecting our revenues. A weak economy could also reduce demand for new hotels."

Global Variables

MSCI Asia stock index. We include the MSCI Asia stock index as a proxy for expected changes in the overall Asian economy. Studies show that the stock market is a leading economic indicator of growth trends, suggesting that an increase in Asian stock prices should increase demand for hotel rooms and thus have a positive impact on RevPAR.

Chinese and U.S. consumer confidence. Consumer confidence reflects consumers' future expectations for income. We include the consumer confidence index for China and for the U.S. Canina and Carvell find, for instance, that consumer confidence has an impact on the price elasticity for hotel properties.⁸ Additionally, Knowles and Egan find that consumer confidence, particularly with regard to people's willingness to travel, is a key factor that affects the international hotel industry.⁹ We thus expect greater con-

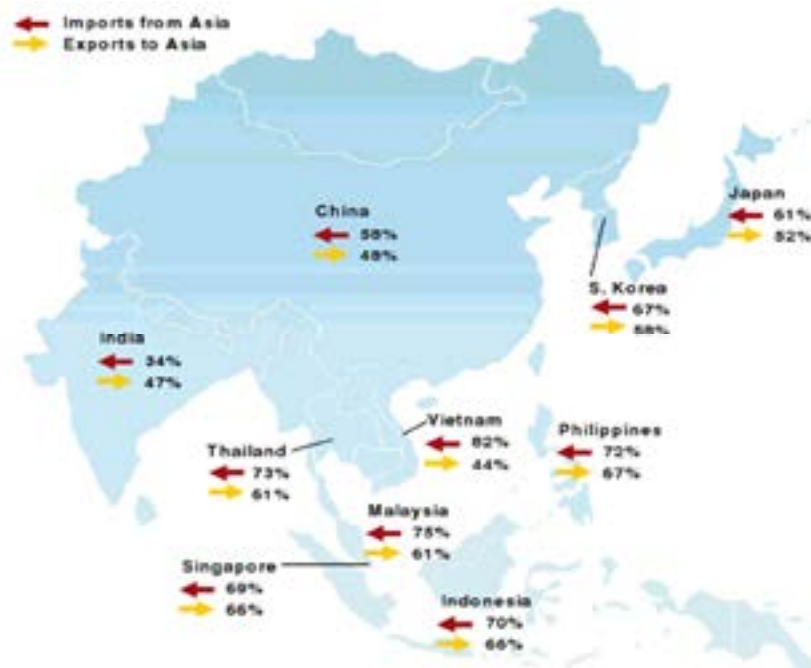
⁶ This also assumes that hotel operating expenses increase with inflation on a per-occupied-room (POR) basis, while undistributed and fixed expenses increasing with inflation on a per-available-room (PAR) basis.

⁷ Chad Church, "ADR, Inflation Moving Forward," *HotelNewsNow.com*, <http://www.hotelnewsnow.com/Articles.aspx/306/ADR-inflation-and-moving-forward>, November 10, 2008.

⁸ Canina and Carvell, *op.cit.*

⁹ T. Knowles and D. Egan, "Recession and Its Implications for the International Hotel Industry," *Travel & Tourism Analyst*, 6: 59-76 (2001).

Imports and exports in selected Asian nations



sumer confidence to increase the demand for hotel rooms and have a positive effect on RevPAR.

China–U.S. exchange rate. We include the China–U.S. exchange rate in our analysis because Chang and Ma show that ADR, occupancy, and (therefore) RevPAR increase in weak currency environments (and likewise decrease in the face of a strong currency) due to exchange-rate interactions.¹⁰ We include only the China–U.S. exchange rate because Asian exchange rates are highly correlated during our sample period, leading to multicollinearity if more than one is included, and the China–U.S. exchange rate captures the main effects.¹¹

Chinese real-estate development. This is another monthly proxy for GDP. China has extensive economic links throughout Asia, and thus its economic status may have contagion effects on other Asian countries. Katsenelson, for example, observes that “what happens in China doesn’t stay in China (not any more); it spills over to the rest of the

world.”¹² Exhibit 2 illustrates the mechanics behind this observation. Asian countries represent 58.2 percent of China’s imports and 47.6 percent of its exports. Investment represents the “I” in the $C + I + G + (X - M)$ GDP equation that we discussed above. Chovanec observes that “even though the real-estate investment figures and the GDP figures are not an exact match, in terms of what they are measuring, ... comparing them still gives us a reasonable window into the direct impact of a real estate slowdown on GDP.”¹³ Moreover, Shen and Liu show that “the impact of the GDP on real estate development investment is much larger than that of real-estate investment on the GDP.”¹⁴ As a proxy for GDP, we expect Chinese real-estate development to be positively related to RevPAR, as economic growth should increase the demand for hotel rooms.

Event-dummy variables. Based on conversations with hoteliers in several Asian cities, we also include dummy

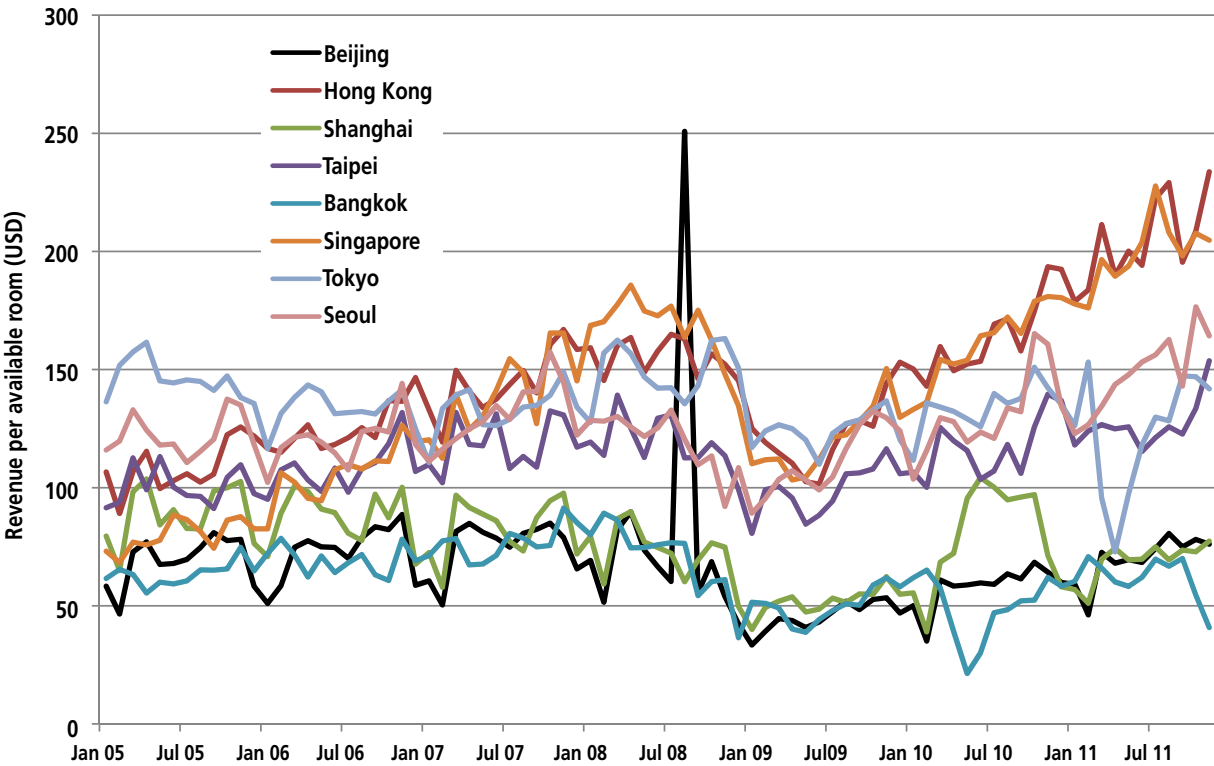
¹⁰ Charles Chang and Liya Ma, “Operational Hedging and Exchange Rate Risk: A Cross-Sectional Examination of Canada’s Hotel Industry,” *Cornell Hospitality Report*, 9 (15); 2009; Cornell Center for Hospitality Research.

¹¹ Although multicollinearity does not reduce the predictive power of the model, a model with multicollinearity may not give valid results for any individual predictor or reveal which predictors are redundant with respect to other correlated predictors. Multicollinearity also can result in overfitting in regression models.

¹² Vitaliy N. Katsenelson, “China: The Mother of All Grey Swans,” Presentation, Casey Research Summit in San Diego (<http://contrarianedge.com/2010/10/30/china-the-mother-of-all-grey-swans/>); October 3, 2010.

¹³ Patrick Chovanec, “Further Thoughts on Real Estate’s Impact on GDP,” <http://chovanec.wordpress.com/2012/01/20/further-thoughts-on-real-estates-impact-on-gdp/>; January 20, 2012.

¹⁴ Real estate accounts for approximately 10 to 13 percent of China’s GDP. See: Shen Yue and Liu Hongyu, “Relationship Between Real Estate Development Investment and GDP in China,” *Journal of Tsinghua University (Science and Technology)*, 9 (2004).

EXHIBIT 3**Asian city RevPARs over time**

variables for the following events: the Beijing Olympics in August 2008, the Japanese tsunami in March 2011, the Bangkok floods that lasted from July 2011 through January 2012, and the Shanghai Expo that started in May 2010 and ended in October of that year.¹⁵ We expect to see an effect on hotel demand from each of these major events. We anticipate increased occupancy from the Olympics, the largest of these events, and the Expo.¹⁶ On the other hand, we know that the tsunami and floods unfortunately reduced tourism and, thus, occupancy. We note that the magnitude of the RevPAR effect of the Olympics and Expo depends on the extent to which supply also increased as the hotel industry prepared to accommodate tourists for those events.

¹⁵ Dummy variables, also known as indicator variables, take on a value of one during the months that the event occurred and a value of zero in all other time periods.

¹⁶ Hotel Online Special Report (http://www.hotel-online.com/News/PR2005_2nd/May05_ChinaRevPar.html)

Findings

Co-movement of RevPAR. Exhibit 3 graphs the RevPAR for all eight cities over our sample period, 2005-2011, in U.S. dollars.¹⁷ The RevPARs of the Asian cities generally move together from 2005 through 2008 (the height of the world liquidity crisis), then begin to diverge noticeably beginning in 2009. This phenomenon is consistent with previous findings regarding stocks, bonds, and real estate. During times of crisis, returns on different asset classes tend to be more highly correlated, as is the case with these diverse cities. Conversely, with the start of the economic recovery in January 2009, the RevPARs of Asian cities start to diverge from one another.

Several of the distinctive patterns in RevPAR displayed in Exhibit 3 are explained by the events we include in the analysis, justifying our inclusion of event dummy variables. For example, the Beijing Olympics explains the spike in Beijing RevPAR in August 2008.

¹⁷ All RevPARs are converted to U.S. dollars using the month-end exchange rate.

RevPAR regression summary

RevPAR regression coefficient signs										
	Seemingly unrelated regression across all eight cities								8-city panel	
	Bangkok	Beijing	Hong Kong	Shanghai	Singapore	Taipei	Tokyo	Seoul	with city FEs	Without city FEs
Local variables										
International tourist arrivals	+	+	+	+	+	+	+	+	N/A	N/A
Trade balance	-	+	+	-	+	+	+	-	N/A	N/A
Inflation	-	+	+	-	+	-	-	-	NA	N/A
Global variables										
MSCI Asia stock index	-	-	+	-	+	+	-	+	+	+
Chinese consumer confidence	+	-	+	-	+	+	-	+	+	+
U.S. consumer confidence	+	+	+	+	+	+	+	+	+	+
China-U.S. exchange rate	-	+	-	+	-	-	-	-	-	-
Chinese real-estate development	-	+	+	+	+	+	+	-	-	-
Number of observations	70	70	70	70	70	70	70	70	560	560
R ²	86%	82%	84%	88%	76%	65%	83%	65%	45%	38%

Notes: Regressions also include controls for the Beijing Olympics, Japanese tsunami, Thai floods, and Shanghai Expo, as well as quarterly fixed effects. The far right-hand columns, shown in red and labeled “8-city Panel,” refer to a regression that includes all eight cities at once, without considering local values and without city fixed effects (FEs). RevPAR (the dependent variable) and explanatory variables are year-over-year percentage changes.

Explanatory Power of Economic Factors

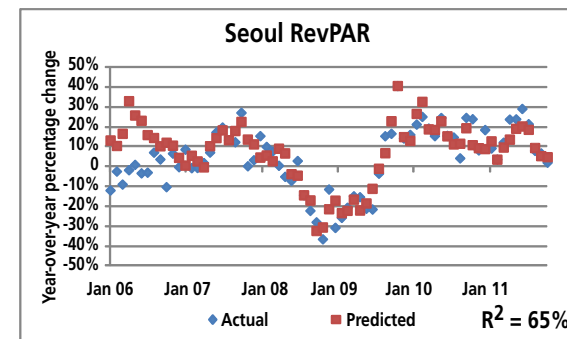
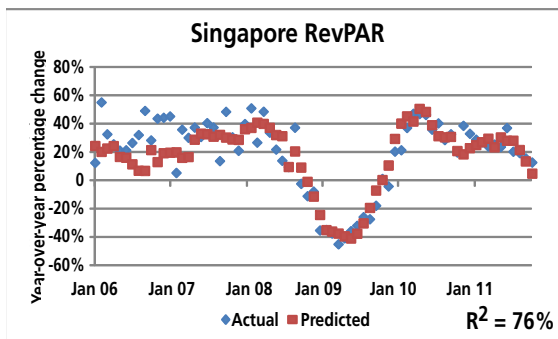
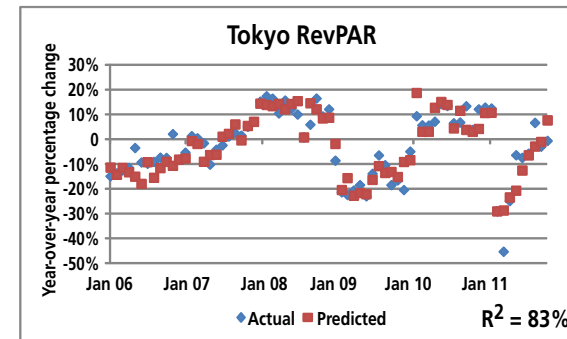
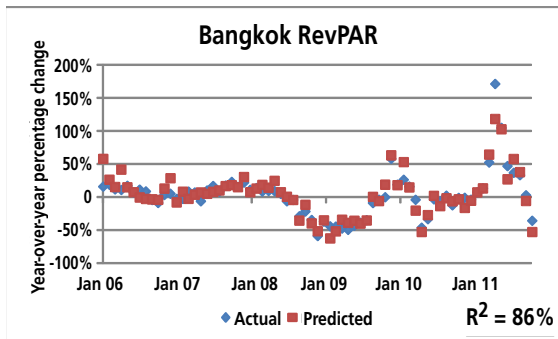
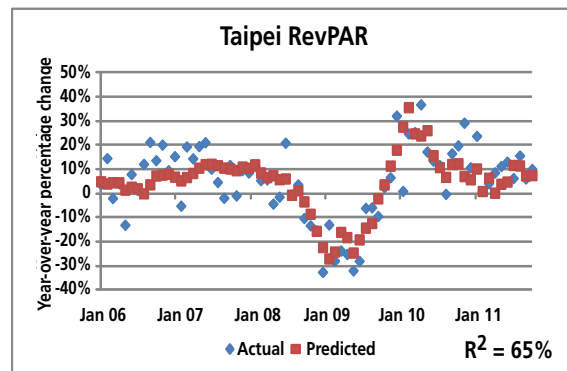
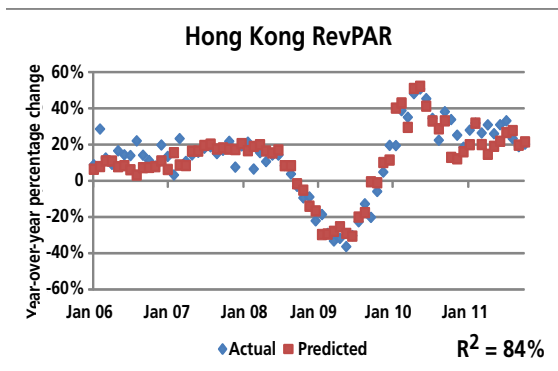
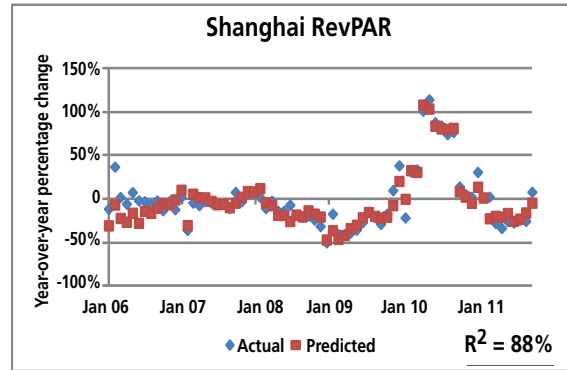
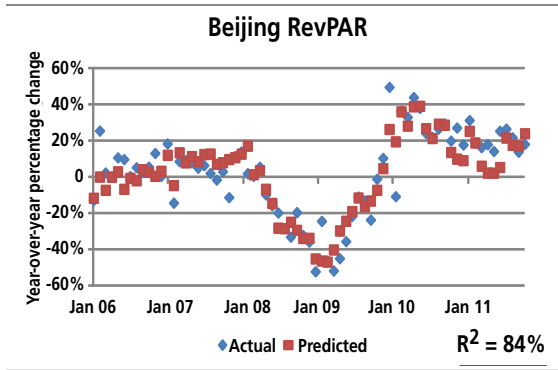
The first eight columns of Exhibit 4 summarize the directional relationship between each explanatory factor and the RevPAR for each city; coefficient signs for the dummy variables are not listed.¹⁸ These relationships are determined using an econometric technique known as seemingly unrelated regression, which takes into account both the individual factors that are primary drivers of each city’s RevPAR and the underlying relationships between the cities’ RevPARs. The last two columns (in red, labeled “8-city panel”) omit the local variables to combine all eight cities into one analy-

¹⁸ Detailed results of all regressions, including coefficient estimates for all explanatory variables and their *p*-values from ordinary least squares (OLS) and seemingly unrelated regressions (SUR), are shown in the appendix. Adding lags of the explanatory variables to the regression equations does not change any of our conclusions, but it does risk introducing multicollinearity because the lagged and contemporaneous variables are highly correlated, so we exclude them from our analysis.

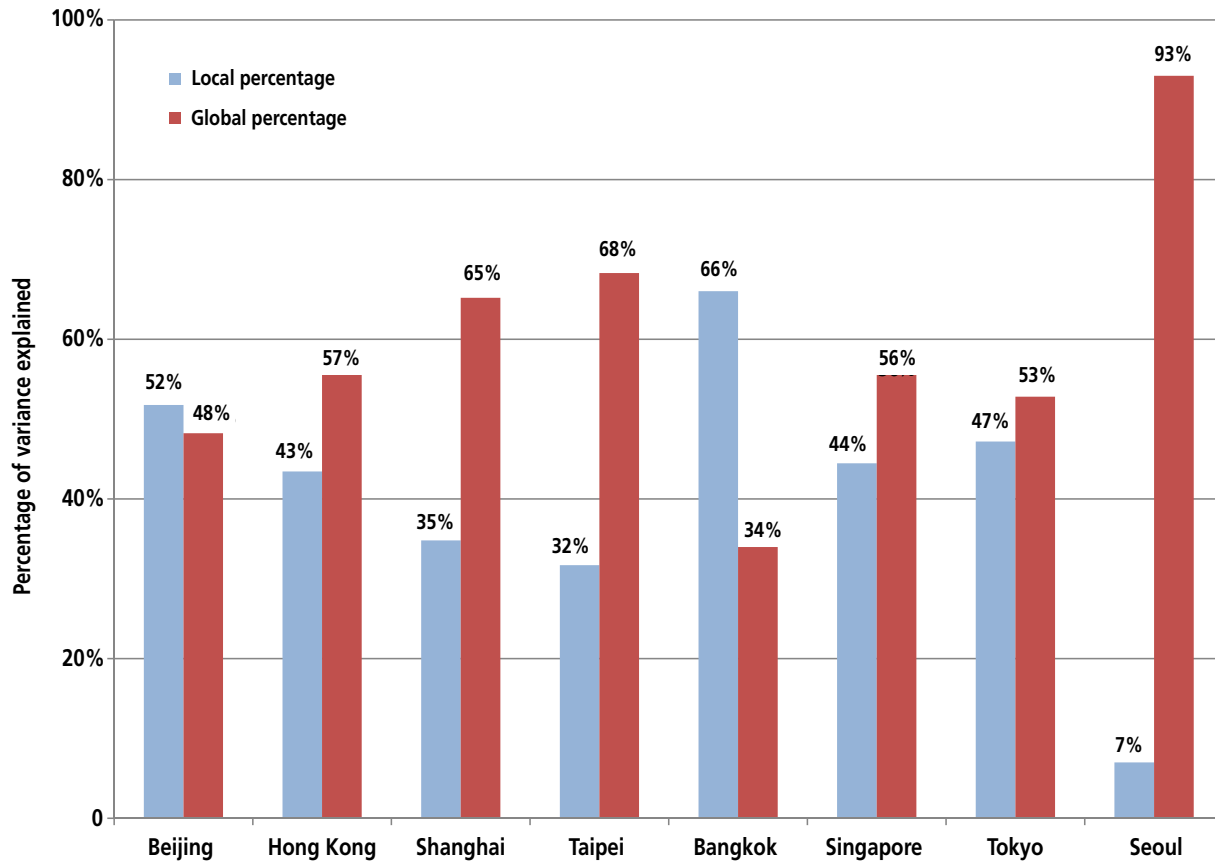
sis. The first column under the “8-city panel” header includes city fixed effects (FEs), a rough way of accounting for the differences across cities by including a dummy variable for each city. In contrast, the last column excludes city FEs. Shaded boxes indicate that the predicted relation is significant at the 90-percent confidence level.

Overall, the results in the first eight columns of Exhibit 4 indicate that the economic variables chosen explain the majority of the year-over-year changes in RevPAR in all eight Asian cities, with the explanatory power of all the factors combined ranging from an R-squared of 65 percent in Taipei and Seoul to 88 percent in Shanghai. Exhibit 5, on the next page, shows the goodness-of-fit graphically, by comparing the actual year-over-year change in RevPAR for each city to its predicted value based on the seemingly unrelated regression model. Stated differently, using the same factors in each city, we are able to account for the overwhelming majority (65% to 88%) of the variation in RevPAR for each Asian city

Predicted RevPAR versus actual RevPAR by city



Explanatory power of local and global factors on RevPAR for eight Asian cities



over time, which is the reason why our predicted RevPAR is so similar to the actual RevPAR for all eight cities examined.

While the positive or negative effect of each variable is not always identical across countries as we had hypothesized, two variables, tourist arrivals and U.S. consumer confidence, always have a positive effect. As international tourism increases in a given Asian country, RevPAR increases in cities in that country. This is the only variable that is statistically significant in every city. Similarly, an increase in U.S. consumer confidence leads to an increase in RevPAR in all eight Asian cities.

After those two variables, the situation is mixed. Chinese consumer confidence is not always associated with RevPAR changes, while an increase in Chinese real-estate development, which generates higher RevPARs in most Asian cities, does not result in a boost for Bangkok or Seoul. An increase in the other GDP proxy, the trade balance, has a similar positive association with RevPARs in seven cities, but not in Shanghai. We should note that these two variables are

distinct, in that Chinese real-estate development is a direct component of China's GDP only, while the trade balance for each country is a direct component of that country's GDP.

Relative Importance of Global and Local Factors

The seemingly unrelated regression analysis of Exhibit 4 and the graphs of Exhibit 5 suggest that our economic model explains a large portion of the variation in Asian hotel RevPARs over time and across cities. Our next step is to determine how much of the explanatory power arises from local factors (as indicated by international tourist arrivals, trade balance, and inflation) and how much is due to global factors (as captured by the MSCI Asia stock index, Chinese and U.S. consumer confidence, the China-U.S. exchange rate, and the Chinese real-estate development index). The last two columns of Exhibit 4, which combine all eight cities into one analysis, begins to address this issue. We see that the global variables explain 45 percent of the variation in RevPAR if we include fixed effects for each city, whereas global variables

explain about 38 percent of the changes in RevPAR if the city fixed effects are omitted.

Exhibit 6 provides a closer look at the relative influence of global and local factors on RevPAR in each of the eight cities individually. The relative weights for global and local variables are determined by comparing the R-squared of the seemingly unrelated regressions for each city using local factors only versus the seemingly unrelated regressions using global factors only. The results are quite striking. Most of the cities are more heavily influenced by global factors rather than local factors. The extreme case is Seoul, where over 90 percent of the explanatory power in RevPAR changes comes from global factors. In contrast, Beijing and Bangkok experience a bigger effect from local factors. Those local factors account for 52 percent of Beijing's RevPAR and for 66 percent of Bangkok's RevPAR.

Implications for Executives and Investors

Since hotels are fixed in location, their RevPAR arises from a combination of idiosyncratic factors, local (city-specific) factors, and broader (regional or global) factors. Our findings on which factors matter most and how they affect RevPAR have several practical implications for hotel investors, hotel operators, and executives making decisions about how to allocate management expertise across hotel properties in different Asian cities.

Investors. One strategy that hotel investors might use for minimizing risk would be to purchase assets in different cities in a region, on the theory that these investments would not be correlated, and a drop in one market should be offset by a boom in another. What this study finds, however, is that certain cities are more correlated than one might expect due to their susceptibility to global factors. For hotel investors, understanding the exposure to local and global factors may enable them to hedge the risk to RevPAR by taking offsetting positions in local or broader investments, such as shorting country and international stock indices. Knowing the portion of RevPAR that arises from local demand and supply factors allows hotel investors to better assess whether they wish to invest in or exit a given Asian city and whether the risks that they face (volatility in RevPAR) are primarily local or more macro in nature.

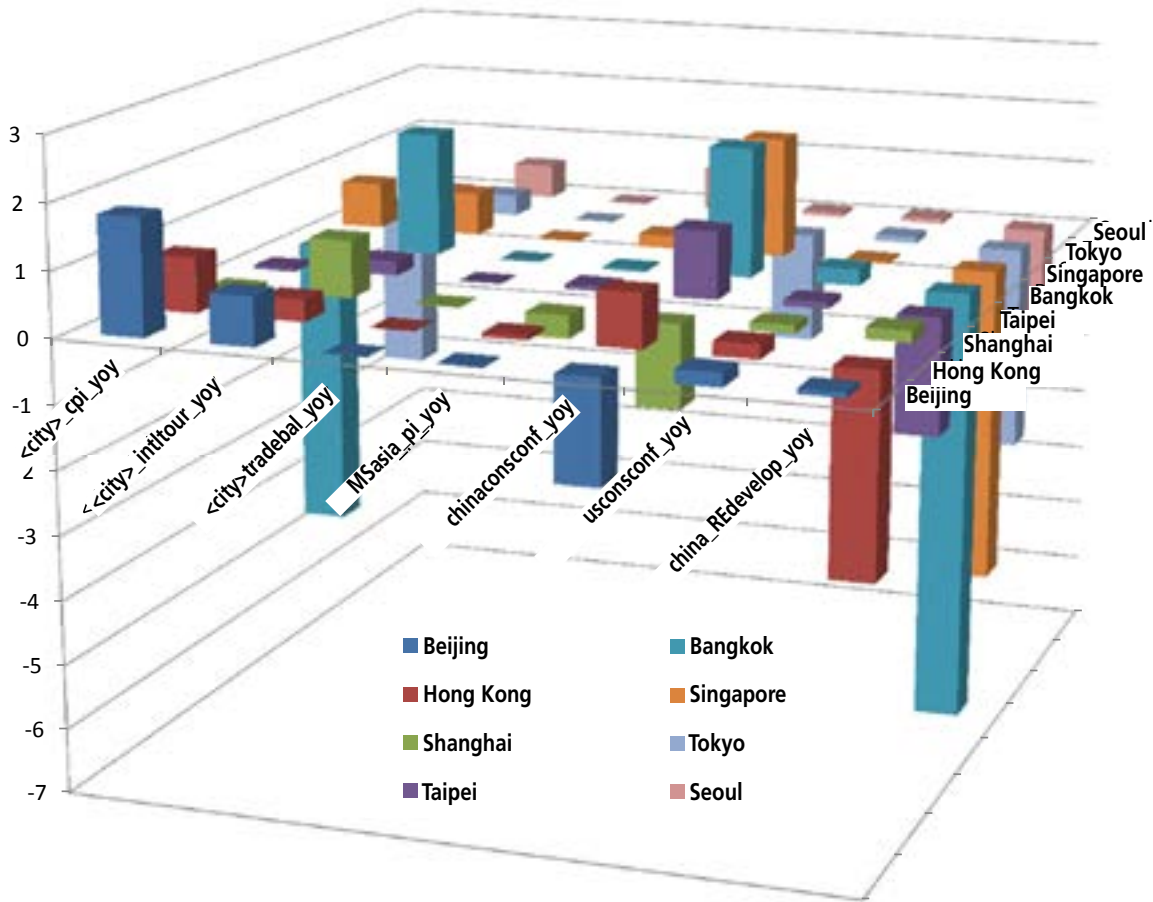
Executives. For hotel operators, the explanatory variables identified as significantly related to RevPAR in our

analyses can be viewed as early warning indicators, which they can use as signals to take timely steps to sustain profitable operations. Knowing the sensitivity of RevPAR to these factors gives hotel operators a sense of the extent to which RevPAR may be affected, given a change in a salient factor that drives RevPAR. For example, according to our seemingly unrelated regression estimation technique, a 1-percent increase in the year-over-year U.S.–China exchange rate results in a 6.9-percent year-over-year decline in RevPAR for Bangkok hotels in aggregate. To deal with this exchange-rate risk, hotel operators might consider using operational hedging, such as with revenue management, rather than financial hedging to sustain operations. As Chang notes, “Hotel firms may be able to offset the fluctuations in dollar-denominated earnings caused by changing currency values simply by matching these changes with complementary adjustments in room rates.”¹⁹ For executives, understanding the extent to which local and global factors in aggregate affect RevPAR can inform decisions about allocating management talent across hotels in different cities. For example, a talented manager is more likely to add value in Taipei or Seoul (where local and global factors explain only 65 percent of RevPAR variation) than in Shanghai (where local and variable factors explain 88 percent of RevPAR changes). We suggest this because managers might have more control over a hotel's risk exposure in Taipei or Seoul. Finally, this study gives investors and operators an indication of which types of economic variables they should monitor in terms of RevPAR expectations and thereby avoid revenue surprises.

Limitations. We should note that our findings may be limited by the fact that they are based on RevPAR changes in just eight cities. However, we see no reason that these cities are exceptional (with regard to the rest of the region), and one could reasonably argue that they represent an effective barometer for the entire region. One other potential limitation is that the data for each city is based on a sample of hotels that report to STR Global, but that sample is not representative, nor is it a census of the destination. That said, the hotels involved are large, international properties that comprise a substantial number of rooms in each destination and are reasonable proxies for all hotels in each city. ■

¹⁹ Charles Chang, “To Hedge or Not to Hedge: Revenue Management and Exchange Rate Risk,” *Cornell Hospitality Quarterly*, 50 (3): 301-313 (2009).

RevPAR coefficients by city



*Appendix:
Seemingly Unrelated Regression Analysis*

We used seemingly unrelated regression (SUR) in our main analysis. SUR is a generalized linear regression model that consists of several regression equations. Each regression equation has its own dependent variable and potentially different sets of explanatory variables. In our study, each city has its own regression equation with the dependent variable equal to the year-over-year change in RevPAR for that city. The explanatory variables for each city are the year-over-year change for consumer price index, the number of international tourists, the trade balance (exports less imports), the MSCI Asia stock index, the consumer confidence index for China and for the U.S., the China–U.S. exchange rate, and the investment index of real-estate development for China. Since each equation is a valid linear regression on its own, it can be estimated separately equation-by-equation using standard ordinary least squares (OLS). But since the error terms are assumed to be correlated across the equations, it is more appropriate to estimate the models simultaneously as a system of equations. Essentially, the SUR method amounts to feasible generalized least squares with a specific form of the variance–covariance matrix. In summary, SUR is a set of equations that may be related not because they interact, but because their error terms are related.

The results of our SUR are displayed graphically above in Exhibit 7 and numerically in Exhibit 8 overleaf. The graphical depiction in Exhibit 7 is intended to give the reader a better sense of which variables are important drivers of RevPAR for a particular Asian city. In Exhibit 8, Estimate stands for the estimate of the coefficient (the beta coefficient of a given independent variable) while ProbT represents the probability that the coefficient is statistically significant. All coefficients shaded in gray are statistically significant at the 10-percent level. Exhibit 8 basically shows that inflation, international tourism, Chinese consumer confidence, U.S. consumer confidence, and Chinese real-estate development are important drivers of RevPAR in most Asian cities.

EXHIBIT 8
Seemingly unrelated regression (SUR) results

Dependent variable = RevPAR (year-over-year percentage change)

SUR Estimation (No. of observations = 70)

Parameter	Bangkok		Beijing		Hong Kong		Shanghai	
	Estimate	ProbT	Estimate	ProbT	Estimate	ProbT	Estimate	ProbT
Intercept	-0.216	0.0030	-0.091	0.1839	-0.092	0.0459	-0.099	0.1435
<city>_cpi_yoy	-4.613	0.0021	1.789	0.0468	0.853	0.2795	-0.325	0.7273
<city>_intltour_yoy	1.948	0.0000	0.754	0.0000	0.342	0.0172	0.898	0.0000
<city>tradebal_yoy	-0.002	0.0178	0.004	0.6532	0.011	0.2408	-0.013	0.1708
MSasia_pi_yoy	-0.038	0.8542	-0.009	0.9573	0.068	0.5585	-0.358	0.0377
chinaconconf_yoy	2.043	0.0396	-1.612	0.0873	0.843	0.1937	-1.305	0.1522
usconconf_yoy	0.254	0.0762	0.211	0.0713	0.229	0.0151	0.123	0.2528
china_exchrte_yoy	-6.858	0.0000	0.082	0.9501	-3.152	0.0015	0.184	0.8861
china_REdevelop_yoy	-0.863	0.3393	0.780	0.2558	0.793	0.1206	2.777	0.0001
BOlympics	0.041	0.7837	0.024	0.8505	-0.007	0.9400	0.085	0.4814
JTsunami	-0.134	0.3592	0.199	0.1156	0.139	0.1399	0.174	0.1455
TFloods	0.009	0.9092	0.225	0.0010	0.120	0.0312	-0.093	0.1247
SHExpo	-0.009	0.9306	0.115	0.2110	0.219	0.0026	0.690	0.0000

Parameter	Singapore		Taipei		Tokyo		Seoul	
	Estimate	ProbT	Estimate	ProbT	Estimate	ProbT	Estimate	ProbT
Intercept	-0.113	0.0727	-0.042	0.4504	-0.173	0.0002	-0.077	0.0939
<city>_cpi_yoy	0.733	0.6347	-0.064	0.9453	-2.699	0.2452	-0.233	0.8362
<city>_intltour_yoy	0.680	0.0680	0.228	0.0804	0.344	0.0000	0.551	0.0004
<city>tradebal_yoy	0.016	0.3527	0.000	0.9843	0.000	0.4571	-0.001	0.0236
MSasia_pi_yoy	0.205	0.2224	0.077	0.5528	-0.194	0.0285	0.686	0.0000
chinaconconf_yoy	1.895	0.0644	1.070	0.1374	-1.767	0.0002	0.070	0.8933
usconconf_yoy	0.039	0.7519	0.101	0.3318	0.097	0.1406	0.083	0.3161
china_exchrte_yoy	-5.066	0.0027	-1.846	0.0837	-3.281	0.0009	-1.589	0.0383
china_REdevelop_yoy	0.972	0.2138	0.893	0.1442	1.754	0.0000	-0.334	0.4282
BOlympics	-0.155	0.2354	-0.037	0.7383	-0.159	0.0208	-0.045	0.5773
JTsunami	0.010	0.9401	-0.045	0.6789	-0.099	0.1593	-0.003	0.9698
TFloods	-0.002	0.9818	0.076	0.1868	0.024	0.4932	0.055	0.2066
SHExpo	0.073	0.4790	-0.009	0.9101	0.047	0.3033	0.073	0.1987

 System-wtd $R^2 = 0.8787$

Seemingly unrelated regression (SUR) results (continued)

Dependent variable = RevPAR (year-over-year percentage change)

OLS Estimation (No. of observations = 70)

Parameter	Bangkok		Beijing		Hong Kong		Shanghai	
	Estimate	ProbT	Estimate	ProbT	Estimate	ProbT	Estimate	ProbT
Intercept	-0.204	0.0056	-0.125	0.1143	-0.063	0.1810	-0.147	0.0476
<city>_cpi_yoy	-4.013	0.0257	1.299	0.2819	2.316	0.0368	-1.200	0.2849
<city>_intl_tour_yoy	1.923	0.0000	0.939	0.0000	0.145	0.4479	1.024	0.0000
<city>_tradebal_yoy	-0.001	0.1986	0.001	0.9524	0.011	0.4394	-0.005	0.6661
MSasia_pi_yoy	-0.037	0.8674	0.009	0.9633	0.046	0.7004	-0.268	0.1452
chinaconsconf_yoy	2.173	0.0300	-1.886	0.0743	1.218	0.0748	-1.707	0.0818
usconsconf_yoy	0.247	0.0855	0.222	0.0584	0.196	0.0395	0.127	0.2368
china_exchrate_yoy	-6.471	0.0002	-0.470	0.7572	-2.255	0.0370	-0.600	0.6716
china_REdevelop_yoy	-1.044	0.2792	0.858	0.2382	0.755	0.1470	3.104	0.0000
BOlympics	0.036	0.8109	0.028	0.8312	-0.020	0.8358	0.061	0.6195
JTsunami	-0.136	0.3526	0.228	0.0849	0.132	0.1604	0.222	0.0710
TFloods	0.001	0.9865	0.221	0.0014	0.094	0.1121	-0.083	0.1721
SHExpo	-0.020	0.8532	0.129	0.1938	0.217	0.0045	0.713	0.0000
Adj R ²	0.8655		0.8002		0.8355		0.9177	

Parameter	Singapore		Taipei		Tokyo		Seoul	
	Estimate	ProbT	Estimate	ProbT	Estimate	ProbT	Estimate	ProbT
Intercept	-0.103	0.1176	-0.051	0.4127	-0.150	0.0026	-0.093	0.0566
<city>_cpi_yoy	0.963	0.6143	-1.103	0.4485	-1.477	0.5836	0.408	0.7541
<city>_intl_tour_yoy	0.810	0.0779	0.252	0.2065	0.285	0.0000	0.580	0.0010
<city>_tradebal_yoy	0.003	0.8827	0.000	0.6506	0.000	0.5647	-0.001	0.0607
MSasia_pi_yoy	0.214	0.2265	0.082	0.5297	-0.177	0.0513	0.694	0.0000
chinaconsconf_yoy	1.959	0.0782	1.025	0.1597	-1.764	0.0003	0.146	0.7811
usconsconf_yoy	0.034	0.7862	0.098	0.3463	0.078	0.2435	0.083	0.3314
china_exchrate_yoy	-4.746	0.0124	-2.356	0.0596	-2.747	0.0107	-1.467	0.0653
china_REdevelop_yoy	0.723	0.3840	1.003	0.1289	1.894	0.0000	-0.394	0.3547
BOlympics	-0.134	0.3098	-0.025	0.8191	-0.164	0.0183	-0.047	0.5634
JTsunami	-0.017	0.8991	-0.035	0.7489	-0.125	0.0857	-0.008	0.9201
TFloods	-0.025	0.7427	0.070	0.2297	0.018	0.6181	0.048	0.2789
SHExpo	0.070	0.5253	-0.009	0.9032	0.046	0.3055	0.067	0.2451
Adj R ²	0.8131		0.5954		0.8052		0.8205	

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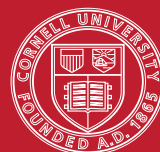
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