

The Impact of 9/11 and Other Terrible Global Events on Tourism in the U.S. and Hawaii

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Working Paper No. 06-2

January 30, 2006

Abstract

This paper reviews recent trends in travel and tourism in the U.S. and Hawaii to ascertain how the terrorist attacks of 9/11 and subsequent terrible global events affected their tourism flows and the manner and pace of their recovery. We note that tourism in the U.S. has not fully recovered from 9/11 and other international shocks; indeed recovery of international travel to the U.S. may be a long way off. By contrast, Hawaii tourism is enjoying robust growth in the aftermath of 9/11 as growth in tourist arrivals from the U.S. mainland has more than offset declines in Japanese and other international visitors. We suggest that Hawaii's current tourism boom is in part explained by the diversion of U.S. travel from foreign travel. The paper demonstrates the usefulness of vector error correction models to generate dynamic visitor forecasts which we use to ascertain whether tourism in Hawaii has fully recovered from 9/11 and other terrible international events. The paper considers policy options for facilitating the recovery of international tourism to the U.S.

JEL Classification: L83, C53

Keywords: Tourism, Terrorism, Impact, Recovery.

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Tourism is an important economic sector in many countries. It is often described as a “fragile” industry in that demand for travel is highly susceptible to numerous shocks such as wars, outbreaks of deadly contagious diseases, incidents of terrorism, economic fluctuations, currency instability, energy crises, and so on. When people travel, they do not want to be exposed to personal hazards, so safety is a paramount concern of most travelers. Not surprisingly, terrorist incidents and other threats to personal safety—whether they are natural disasters or deadly contagious diseases—reduce people’s propensity to travel. Alternatively, some people may opt to change their travel plans and visit destinations where they are exposed to less personal risk. A number of major events have had significant negative impacts on international travel and tourism during the past decade, among them, the terrorist attacks of September 11, 2001 (9/11), the coalition invasion of Afghanistan (October, 2001), the Bali bombings (October, 2002), the “Perfect Storm” of the Severe Acute Respiratory Syndrome (SARS) outbreak and the war in Iraq (Spring, 2003), the Madrid train bombings (March, 2004), and more recently the massive, destructive tsunami in the Indian Ocean (December, 2004) and the London bombings (July, 2005). These various shocks since 9/11 appear to have exerted different impacts in the countries directly affected, in neighboring countries and regions, and in the global tourism market (Edmonds and Mak, 2005). Reviewing past trends suggests some countries appeared to recover more quickly than others from adverse shocks, and an examination of the reasons for this warrants researcher attention, especially if the answers provide useful policy prescriptions.

There is a substantial and growing body of research on the effects of terrorist events on tourism, much of which has considered the effect of 9/11 on tourism flows. One early

analysis, Enders et al. (1992), estimated ARIMA models of tourism arrivals and terrorist incidences in Austria, Greece, and Italy, using data from 1970 to 1990, to estimate revenue losses in the tourism industries in these countries. Pizam and Fleischer (2002) examined whether the magnitude or frequency of terrorist incidents had a more detrimental effect on tourism through analysis of data on Israel and found more frequent incidents have a more lasting effect that can eventually lead to a complete collapse of tourism. Sloboda (2003) applies ARMAX estimation to study the short-term effects of terrorism on tourism flows. Several other recent papers have examined the impact of 9/11 on particular segments of the U.S. tourism industry—particularly the airline industry (e.g., Ready and Dobie 2003, Lee et al. 2005, Rupp et al. 2005) and have highlighted the adverse effects of terrorism and counter-terrorism measures on tourism industry performance. By contrast, there is paucity of research on the process of tourism recovery and when full recovery has been achieved following terrorist attacks and other terrible events. As well, there is paucity of rigorous empirical research on how terrorist attacks and other shocks may redirect tourists from riskier to perceived safer destinations. Thus, our paper advances the earlier research in a number of respects. First, we offer a stylized way of examining tourism recovery following terrorist attacks and other external shocks and develop an empirical method for testing the recovery of Hawaii tourism in the aftermath of 9/11. Second, our paper calls attention to the tourism diversion effect of terrorist incidents and notes that terrorist attacks and counter-terrorism measures may influence travelers' choices between domestic and international travel.

In this paper, we review trends in travel in the U.S. and Hawaii since 9/11. We wish to ascertain how the terrorist attacks of 9/11 and subsequent international shocks affected

their tourism flows and the manner and pace of their recovery. The paper is divided into four sections. The first part presents a stylized picture of industry recovery following terrorist incidents and other major negative shocks to tourism. We offer an economic—which is quite different from the conventional travel trade—definition of tourism “recovery”. The second section reviews and notes the decline in international travel to the U.S. and U.S. travel abroad since 9/11. We argue that the recovery of international travel to the U.S. is not imminent. We suggest that the decline in U.S. travel abroad has been partially offset by the diversion to (i.e. increase in) domestic U.S. travel and that Hawaii has been a major beneficiary of this travel diversion. We focus on Hawaii because Hawaii has excellent data on both international and domestic tourist arrivals. Moreover, as is much of international travel, Hawaii travel is long-distance travel and hence a good substitute for travel abroad. In part three, we employ state-of-the-art econometric analyses to derive estimates of the impact of 9/11 and subsequent shocks on Hawaii inbound tourism flows, after accounting for macroeconomic fluctuations in the origin countries that may have influenced outbound tourist travel. We wish to ascertain to what extent Hawaii—which is widely regarded as a “safe” destination—has been able to divert travel from other destinations. As we shall demonstrate, the substitution of domestic travel for overseas travel by Americans since 9/11 has had a dramatic impact on Hawaii, which has witnessed a sharp upturn in U.S. mainland-origin tourist arrivals in recent years. By comparison, travel and tourism in the U.S. as a whole has not done as well. The final section explores possible reasons for the differences observed in travel industry responses and considers the effects of anti-terrorist and tourism promotion policies on tourism market recovery and growth.

I. Economic View of Tourism Recovery

When travel industry officials speak of recovery from 9/11, the conventional practice is to refer to the year 2000 as the point of reference, and to regard recovery as having been achieved when tourist arrivals (or spending) returns to pre-attack levels. Economists, however, tend to view “recovery” differently. For full recovery to have occurred, it is not enough to get back to where you began, it is necessary that you get to where you otherwise might have been had the terrorist incident not occurred. Since the latter (i.e. the hypothetical level of tourism flow) may be difficult to estimate, a simpler alternative, often employed, is to regard recovery as having been attained when the level of economic activity (in this instance, tourist arrivals or expenditures) reaches the level obtained by extrapolating the pre-9/11 trend (see, for example, Engerman, 1971).

By this definition of “recovery”, the effects of an external shock and subsequent recovery begin with the historical growth trend in tourist arrivals (or expenditures) that is suddenly interrupted by an external shock such as a major terrorist attack or natural disaster. The downturn and recovery process is depicted graphically in Figure 1. The shock produces a sharp downward spike in tourist arrivals/expenditures. Following the shock, recovery begins almost immediately. To achieve full recovery, tourist arrivals/expenditures must grow at a rate that is faster than the historical growth trend—the “catch-up” period. At some point, with the higher growth rate, tourist arrivals/expenditures reach the level that would have been attained had the event not occurred, and recovery is complete. Thereafter, growth is envisioned to proceed according to the historical trend. In this paper, we employ this stylized framework to

examine tourism recovery in the U.S. and Hawaii after the sequence of terrible events beginning with the 9/11 terrorist attacks.

II. Travel and Tourism in the U.S. Since 9/11

The terrorist attacks on 9/11 reverberated around the world, but at the global level their impact on aggregate international tourist arrivals was thought to be minor. Shortly after the attacks, the World Tourism Organization (WTO) noted with a degree of satisfaction that the number of international tourist arrivals fell by less than 1 percent from 696.7 million arrivals in 2000 to 692.7 million in 2001. This small annual decline, however, marked a sharp reversal of the growth trend in international tourist arrivals registered in the decade preceding 9/11. By 2002, international tourist arrivals around the world rebounded to 702.6 million, exceeding the 2000 peak (World Tourism Organization, 2003). Of course, experiences in individual countries can diverge sharply from global trends. Figure 2 shows that 9/11 and subsequent terrorist incidents and other major international shocks produced sharp declines in international tourist arrivals in the U.S. The Figure indicates that the U.S. travel and tourism industry is far from recovery as the volume of international visitors to the U.S. continues to languish well below pre-9/11 peak levels. Moreover, unlike the stylized recovery path described in Figure 1, the post-9/11 trend remains flatter than the historical trend. Thus, full recovery is not imminent. The U.S. share of total international arrivals has fallen to a low 5.9 percent (down significantly from its recent peak level of 9.4 percent recorded in 1992) before showing a modest rise (0.1 percent) in 2004.

One compensation to tourism related businesses in the U.S. has been the uninterrupted rise in the number of domestic person trips since 9/11 (Table 1) compared to the discouraging decline in the number of foreign tourists. On the other hand, total travel spending (after accounting for inflation) fell even among U.S. domestic travelers, and in 2004 remained below the level of domestic travel spending pre- 9/11 (Table 2). This drop in travel spending has fallen particularly hard on tourism employment as direct employment in tourism fell by nearly 5 percent between 2000 and 2004 (Table 3), while total employment in the U.S. declined only marginally (0.23 percent) over the same period.

The decline in U.S. domestic travel spending, despite the rising number of domestic trips, is likely explained by the change in the mix of travelers. Both the terrorist attacks of 9/11 and subsequent shocks and the U.S. economic recession that began in March 2001, have led to reduced business travel budgets and sharply curtailed high spending business travel, especially travel to conventions and other meetings. In 2003, business travel accounted for 18 percent of total domestic person trips in the U.S., but 31 percent of total travel spending (Travel Industry Association of America, 2005).

Advances in telecommunication technology explain part of the decline in business travel; today businesses (40 percent of business air travelers in 2004) are relying more heavily on improved teleconferencing and the Internet as an alternative to personal travel (Ibid.).

In response to 9/11 and subsequent shocks, U.S. residents have also curtailed their travel abroad, and the number of foreign trips from the U.S. declined continuously from 60.9 million trips in 2000 to 54.2 million trips in 2003 (World Bank, 2005). If we exclude trips to Mexico and Canada, the number of long distance overseas trips declined

from 26 million to 24 million. However, the decline in outbound international travel from the U.S. was less than the drop in international visitors to the U.S., which contributed to the country's growing current account deficit with the rest of the world.

The combination of rising domestic travel *and* declining U.S. travel to foreign destinations suggests that Americans have substituted travel to domestic destinations in lieu of foreign travel. This is most clearly illustrated in U.S. travel to Hawaii. Figures 3 and 4 show that while international (i.e. mostly Japanese¹) visitor arrivals in Hawaii fell after 9/11 and have yet to reach pre-9/11 levels², domestic arrivals from the U.S. mainland have risen more than enough to compensate for the fall in international visitors. The total number of visitor arrivals (domestic and foreign) has surpassed the pre-9/11 peak attained in 2000. Figure 5 suggests why U.S. travel to Hawaii is booming: the pre-9/11 trend in the ratio of Hawaii to foreign travel was falling meaning that U.S. travelers were displaying increasing preference for foreign travel as opposed to travel to Hawaii before 9/11. The upward spike in the ratio after 9/11 suggests that 9/11 and subsequent shocks abroad suddenly increased U.S. preference for travel to Hawaii, and this has had a strong positive effect on the state's tourism industry.

III. Post 9/11 Tourist Arrivals in Hawaii: An Econometric Analysis

To evaluate in a more rigorous manner the effects of 9/11 and other terrible global events on tourist travel to Hawaii, we develop an econometric model of Hawaii tourism using quarterly data from 1980:1 through 2001:2. The estimated model is then used to make out-of-sample forecasts of tourism flows in the post-9/11 period assuming that 9/11

¹ Japanese visitors accounted for seventy-four percent of all international visitors to Hawaii in 2001.

² Edmonds and Mak (2005) provide data which suggest that Japanese may also have substituted domestic travel for overseas travel after 9/11.

and other subsequent terrible shocks had not occurred. We then compare the actual path of visitor arrivals in the post-9/11 period against the predicted path; the difference is attributed to the effects of the shocks. Our approach is similar to intervention analysis commonly used to measure the impact of major events on tourism (see, for example, Enders, Sandler and Parise, 1992, Coshall, 2005, and Pizam and Fleischer, 2002). However, intervention analysis is typically conducted using simple ARIMA models that do not allow for the effects of variables that may help explain tourism flows (but see Bonham and Gangnes, 1996). Also, intervention analysis is typically used to measure the impact effects of a shock by modeling that shock using dummy variables. In contrast, we focus on the recovery from terrorism and other terrible events and define recovery as a return to the path tourism would have followed had the shocks not occurred.

Specifically, our Hawaii tourism model is a vector error correction model (VECM) which explains the movement of four key endogenous tourism variables: U.S. (v_{us}) and Japanese (v_{jp}) visitor arrivals to Hawaii, the Hawaii average daily room rate (prm), and the Hawaii average hotel occupancy rate ($ocup$). These endogenous variables are determined by U.S. and Japanese real national income (yr_{us} , and yr_{jp} respectively), the U.S. consumer price index (p_{us}), and the Japanese *exchange rate adjusted* consumer price index (p_{jp}). See the Appendix for a brief description of the Hawaii Tourism Model (HTM), and Zhou, Bonham, and Gangnes (2005) for a complete discussion. The idea of error correction models was suggested by Sargan (1964), and developed in Hendry and Anderson (1977) and Davidson et al. (1978). For examples in tourism demand forecasting, see Dritsakis (2004), Kulendran & Witt (2003), Song, Witt & Li (2003).

We calculate out-of-sample dynamic forecasts for the period from 2001:3 through 2005:1, and treat the forecasts as the likely path of tourism growth to Hawaii without the effects of 9/11 and other shocks such as the Bali bombings, the 2nd Gulf war, SARS, and so on.³ This is preferable to using linear trend extrapolation since the year 2000 was a very strong growth year for Hawaii tourism, and forecast values generated by linear extrapolation are likely to overstate the growth of tourist arrivals after 2001. To compute dynamic forecasts, lagged endogenous variables in the HTM take their historical values up through 2001:2 and their forecasted values from the model beginning in 2001:3. In contrast, we make use of historical data on the external factors yr_{us} , yr_{jp} , cpi_{us} , and p_{jp} over the entire forecast period from 2001:3 to 2005:1. Therefore, to the extent that the 9/11 terrorist attacks and other shocks led to a slow-down in the U.S. or Japanese economies, our forecasts will be not be immune to all effects of these terrible shocks. As a result, the use of the model-based forecasts is likely to produce slower growth in tourist arrivals than suggested by simple trend extrapolation described in Section II.

Figures 6 and 7 demonstrate the “no 9/11” expected paths for U.S. and Japanese visitor arrivals compared with the actual paths. Clearly, because these are dynamic out of sample forecasts, they will completely miss the severe drop in visitor arrivals that occurred in 2001:3, as well as the subsequent decline in Japanese arrivals in 2003:2 during the height of the SARS epidemic and the launch of the second Gulf War. In Figure 6, actual U.S. visitor arrivals exceeded the dynamic forecasts beginning in late 2003, and the gap widens markedly in 2004. By comparison, in Figure 7, Japanese visitor arrivals in Hawaii after 9/11 have yet to reach the levels predicted by the model.

³ Coshall (2005) briefly describes the use of out of sample forecasts of UK tourism receipts from an ARIMA model, and refers to a “speedy recovery” and “return to norm” as occurring when actual receipts approach the level predicted by his model.

Table 4 presents forecasted and actual U.S. and Japanese visitor arrivals in Hawaii from 2001:3 through 2005:1. Applying the economic definition of “recovery” described in Section II, Table 4 clearly demonstrates that U.S. travel to Hawaii had fully recovered from the shocks of 9/11 and subsequent terrible events by the end of 2003 as the number of U.S. visitor arrivals exceeded the predicted number. By year-end 2004, the actual number of U.S. visits to Hawaii was 9 percent higher than the predicted number of arrivals in 2004, and in the first quarter of 2005 they were 18.5 percent higher than the forecast number. It is not mere coincidence that U.S. arrivals to Hawaii (and to other domestic destinations) grew even as U.S. foreign/overseas travel declined following 9/11. We suggest that many U.S. travelers were transparently making conscious choices to travel domestically rather than to destinations abroad in a world that had become increasingly hazardous to Americans. It is also noteworthy that there were 4.125 million U.S. visitor arrivals in Hawaii in 2000 so that 2003 was also the year when U.S. visitor arrivals surpassed the pre-9/11 peak. By comparison, Table 4 tells a totally different story for Japanese travel to Hawaii. By year-end 2004, the 1.481 million Japanese arrivals in Hawaii were 15.8 percent below predicted arrivals and nearly 19 percent less than the number recorded in 2000 (1.819 million). However, there could be reasons other than the fear of foreign travel after 9/11 that helps to explain the decline in Japanese visits to the Hawaiian Islands.⁴

Table 5 compares the gains and losses in Hawaii *real* tourism revenues post-9/11 in year 2000 prices. These gains and losses were derived by multiplying the differences between the actual and forecasted visitor arrivals post-9/11 (Table 4) by the yearly

⁴ Mak, Carlile, and Dai (2005) suggest that the aging of Japan’s population may also help to explain the declining popularity of Hawaii amongst Japanese overseas travelers.

estimates of the average per person per trip expenditures for U.S. and Japanese visitors, deflated by the Honolulu consumer price index (CPI-U, Year 2000=100). Again, applying the economic definition of recovery, Table 5 shows that tourism receipts from U.S. visitors had fully recovered by year-end 2003, but not for Japanese visitors. Nevertheless, by 2004, gains in tourism receipts from U.S. visitors more than compensated for the losses from Japanese visitors. Thus, aggregate tourism receipts for Hawaii from these two groups of visitors had achieved full recovery (in the economic sense) by year-end 2004. Still, recent gains in tourism revenues were not enough to recoup the earlier aggregate losses incurred between 2001:3 and 2003:4. Furthermore, in 2004, tourism receipts, adjusted for inflation, were nearly 2.5 percent less than the level in 2000. Thus, measured in real dollars, tourism spending by U.S. and Japanese visitors to Hawaii has not returned to the pre-9/11 level even though revenues had fully recovered from 9/11 and other terrible events. Indeed, an important lesson from this paper on the nature of recovery from exogenous shocks is that we need not necessarily get back to the pre-shock levels of performance in order to achieve full recovery from the shocks themselves. There could be reasons other than the shocks that may explain why we should not expect tourism revenues to return to the pre-shock levels. In the case of Hawaii, real visitor spending per person per trip had been declining long before 9/11 (see, for example, Mak and Sakai, 1992, pp. 191-192; and DBEDT, 1999-2004) so that real tourism receipts might have been expected to decline even if 9/11 and other shocks had not occurred.

In sum, the story of Hawaii tourism post-9/11 parallels that for the entire U.S. with international tourist arrivals exhibiting lackluster performance while domestic travel

appears to have benefited from the greater reluctance of Americans to travel abroad. However, by 2004 tourism in Hawaii has fully recovered from 9/11 and other terrible international events after 2001, but not so for the U.S.

IV. Conclusions and Policy Implications

Global tourism has withstood the effects of recent years' terrible events pretty well as travelers adapt to threats by switching their choices of travel destinations. As a result, tourist arrivals in most countries have displayed great resilience in the face of this adverse travel environment. Nonetheless, the succession of negative shocks around the world following 9/11 has clearly stymied the recovery of tourism in some countries.

In the case of the U.S., two trends appear to be working together to contribute to the decline in its global market share of international tourism. One trend relates to the reality and perception regarding ease of travel to the U.S. and the hospitality of the country to foreign visitors. The second trend relates to increasing ease of international travel to many countries and the emergence of new destinations for international visitors. We will briefly discuss these two trends in turn.

Opinions about the U.S. have become increasingly negative in recent years (Pew Research Center, 2005) and this may carry over into an increasing perception abroad that the U.S. is unfriendly to foreign tourists, but that has not been demonstrated to be a serious deterrent to foreign travel to the U.S. The perception that U.S. is 'fortress-like' when it comes to allowing foreign tourists into the country is longstanding. Until 1986, the U.S. had among the most restrictive visa entry requirements in the world. The U.S. implemented its first visa waiver agreement with U.K. (as an experiment) only in 1988.

Today, the list of countries whose nationals are able to enter the U.S. without a prearranged visa is perhaps the shortest of any of the OECD countries.

U.S. insistence that foreign visitors hold passports that include biometric identifiers of the passport holder threatened to stifle the busy summer travel season, and was only dropped last May when it became clear that a majority of European countries would not be able to satisfy the requirement.⁵

It seems obvious that the growing number of regulations and requirements needed to obtain a tourist visa to the U.S. make it more difficult for foreigners who want to visit America. Requirements for personal interviews, and higher visa application fees and longer waits to obtain visas can deter would-be international visitors. Added security measures at U.S. Embassies abroad mean that visa applicants must often wait in long-lines in order to apply for a visa (See, for example, Edmonds and Mak, 2005, and Luzadder, 2005).

While added scrutiny of would-be visitors and tighter security at U.S. facilities abroad are entirely understandable in today's dangerous world, greater efforts seem necessary to ensure the that time and inconvenience faced by those interested in visiting the U.S. be reduced as much as possible. It is widely acknowledged that tourism has often been treated as a "second class citizen" among the other major industries. Unless this mindset changes, it is obvious that the final recovery of international travel to the U.S. will not be in sight. The industry, however, is not totally impotent. The recent announcement by the 2,200-member Travel Industry Association of America (TIA) to

⁵ By October 27, 2005, two of the 27 countries participating in the Visa Waiver Program—Italy and France—were unable to meet the October 26th deadline to produce passports with integrated circuit chips capable of storing biographic information from the passport data page, a digitized photograph, and other biometric information (Milligan, 2005).

forge a “strategic partnership” with the Travel Business Roundtable (TBR) could provide more political muscle for a coordinated political lobby campaign to reduce many of the pains associated with international travel. There is an obvious need for the U.S. to figure out ways to reduce the transactions costs foreign tourists face in their efforts to visit the U.S. Otherwise, international travel to the U.S. seems likely to continue to perform below its potential, and the country will be economically worse off as a result. Understandably, the State Department of Homeland Security recently (January 2006) unveiled the “Secure Borders, Open Door” strategy to encourage inbound tourism (Milligan, 2006; Hall, 2006).

Another trend—i.e. measures taken by foreign countries to ease their inbound travel restrictions in order to promote international travel to their countries—also appears likely to contribute to the relative decline in U.S. international tourism. Following 9/11, many countries have lowered their regulatory barriers to international visitors and have become much easier for foreign visitors to visit. Perhaps it is not a coincidence that Singapore which has visa waiver agreements with well over 150 countries in the world saw its international travel recover quickly from waves of external shocks and then surpass its pre- 9/11 peak (Edmonds and Mak, 2005). The numbers of foreign travelers visiting China have been increasing and the country will likely pass the U.S. as the third most popular international destination worldwide if recent trends continue. In recent years, China has been negotiating “Approved Destination Status” (ADS) agreements that facilitate easier visa processes for Chinese wishing to travel abroad and for foreigners wishing to visit China. The 1990’s saw a number of important multilateral agreements to ease travel between countries. The European Union (EU) implemented the “Schengen

Visa” that enables foreign visitors from non-EU countries to obtain a single visa that allows them to travel to all the EU countries. Several countries in the Association of South East Asian Nations (ASEAN) now allow visa free entry for each other’s nationals, and negotiations are underway to allow a “Schengen-type” visa for travel within the ASEAN region. The purpose of mentioning these developments is to note that moves toward easing travel restrictions continue around the world, even in an environment of heightened security concerns, and to note that in the highly competitive global market for tourism, these measures can be expected to influence travelers’ choices of destinations. For the U.S., 9/11 and its manner of executing the war on global terrorism has hurt international travel to the country—perhaps for a long time to come.

On the other positive front, the preference for Hawaii (and probably other domestic destination) travel as a substitute for foreign travel may increase further in the near future as new U.S. travel regulations under the Western Hemisphere Travel Initiative (WHTI)-- to require U.S. residents returning from trips to Mexico, Canada, and the Caribbean (except Puerto Rico and the U.S. Virgin Islands) to show U.S. passports-- further discourages American travel abroad.⁶ There is a *caveat* here. When U.S. travelers begin to favor foreign travel again, the current boom in Hawaii tourism could come to an end. For now, tourism in the U.S. and Hawaii have become more dependent on domestic leisure travel.

⁶ By law, the WHTI must be fully implemented by January 1, 2008. However, the State Department and the Department of Homeland Security recently announced a plan to create an identity card to facilitate travel across U.S. borders (Milligan, 2006).

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Appendix

The Hawaii tourism model (HTM) is a four variable vector error correction model (VECM). A VECM, is basically a vector autoregression model in differences augmented by levels information in the form of “equilibrium errors”. The equilibrium errors arise from imposing cointegration restrictions. For example, suppose that U.S. visitor arrivals to Hawaii (v_{us}) and U.S. real income (yr_{us}) are nonstationary, $I(1)$ series. (A series is $I(d)$, i.e., integrated of order d , if it must be differenced d times to be made stationary.) Nonstationary processes may wander a great distance from their starting point and are not tied to any fixed mean. Yet a linear combination, $v_{us} - \gamma \cdot yr_{us} = \varepsilon_{Dus}$, may exist that is $I(0)$ and therefore defines an equilibrium relationship. The linear combination defines an attractor that prevents the two $I(1)$ series from wandering too far apart. Finally, when two or more series are cointegrated they are known to have an error correction representation,

$$(A.1) \quad \Delta v_{us,t} = c_0 + \sum_{i=0}^p \beta_i \Delta yr_{us,t-i} + \sum_{j=1}^k \beta_j \Delta v_{us,t-j} + \alpha \cdot \varepsilon_{Dus} + \mu_t.$$

In equation (1), the change in U.S. visitors is explained by past changes in itself, changes in real income, and the “equilibrium error”, ε_{Dus} , defined by deviations from the cointegrating relationship. An important advantage of error correction models is that they provide a method of combining the benefits of modeling both levels and differences, and the parameter, α , on the “equilibrium error” provides a measure of how much of the “disequilibrium” is corrected in each period. The VECM simply extends these concepts to the case of a vector of variables.

The HTM explains the movements of four endogenous variables: U.S. visitor arrivals, v_{us} , Japan visitor arrivals, v_{jp} , the Hawaii average daily room rate, prm , and the

Hawaii average hotel occupancy rate, $ocup$, conditional on a set of weakly exogenous external factors (see Zhou, Bonham and Gangnes, 2005). The external factors are U.S. and Japanese real national income (yr_{us} , and yr_{jp} respectively), U.S. consumer prices (cpi_{us}), and Japanese exchange rate adjusted consumer prices (p_{jp}).⁷

The HTM was developed by first estimating an eight variable VAR, testing and imposing weak exogeneity restrictions on the external drivers, and testing and imposing cointegration restrictions. Finding evidence of three cointegrating relationships, restrictions were tested and imposed to identify equilibrium visitor demand equations for both the U.S. and Japan, and one inverted supply curve explaining the hotel room price. The identified equilibrium relations are:

$$(A.2) \quad v_{us} = -0.167 \cdot (prm - cpi_{us}) + 2.5 \cdot yr_{us} - 0.012 \cdot t + \varepsilon_{Dus}$$

$$(A.3) \quad v_{jp} = -0.336 \cdot (prm - p_{jp}) + 2.25 \cdot yr_{jp} + \varepsilon_{Djp}$$

$$(A.4) \quad prm = 0.572 \cdot v_{us} + 0.116 \cdot v_{jp} + 1.76 \cdot ocup + 0.008 \cdot t + \varepsilon_S$$

The VECM then models the growth of the endogenous variables conditional upon the growth of weakly exogenous variables and the equilibrium errors ε_{Dus} , ε_{Djp} , and ε_S .

$$(A.5) \quad \Delta y_t = c_0 + \omega \Delta x_t + \sum_{i=1}^3 \Gamma_i \Delta z_{t-i} + \alpha_1 \varepsilon_{Dus} + \alpha_2 \varepsilon_{Djp} + \alpha_3 \varepsilon_S + \mu_t$$

where $z = [y, x]'$, $y = [v_{us}, v_{jp}, prm, ocup]'$, $x = [yr_{us}, yr_{jp}, cpi_{us}, p_{jp}]'$. The 3×1 loading vectors α_1 , α_2 , and α_3 determine the extent to which demand and supply variables respond to disequilibrium. For example, if U.S. arrivals are less than predicted by U.S. real income.

⁷ All variables used throughout Part III of the text are described in Table A1.2. All series used in this part of the paper are also seasonally adjusted at quarterly frequency and expressed as natural logarithms with the exception of the occupancy rate expressed as a percentage.

Table A1: Dynamic Model: Loading Parameters and Diagnostic

| Equation | α_1 | α_2 | α_3 | R^2 | AR1-5 | Normality | Arch |
|--|---------------------|---------------------|---------------------|--------|--------------------|--------------------|------------------|
| Δv_{us} | -0.2014 (-5.148) | | 0.1642 (4.725) | 0.6378 | 2.5094 [0.0526] | 0.6526 [0.7216] | 0.64 [0.6413] |
| Δv_{jp} | | -0.2932 (-3.932) | | 0.7345 | 2.2675 [0.0741] | 1.9872 [0.3702] | 0.46 [0.7632] |
| Δprm | -0.1147 (-5.186) | | -0.1617 (-4.507) | 0.7359 | 2.0703 [0.0981] | 3.0002 [0.2231] | 0.51 [0.7266] |
| $\Delta ocup$ | -0.0503 (-1.861) | -0.1265 (-3.475) | 0.2137 (5.460) | 0.7531 | 2.1744 [0.0846] | 0.0710 [0.9651] | 0.43 [0.7889] |
| Log-likelihood = 1043.2214 | | | | | | | |
| LR-test, $\chi^2(71) = 46.4704$ [0.9893] | | | | | | | |

Note: Column 1 lists the dependent variable of individual equations in the system; Column 2 to 4 give the loading parameters, α_1 - α_3 and the corresponding *Student t*-statistic for the three identified cointegrating vectors; Column 5 presents the coefficient of determination R^2 ; Column 6 gives an F-test (and corresponding p-value) for the null hypothesis that the equation residuals are independent up to lag 5. Column 7 is a χ^2 test (and p-value) for the null hypothesis that the regression residuals are normally distributed. Column 8 is a test for the null that the residuals do not exhibit autoregressive conditional heteroscedasticity (ARCH). Figures in parenthesis (.) are the *Student t*-statistics corresponding to the loading parameters whereas those in brackets [.] are *p*-values for individual tests. Computations are carried out using *Pc-Fiml* 9.10 with the exception of the R^2 which are calculated using RATS v 5.0.

The three long-run equilibrium errors enter the four equations differently. The equation for U.S. visitor growth, Δv_{us} , contains both ε_{Dus} and ε_s . The loading parameter on the U.S. demand equilibrium, ε_{Dus} , is -0.20, so 20% of the equilibrium error is corrected each period. The equation for Japanese visitor growth, Δv_{jp} , contains only the equilibrium error associated with Japanese visitor demand, ε_{Djp} , with a coefficient of -.29, suggesting complete adjustment to any disequilibrium in less than a years time. The equilibrium errors for U.S. demand, ε_{Dus} , and the supply relationship, ε_s , enter the hotel room price equation, Δprm , while all three errors enter the equation for the change in hotel occupancy, $\Delta ocup$. The estimated system appears to be an adequate model for Hawaii tourism activity. All equations perform reasonably well, explaining 64%, 73%, 74%, and

75% of the variation in Δv_{us} , Δv_{jp} , Δprm , and $\Delta ocup$, respectively. All equations pass all diagnostic tests at the 5% significance level.

Table A2: Summary of Variables in the Hawaii Tourism Model

| Mnemonic | Description | Units | Source |
|----------------------|---|-------------|----------------|
| Hawaii Variables | | | |
| v_{us} | U.S. visitors to Hawaii | 000s | DBEDT; |
| v_{jp} | Japanese visitors to Hawaii | 000s | DBEDT; |
| prm | Hawaii average daily hotel room rate | dollar | DBEDT |
| $ocup$ | Hawaii average daily hotel occupancy rate | % | DBEDT |
| U.S. Variables | | | |
| yr_{us} | U.S. real personal income | bil 82-84\$ | BEA |
| cpi_{us} | U.S. CPI (1982-1984=100) | index | BLS |
| Japan Variables | | | |
| yr_{jp} | Japan real personal income | bil 95Yen | ESRI |
| cpi_{jp} | Japan CPI (1995=100) | index | SBSC |
| e | yen/dollar exchange rate | yen/dollar | FED |
| Calculated Variables | | | |
| p_{jp} | cpi_{jp} / e | - | Authors' calc. |

Abbreviations:

DBEDT: Department of Business Economic Development and Tourism, State of Hawaii.

BEA: Bureau of Economic Analysis, U.S.

BLS: Bureau of Labor Statistics, U.S.

FED: Federal Reserve Bank at St. Louis.

ESRI: Economic and Social Research Institute, Japan.

SBSC: Statistics Bureau and Statistics Center, Japan.

Figure 1. Schematic representation of tourism downturn and recovery

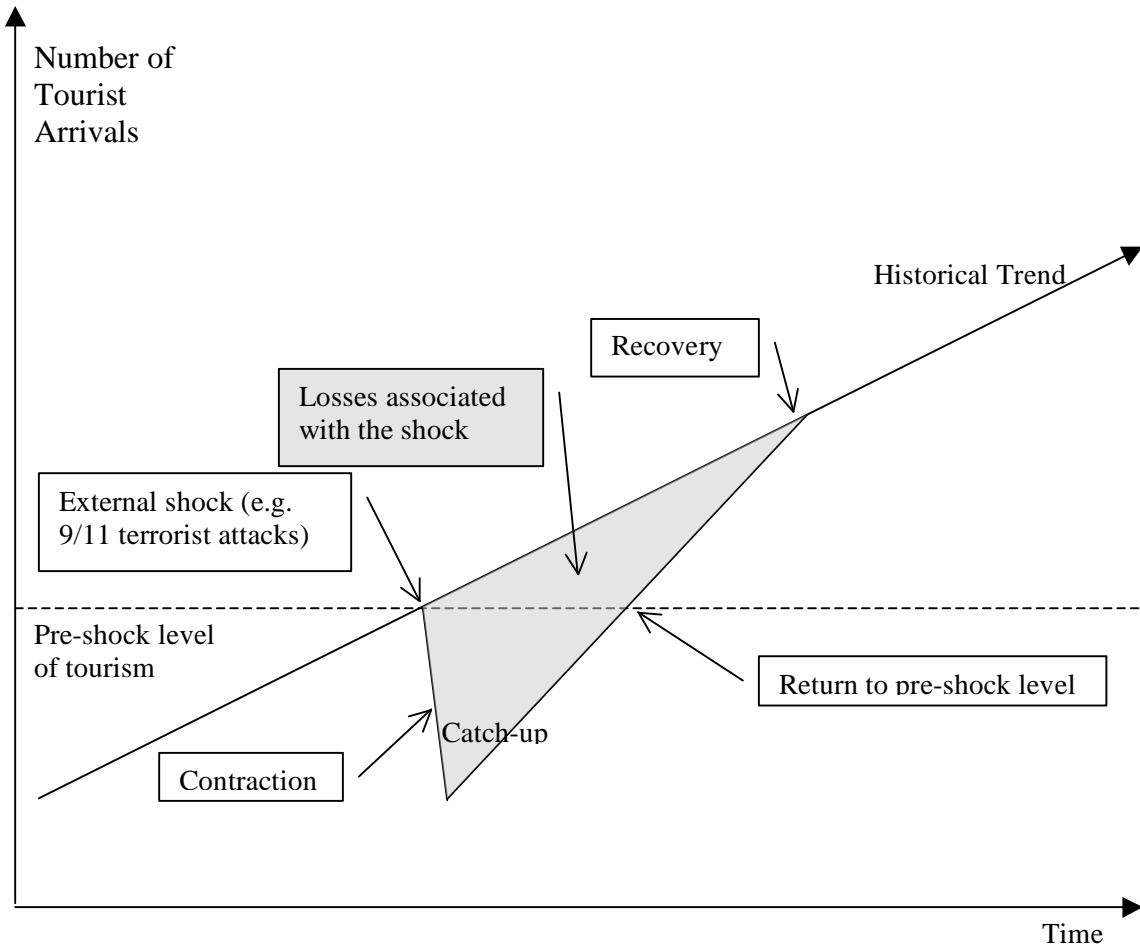
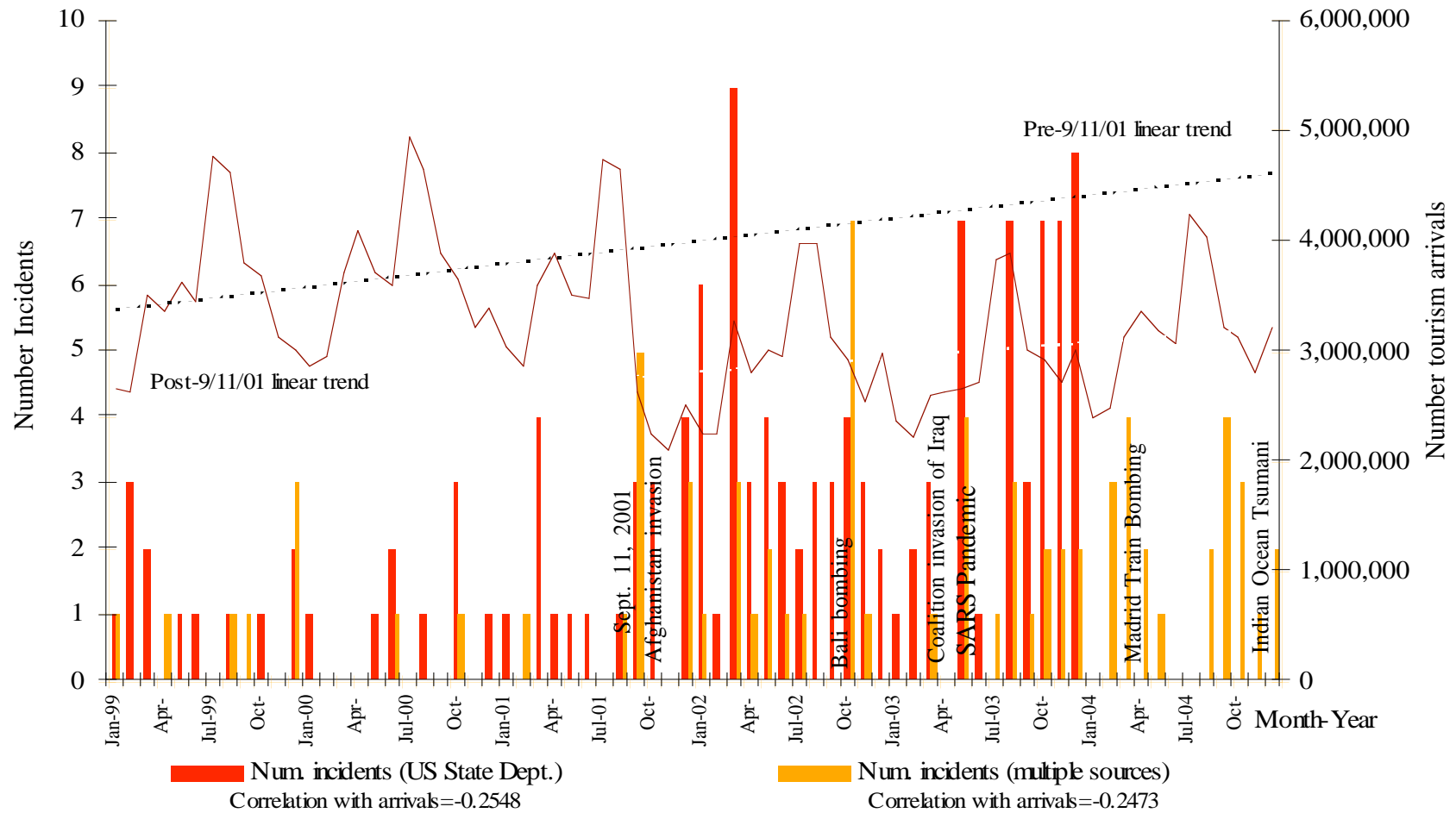


Figure 2. Terrorist incidents and international tourist arrivals to U.S.



Sources: Information on visitor arrivals to U.S. comes from the Office of Travel and Tourism Industries (2005) and number of terrorist incidents per month extracted from U.S. Department of State (2004) and Wikipedia (2005).

Table 1. Domestic and Foreign Travel in the U.S.: 2000-2004

| <u>Year</u> | <u>Domestic Person Trips (millions)</u> | <u>Foreign Visitors (millions)</u> |
|-------------|---|--|
| 2000 | 1,100.8 | 51.2 |
| 2001 | 1,123.1 (2.03) | 46.9 (-8.40) |
| 2002 | 1,127.0 (0.35) | 43.5 (-7.25) |
| 2003 | 1,140.0 (1.15) | 41.2 (-5.29) |
| 2004 | 1,163.9 (2.10) | 46.1 (11.89) |

Note: Numbers in parenthesis gives the year-on-year change (pct.)

Source: Travel Industry Association of America (TIA) (2005)

Table 2. Domestic and Foreign Travel Spending in the US: 2000-04

| <u>Year</u> | <u>In Current US\$ (billions)</u> | | | <u>In Year 2000 \$ (billions)</u> | | |
|--------------------------------|-----------------------------------|----------------|--------------|-----------------------------------|----------------|--------------|
| | <u>Domestic</u> | <u>Foreign</u> | <u>Total</u> | <u>Domestic</u> | <u>Foreign</u> | <u>Total</u> |
| 2000 | \$498.4 | \$82.4 | \$580.8 | \$498.4 | \$82.4 | \$580.8 |
| 2001 | 479.0 | 71.9 | 550.9 | 473.8 | 71.1 | 544.9 |
| 2002 | 473.6 | 66.5 | 540.1 | 470.7 | 66.0 | 536.7 |
| 2003 | 491.6 | 65.1 | 556.7 | 475.9 | 63.0 | 538.9 |
| 2004 | 525.3 | 74.8 | 600.1 | 486.8 | 69.3 | 556.1 |
| Percentage Change 2000 to 2004 | | | | -2.3% | -15.9% | -4.3% |

Note: Real expenditures were calculated using the travel price index developed by the Travel Industry Association of America.

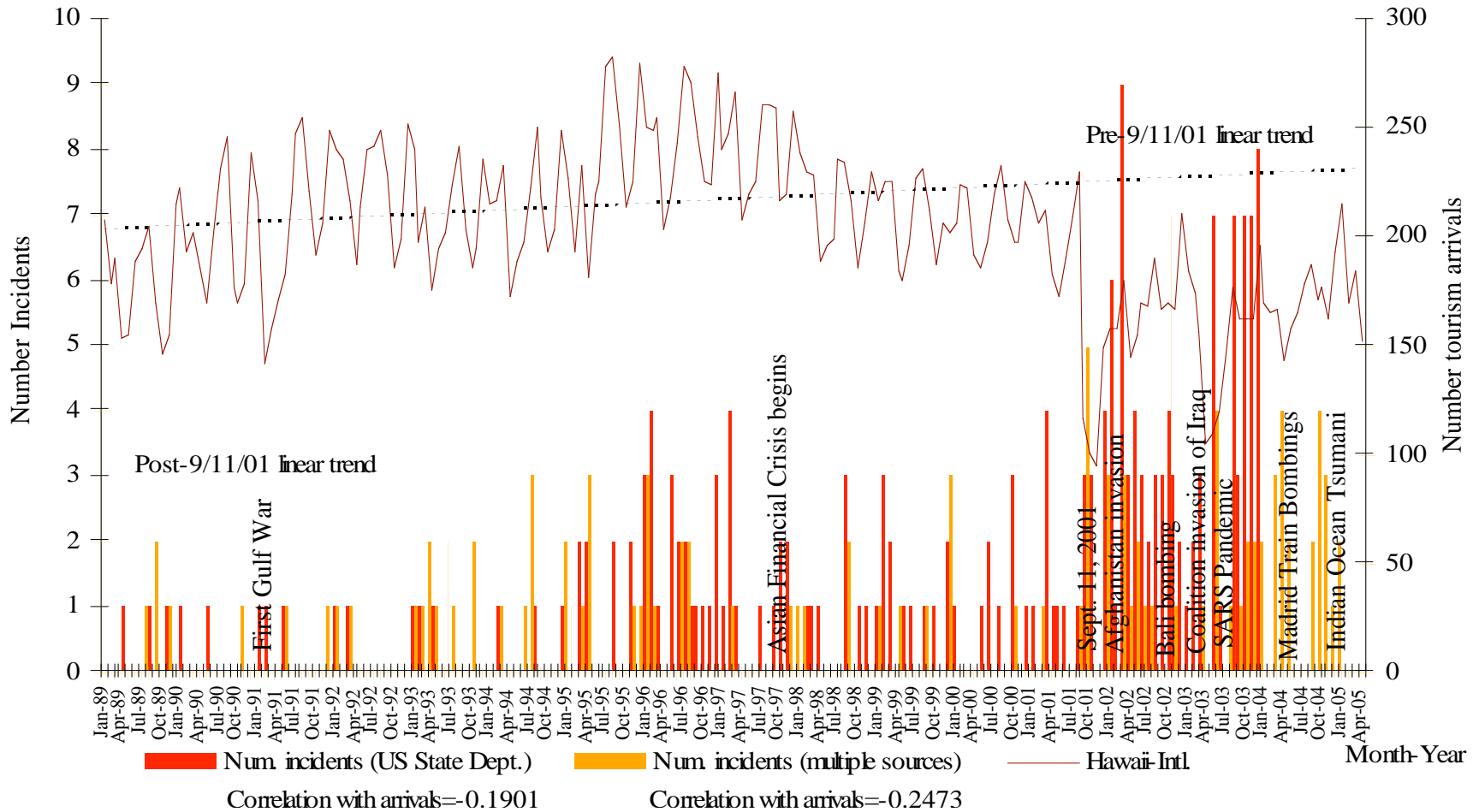
Source: Spending data from the TIA (2005).

Table 3. Direct Tourism Related Sales and Tourism Employment in the US: 2000-04

| <u>Year</u> | <u>Nominal Direct Tourism Sales (billions current \$)</u> | <u>Deflated Direct Tourism Sales (in billions Yr.2000\$)</u> | | <u>Direct Employment (in 000s)</u> |
|--------------------|---|--|--------------|---|
| | | <u>TIA Deflator</u> | <u>CPI-U</u> | |
| 2000 | \$516.7 | \$516.7 | \$516.7 | 5,698.3 |
| 2001 | 492.1 | 486.7 | 478.2 | 5,624.3 |
| 2002 | 494.1 | 490.7 | 472.8 | 5,499.5 |
| 2003 | 512.2 | 495.8 | 479.1 | 5,402.1 |
| 2004 | 546.4 | 506.4 | 497.6 | 5,423.6 |
| <i>Pct. Change</i> | | | | |
| 2000-Low Year | -4.8% | -5.8% | -8.5% | -5.2% |
| 2000-2004 | 5.7% | -2.0% | -3.7% | -4.8% |

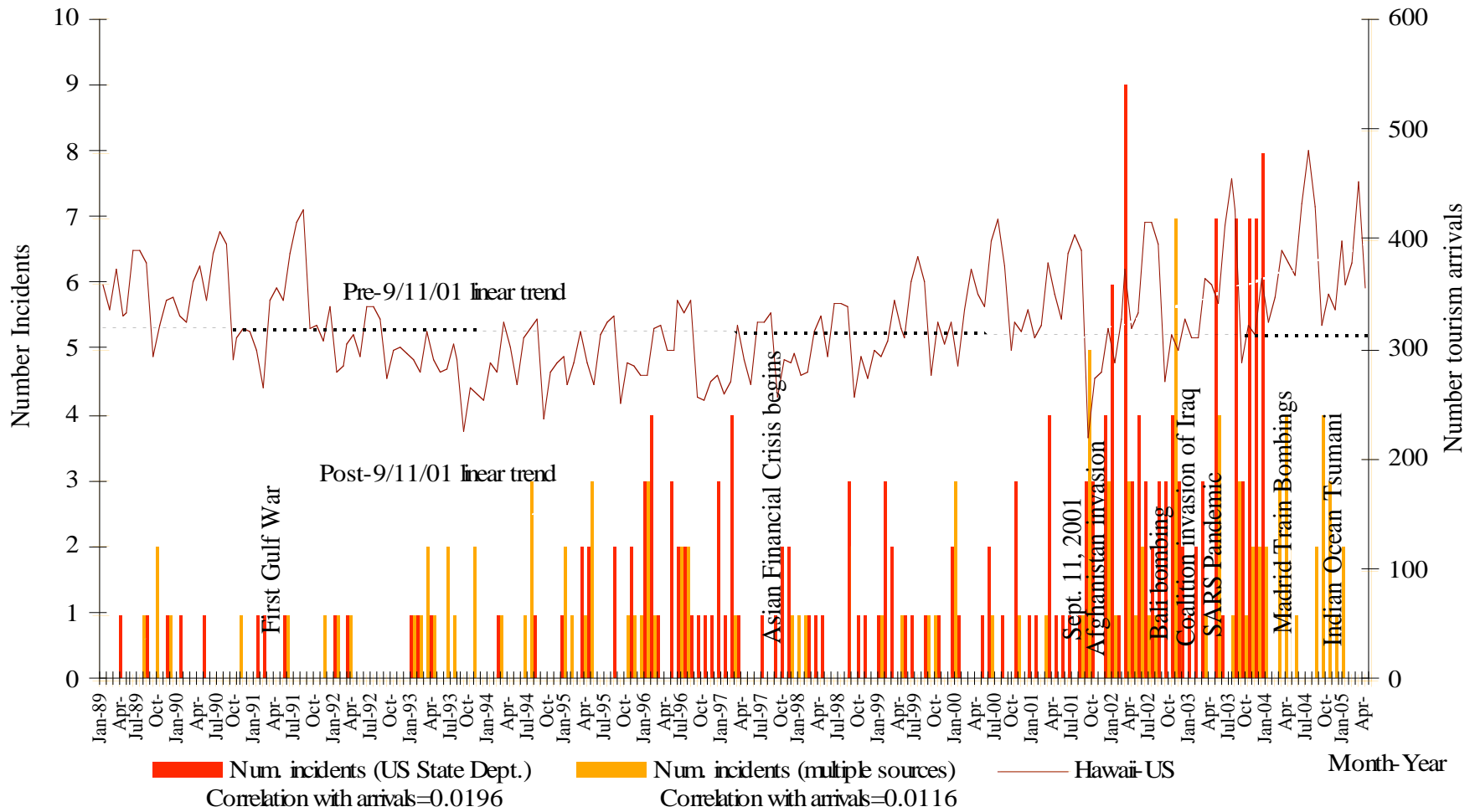
Sources: Direct sales and employment data from Bureau of Economic Analysis (2005); travel price index used to deflate direct sales obtained from the Travel Industry Association of America (TIA); CPI-U obtained from the Bureau of Labor Statistics (2005).

Figure 3. Terrorist incidents and tourist arrivals: Hawaii (international arrivals)



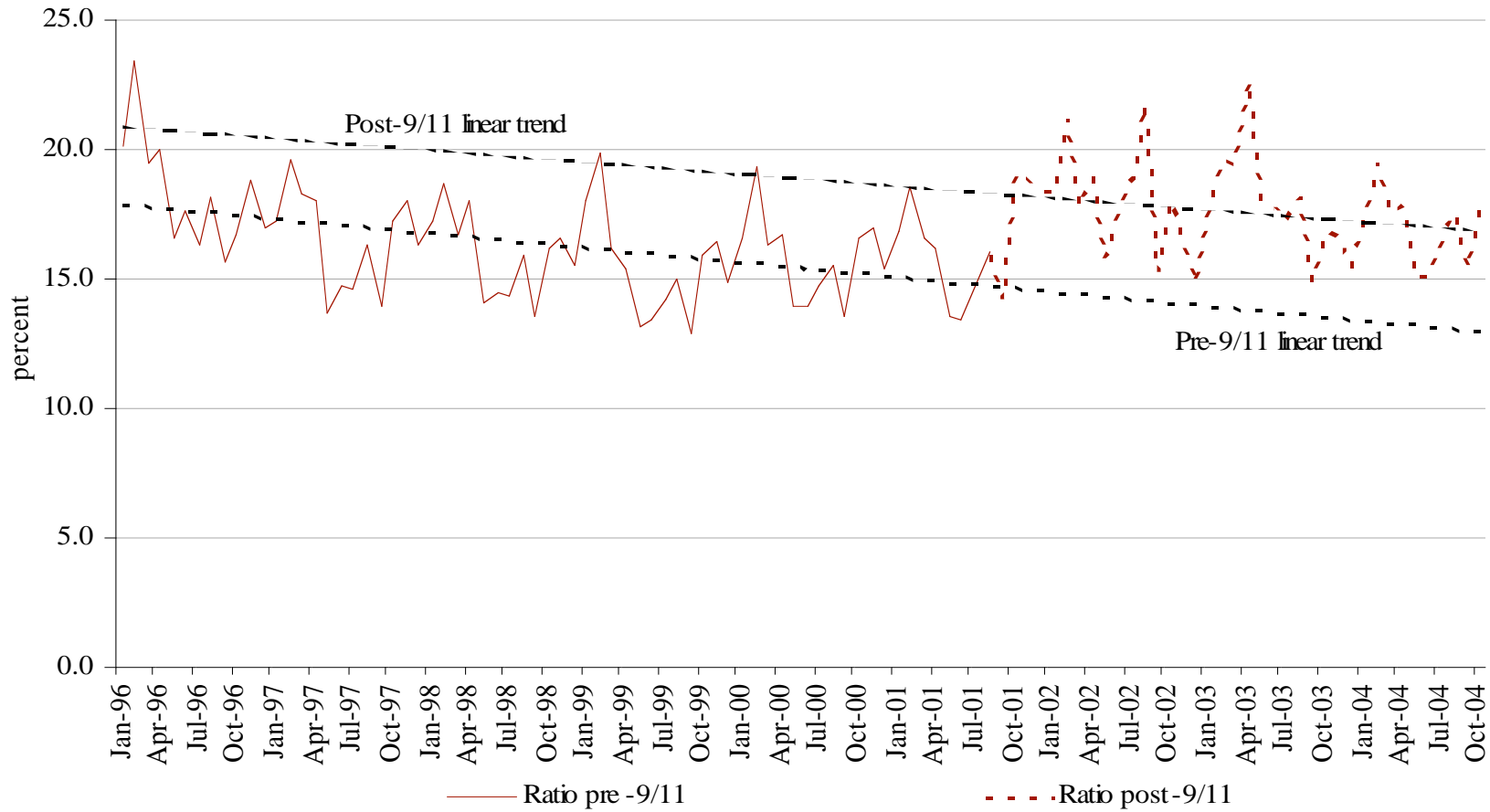
Sources: Information on visitor arrivals to U.S. comes from the Office of Travel and Tourism Industries (2005) and number of terrorist incidents per month extracted from U.S. Department of State (2004) and Wikipedia (2005).

Figure 4. Terrorist incidents and tourist arrivals to Hawaii from U.S.



Sources: Information on visitor arrivals to U.S. comes from the Office of Travel and Tourism Industries (2005) and number of terrorist incidents per month extracted from U.S. Department of State (2004) and Wikipedia (2005).

Figure 5. Ratio of U.S. Arrivals to Hawaii and Total U.S. Overseas Departures



Sources: Authors' calculation based on data from DBEDT (2005), and U.S. Department of Commerce, International Trade Administration (1998 through 2005).
 Note: Figures shows ratio of Hawaii's U.S. visitor arrivals by air to all US overseas departures (international departures excluding Canada and Mexico).
 US overseas for April-to-December 1999 and December 2000 missing from ITA statistics, so estimated based on prior year's month-to-month change in arrivals times prior month's level of arrivals.

Figure 6. U.S. Visitors to Hawaii: Actual vs Forecast

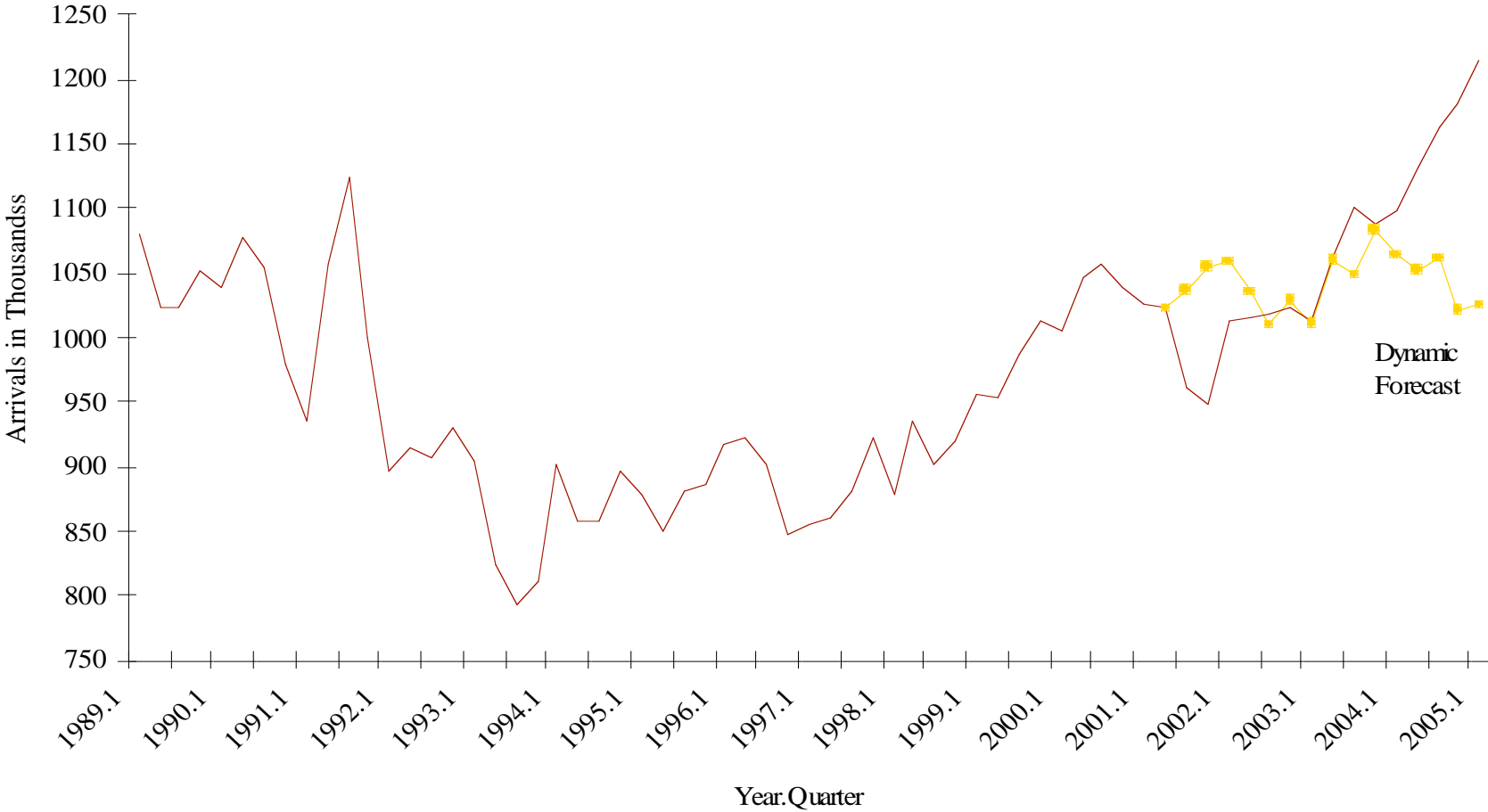


Figure 7. Japanese Visitor to Hawaii: Actual vs Forecast

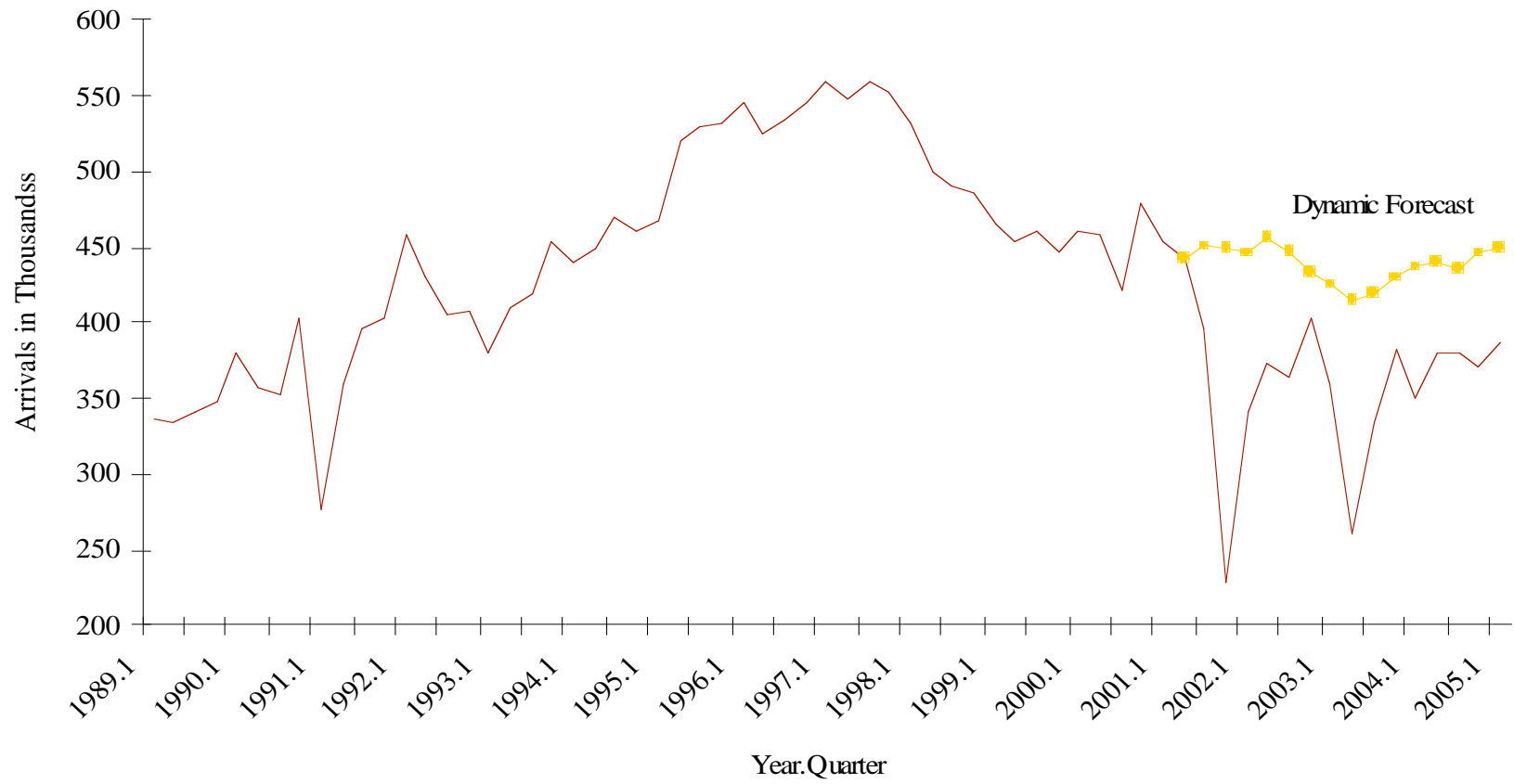


Table 4: Actual and Predicted Visitor Arrivals in Hawaii 2001:3-2005:1

| Year | U.S. Visitor Arrivals | | | Japanese Visitor Arrivals | | |
|-------------|-----------------------|--------|------------|---------------------------|--------|------------|
| | Forecast | Actual | Difference | Forecast | Actual | Difference |
| 2001 (Q3&4) | 2091 | 1908 | -183 | 900 | 625 | -275 |
| 2002 | 4133 | 4070 | -63 | 1783 | 1478 | -305 |
| 2003 | 4202 | 4264 | +62 | 1689 | 1337 | -352 |
| 2004 | 4197 | 4574 | +377 | 1758 | 1481 | -277 |
| 2005 Q1 | 1025 | 1215 | +190 | 449 | 387 | -62 |

Table 5: Impact of Post-9/11 Shocks on Hawaii Real Tourism Receipts: 2001:3 – 2005:1
(\$ values in '000s of Year 2000 dollars)

| Year | U.S. Visitor Arrivals | | Japanese Visitor Arrivals | |
|----------|-----------------------|-------------------------|---------------------------|-------------------------|
| | Gains/Losses | % of Predicted Revenues | Gains/Losses | % of Predicted Revenues |
| 2001:3&4 | -\$264,984 | -8.8% | -\$371,525 | -30.6 |
| 2002 | -98,280 | -1.5 | -409,184 | -17.0 |
| 2003 | +93,124 | +1.5 | -479,670 | -21.0 |
| 2004 | +550,154 | +8.9 | -375,300 | -15.8 |
| 2005:1 | +270,180 | +18.5 | -76,570 | -13.8 |

Note: Gains and losses were derived by multiplying the differences between actual and predicted visitor arrivals (Table 4 above) by the estimates of the average real per person per trip expenditures for U.S. and Japanese visitors for the respective years. Real numbers are obtained by deflating by the Honolulu Consumer Price Index (CPI-U), rescaled to year 2000=100. The expenditure estimates are obtained from the State of Hawaii, Department of Business, Economic Development and Tourism (DBEDT), *Annual Research Reports* for the relevant years; estimates of visitor expenditures for 2005 were obtained from the http://www3.hawaii.gov/dbedt/index.cfm?section=READ_VisitorStatistics447.