A RESEARCH PROJECT REPORT IN AVIATION
ON

"STRATEGIC MANAGEMENT OF U.S AVIATION INDUSTRY AFTER 9/11"

(BBAV3012)

FOR THE PARTIAL FULLFILMENT OF THE REQUIRMENT FOR THE AWARD OF

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By

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“STRATEGIC MANAGEMENT OF U.S AVIATION INDUSTRY AFTER 9/11”

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JANUARY – APRIL 2021

Certificate of Approval

The following Research Project report titled (STRATEGIC MANAGEMENT OF U.S AVIATION INDUSTRY AFTER 9/11) is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of Bachelor of Business Administration for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the Research Project Report only for the purpose it is submitted to the Research Project Report Examination Committee for evaluation of Research Project Report.

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This is to certify that the project report (STRATEGIC MANAGEMENT OF U.S AVIATION INDUSTRY AFTER 9/11) has been prepared ABHIRAJ SINGH under my supervision and guidance.The project report is submitted towards the partial fulfillment of 3 year, full time Bachelor of Business Administration.

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DECLARATION

I ABHIRAJ SINGH having admission number 18SLAM1020020 student of BBA of School of Business, Galgotias University, Greater Noida, hereby declare that the project report on "STRATEGIC MANAGEMENT OF U.S AVIATION INDUSTRY AFTER 9/11" is an original and authenticated work done by me.

I further declare that it has not been submitted elsewhere by any other person in any of the institutes for the award of any degree or diploma.

Name of the Student

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Date: Jan-April 2021

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EXECUTIVE SUMMARY

This paper assesses the impact of the Sep 11 terrorist attacks and its after-effects on U.S. airline demand. using monthly time-series information from 1986 to 2003, we discover that Sep 11 resulted in each a negative temporary shock of over half-hour associate degreed an current negative demand shock amounting to roughly seven.4% of pre-September eleven demand. This current demand shock has yet to dissipate (as of November 2003) and can't be explained by economic, seasonal, or alternative factors. Since Sep 11, 2001, varied airlines (both in the U.S. and abroad) are experiencing a money crisis not like any in fashionable aviation history. whereas United Airlines and us Airways have already filed for Chapter eleven bankruptcy, several alternative massive U.S. carriers have engaged in dramatic cost-cutting programs. The prospects for (or lack of) a recovery in rider demand has been the primary issue within the minds of aviation trade leaders and policymakers alike. during this paper, we tend to investigate the shape and extent of the the primary in demand for domestic traveling following Sep 11, 2001. whereas there's very little doubt that september 11 and its after-effects resulted in trade turmoil within the days and months directly following the attacks, there's difference of opinion concerning the long term impact of Sep 11 on the airline trade. This difference of opinion arises thanks to the very fact that weak economic conditions (particularly in the labor market) pre-dated and have mostly persisted since Sep 11, 2001.

INTRODUCTION

No trade has suffered bigger economic harm from the terrorist attacks of Sep 11, 2001 than the U.S. airline trade. additionally to directly inflicting a brief however complete shut-down of the industrial aviation system, the attacks caused several travelers to scale back or avoid traveling, weary of a newly-perceived risk related to flying. Likewise, following Sep 11, several businesses place temporary freezes on just about the foremost essential travel for his or her workers. And though the initial "panic" driven concern of flying straightaway following Sep 11 seems to possess largely dissipated, the rigorous new security needs that were enforced as a right away results of the terrorist attacks have made traveling by air additional cumbersome and long than before Sep 11. the aim of this paper is to examine the impact of Sep 11 on U.S. airline demand and to work out whether or not or not Sep 11 and its after-effects have resulted in an exceedingly negative shift in the demand for traveling. though the airline trade has continually been extremely cyclical, it's historically been ready to weather through temporary economic downturns. The impact of Sep 11 on airline demand has been thus severe, however, that demand still remains well below pre-attack levels quite two years once the attacks. Our analysis purpose is to live the magnitude of this current shift in demand by disentangling it from each the immediate downward spike following the terrorist attacks (resulting from factors like the temporary termination of the aviation system and therefore the initial panic driven concern of flying) similarly as economic cycle effects. measuring the magnitude of the continued demand shift is vital for 3 reasons.

First, since the terrorist attacks, there have been and continue to be numerous arbitrations between airlines and their labour unions related to the impact of September 11 on airline demand. Since many airline labor contracts expressly prohibit laying off employees due to weak economic conditions (i.e., recessions), determining both the initial and ongoing impact of the September 11 terrorist attacks has important ramifications on labor negotiations within the industry. In particular, many contracts between airlines and their unions have “no furlough” clauses that prohibit layoffs except in the case of extraordinary circumstances beyond the control of the airline, known as force majeure events. Second, in the weeks and months leading up to September 11, one of the primary concerns of aviation policymakers was airport and air traffic control congestion and delays. Consequently, understanding the ongoing impact of September 11 on airline demand is important for aviation capacity planners. Finally, to the extent that the demands for air travel has spill-over effects into other sectors of local economies the impact of lower demand for air travel has much broader economic effects than those impacting solely the airline industry.

OBJECTIVES

The Project Based Learning program on 'STRATEGIC MANAGEMENT OF US AVIATION INDUSTRY AFTER 9/11' has an objective to understand the following points:

- National Aviation Security Policy
- The National Strategy for Aviation Security
- Threats to Aviation
- Aircraft -Related Threats
- Threats to Aviation Infrastructure
- Threats Involving Exploitation of Air Cargo
- Risk – Based Methodology
- Strategic Objectives
- Roles and Responsibilities
- Aviation Mode- Specific
- How does the organization quantity the benefits to the society.

LITERATURE REVIEW

After controlling for cyclical, seasonal and other unique events impacting the industry, we model the post-September 11 period using an attenuating shock process that has both a transitory component as well as an ongoing (as of November 2003) component. After controlling for factors such as trend, seasonality and general macroeconomic conditions, we find that the events of September 11 led to both an initial demand shock of more than 30% as well as an ongoing downward shift in the demand for commercial air service of roughly 7.4%. We estimate that this ongoing demand shock accounts for over 90% of the current weakness in domestic airline demand relative to its pre-September 11 peak.

The remainder of this paper is organized as follows. Section 2 provides a brief overview of U.S. airline demand prior to and following September 11 and discusses some reasons why September 11 may have resulted in a longer-term structural change. Section 3 presents our model and empirical analysis. A summary of our findings and concluding remarks are provided.

The National Aviation Security Policy represents the overarching aviation-specific components of The National Strategy for Homeland Security. That strategy specifies that the Department of Homeland Security (DHS) will serve as the focal entity for managing and coordinating border and transportation security initiatives to prevent the entry of terrorists and the instruments of terror, while facilitating the legal flow of people, goods, and services on which our economy depends. The policy, however, addresses a broader spectrum of threats to the air domain that include not only specific threats to the homeland, but also threats to national

security interests both within the United States and abroad. Therefore, in addition to the overall responsibility for homeland security and aviation security for which the DHS and the TSA are directly responsible, the National Aviation Security Policy also involves matters concerning the Department of Defense, the Department of State, the Department of Justice, and a variety of other federal, state, and local agencies and private entities, and relies on close coordination with and continued cooperation from other nations.

On June 20, 2006, President Bush issued Homeland Security Presidential Directive 16 (HSPD-16/ National Security Presidential Directive 47 (NSPD-47)) establishing new U.S. policy, guidelines, and implementation of actions to address threats to the air domain. The document broadly defines the air domain as the global airspace and all aircraft operating within that airspace including both manned and unmanned, as well as all people and goods being transported by such aircraft, and all supporting aviation infrastructure.

The policy objectives set forth in HSPD-16 endeavor to prevent terrorist acts and other hostile actions either directed at or exploiting elements of the aviation domain while also minimizing the impact on air commerce and fostering the economic growth and stability of the aviation industry.

RESEARCH METHODOLOGY

Our basic methodology is to estimate a reduced form model of demand for domestic air services using monthly time-series data since 1986. The purpose of our investigation is to determine what–if any–structural impact the terrorist attacks of September 11 has had on domestic airline demand. It is well known that the demand for commercial airline service is both seasonal and cyclical. Thus, an integral part of our analysis of the effects of September 11 requires that we effectively control for seasonal, economic and other unique factors that are known to have impacted the demand for air service. After controlling for these factors, we should be able to assess the degree to which the current industry malaise is related to September 11 and its after-effects.

- **Modeling the impact of September 11**

Having described the baseline model, we now turn our attention to modeling the impact of September 11. As a starting point, we first take a non-parametric approach by fitting 27 dummy variables—one for each month on and after September 2001—onto the baseline model we introduced in the previous section. For this exercise, we also included the seasonality dummy variables but excluded the Iraq War and SARS dummy variables. plots the coefficient estimates of those 27 monthly dummy variables across time. Each data point represents the gap between the actual log of the RPMs/yield observation and what the baseline model predicts, after controlling for economic fluctuations and other demand and supply factors. demonstrates that after the sharp drop in September 2001, there was an initial recovery phase. By mid 2002, however, the recovery began to taper off, and

through November 2003, the gap for both RPMs and yield continues to hover well below zero, without any apparent tendency of closing.

- **Estimation results**

The ordinary least squares estimates for Models 1 and 2 are presented in. Since the model is static and the regressors are identical in equations, there is no gain from estimating the two equations together. also reports Newey–West robust standard errors in order to account for a non-spherical distribution of the error term.

- **Reduced form estimates**

Both the labor force and the unemployment rate are powerful and significant predictors of RPMs (quantity), consistent with our a priori belief. A higher unemployment rate also reduces yields (prices), which is intuitive.19 A larger labor force, however, also tends to reduce yields. This result is somewhat counterintuitive, and we expect that this is probably due to the fact that the labor force tends to be somewhat correlated with the growth of low-cost carriers.

- **Analysis of post-September 11 airline demand**

Having estimated the impact of September 11 on U.S. airline demand, we now use our model's estimates to predict what demand would have been had it not been for the terrorist attacks. For our analysis in this section, we use the predicted values from Model l.

Our methodology is as follows. From the predicted values of the regression model, we subtract both the ongoing and transitory estimated effects of September 11, along with the seasonal fluctuation This counterfactual demand prediction is plotted in, along with the actual (seasonally adjusted) level of RPMs .

As illustrated in, the model predicts a significantly higher level of demand had September 11 not occurred, notwithstanding the weakness in the labor market. Recall also that the immediate shock of September 11 is largely dissipated after 5 months. The difference between the counterfactual (b) and actual (a) RPMs after 5 months is the ongoing shift predicted by the model of roughly 7.4%

- **Limitations of the current analysis**

While our analysis provides strong evidence of a negative structural change in airline demand following September 11, we should emphasize that our analysis has some limitations. To begin with, at the time of our analysis, only 27 monthly observations since September 2001 are available, which limits the degrees of freedom for our analysis concerning the post-September 11 period. While the U.S. airline industry has typically recovered from other negative shocks considerably faster than 27 months, a catastrophic event such as September 11 could obviously require a longer recovery period. If this is the case, we are still observing the recovery. Based on the data, one cannot rule out the possibility that we are still on the recovery trajectory from September 11, especially when events such as the Iraq War and the SARS epidemic have put additional downward pressure on the demand for air travel. Consequently, it will be useful to repeat the current analysis as additional observations become available.

The directive required that the national strategy, along with its supporting plans, include, at a minimum, risk-based approaches to address the following threats:

- attacks using aircraft against ground-based targets, including possible attacks using aircraft to deliver or transport chemical, biological, radiological, nuclear, or explosive (CBRNE) weapons;
- attacks using stand-off weapons, such as shoulder-fired missiles or other man-portable air defense systems (MANPADS);
- attacks using on-board explosive devices and other conventional and non-conventional weapons to directly target aircraft;
- hijackings and air piracy; and
- physical attacks or cyber-attacks on aviation critical infrastructure and facilities, such as air traffic control facilities and networks and navigation systems.

The directive also identifies several specific action items to be addressed in supporting mode-specific plans to implement the national strategy for aviation security. The required plans include

- the Aviation Transportation System Security Plan;
- the Aviation Operational Threat Response Plan;
- the Aviation Transportation System Recovery Plan;
- the Air Domain Surveillance and Intelligence Integration Plan;
- the International Aviation Threat Reduction Plan;
- the Domestic Outreach Plan; and
- the International Outreach Plan.

- **Risk based methodology**

The U.S. National Strategy for Aviation Security is predicated on a risk-based, multi-disciplinary, and global approach to ensure that resources allocated at the federal, state, and local levels and by private sector aviation interests provide the greatest potential to detect, deter, and prevent attacks against aviation and mitigate the consequences if an attack does occur. This risk-based approach or methodology is described in detail in the National Infrastructure Protection Plan (NIPP) and the NIPP Transportation Sector Specific Plan (TSSP) which were made available to the public in May 2007.In general, the NIPP serves to define the unifying structure through a common framework for identifying critical assets, conducting risk assessments, and developing and implementing risk reduction and mitigation initiatives based on the results of these assessments.The TSSP applies this risk-based framework across the entire transportation sector, including the aviation domain.

The system-based risk-management framework outlined in the TSSP describes risk as a function of threat, vulnerability, and potential consequences, and it analyses security risk by taking into account all three of these factors. The transportation sector approach to risk management adheres to an underlying vision for risk-based decision making that seeks to establish a balance between security and freedom. The goals outlined in the TSSP include

- preventing and deterring terrorist acts against transportation systems;
- enhancing the resilience (i.e., the ability to absorb damage without catastrophic failure) of the U.S. transportation system; and
- improving the cost-effective use of resources allocated to transportation security.

The risk-based methodology seeks to achieve these three overarching goals by prioritizing resources based on risk. This approach seeks to involve extensive participation from global, state and local, and private sector entities with specific domain expertise. It also is intended to rely on inputs from the intelligence community, expert judgment, and futures analysis related to the impact or consequences of various threat scenarios.

A wide variety of risk-based transportation sector security assessment tools have been developed to assist security strategists and planners. These consist of self-assessment tools and government site evaluations, reviews, and analytic tools examining either risk as a whole, or specific risk subcomponents including threat, vulnerability, and consequence. Some specific tools being implemented to assess risk in the aviation domain include government facilitated site assistance visits and comprehensive reviews, web-based (VISAT) modules for airports that are currently under development, and the FAA's Information Systems Security Program (ISSP) for air traffic control systems and related functions. Communication and dissemination of this information seen as a critical component of the risk-based strategy.

Strategic Planning

Relying on the risk-based approach, the National Strategy for Aviation Security identifies five strategic planning to guide aviation security activities. These include

- deterring and preventing terrorist attacks and criminal or hostile acts in the air domain;
- protecting the homeland and United States interests in the air domain;
- mitigating damage and expediting recovery if an attack against aviation occurs;
- minimizing the impact of an attack on the aviation system and the broader U.S. economy; and
- actively engaging domestic and international partners.

According to the strategy for aviation security, terrorist attacks will be deterred and prevented by maximizing shared awareness of domestic and international airspace, aviation infrastructure, and individuals having access to the aviation system. Therefore, the strategy seeks to establish a system of protection that considers not only individual elements of the aviation system, but also their connections and interdependencies.

While the principal goals of the strategy are to deter and prevent attacks, the strategy also seeks to prepare for, and have in place, contingencies for mitigating damage and expediting recovery. The strategy identifies a need for diverse and flexible response options, for example, allowing for the selective restriction or suspension of air traffic on local or regional levels as necessary and providing decision makers with tools and resources to effectively close and reconstitute the aviation system and take other appropriate steps to prevent further attack. In

general, the strategy seeks an overall approach to implementing security measures whose normal operations will minimize impacts on the flow of goods and people through the air transportation system while at the same time providing a high level of protection tailored to the unique needs of the aviation sector.

The complexity and scope of the global aviation transportation systems requires cooperation among federal, state, and local government entities, international agreements and cooperation, and the participation of various industry and other private sector stakeholders to prevent, respond to, and recover from possible attacks involving aviation assets. The leading and supporting roles and responsibilities of these various entities are guided by existing laws and regulations particularly those regarding the authority to act, desired outcomes or objectives, and the availability of assets and capabilities to address aviation security needs or requirements.

At the highest levels of federal government (i.e., among cabinet-level leadership), the Secretary of Homeland Security has responsibility for coordinating national aviation security programs. In general, responsibilities of the Department of Homeland Security (DHS) include risk analysis and reviews of aviation security programs; coordination of aviation security law enforcement operations; border protection including monitoring of cross-border aviation operations and inspections and controls at all ports of entry including airports; coordinating efforts to assess and prioritize security measures for critical infrastructure and key resources (CI/KR); developing security technologies to protect against threats to aviation security such as explosives, carry-on weapons, and shoulder-fired missiles; coordination of aviation security measures and incident response; and information sharing to support and improve the global aviation security network.

Within the DHS, the TSA has the statutory responsibility for security across all modes of transportation, including aviation where it has extensive operational responsibility for passenger airline security as well as strategic planning and regulatory responsibilities for all other aspects of security. The TSA collaborates with Department of Transportation (DOT) entities, and in particular the Federal Aviation Administration (FAA), on transportation and aviation infrastructure protection and security issues. The TSA administers a variety of programs to support aviation security, including the National Explosives Detection Canine Team program, which trains and deploys canine teams for explosives detection in aviation and other transportation modes; the Federal Flight Deck Officers Program which trains and deputizes armed pilots to defend commercial airliner flight decks from hostile actions; checkpoint and baggage screening carried out by TSA-employed Transportation Security Officers (TSOs); the use of aviation security inspectors to ensure regulatory compliance among aviation operators and related industries; Federal Air Marshals (FAMS), and the explosives operations division to respond to potential explosives threats. Additionally, the TSA maintains an intelligence function to coordinate and provide notice regarding threats to transportation, vetting passengers and aircrews, foreign students seeking flight training in the United States, airport workers, and other populations that may pose a threat to aviation or transportation security. During a national emergency, the TSA has the responsibility of coordinating transportation security-related responsibilities and activities of other departments and agencies in all modes, including aviation.

The TSA Office of Intelligence (OI) plays a central role in the transportation threat assessment process. It is the only federal entity focused solely on transportation and aviation security threat assessment. As such, it has developed a wide range of threat assessment products, based on analysis of intelligence information provided by the National Counterterrorism Center (NCTC) and other components of the intelligence community. These include a transportation intelligence gazette; comprehensive transportation-related threat assessments; annual modal threat assessments for all transportation modes including aviation; special threat assessments of specific events; weekly intelligence reports; suspicious incident reports; intelligence notes on transportation-related terrorist trends, incidents, and tactics; and transportation situational awareness notes on notable transportation-related terrorist information.

While the TSA has broad authority and responsibility for both domestic and international aviation and other transportation modes, Customs and Border Protection (CBP) has a specific primary mission of preventing terrorists and terrorist weapons from entering the United States. CBP also provides radar tracking and monitoring to support the FAA and the Department of Defense in protecting airspace around Washington, DC and throughout the continental United States. The United States Coast Guard (USCG) conducts aviation operations for national defense, law enforcement, and national security, including the specific mission of providing aerial patrols and aircraft interdiction in the National Capital Region around Washington, DC. The Department of Defense (DoD) is, however, ultimately responsible for deterring, defending against, and if necessary, defeating aviation threats within the United States and to U.S. interests globally. To meet this mission, the DoD operates as part of the North American Aerospace Defense Command (NORAD) to monitor, deter, and detect potentially hostile actions. The

DoD also maintains a capability to respond to aerial threats by keeping significant numbers of fighter aircraft on alert, carrying out airborne fighter patrols over the homeland, and deploying ground-based missile defense systems around Washington, DC and other areas as warranted.

Whereas the DoD has responsibility for airborne threats, potential criminal and terror threats to aviation by individuals or groups of individuals is primarily the responsibility of the law enforcement arm of the Department of Justice (DOJ), the Federal Bureau of Investigation (FBI). The FBI's Civil Aviation Security Program (CASP) and counterterrorism units have been involved extensively in efforts to uncover and prevent terrorist operations to attack or exploit civil aviation in the United States. The FBI has deployed over 500 airport liaison agents (ALAs) to about 450 airports with commercial passenger service to respond to aviation-related incidents and threats and participate in vulnerability assessments and planning at the airport level of analysis.

There are a myriad of other agencies and organizations that play important roles in operational aviation security. The DHS Science and Technology (S&T) Directorate maintains research and development programs to enhance aviation security, especially to address explosives threats and threats to aircraft from shoulder-fired missiles. Additionally, the multi-agency Joint Planning and Development Office (JPDO) has responsibility for designing and overseeing the implementation of the future air transportation system, including its security components. However, the degree to which the JPDO plans for future aviation security systems are integrated with DHS aviation security technology initiatives has not been fully assessed at this point.

In addition to these efforts, the Department of State has overall responsibility for outreach and coordination with foreign governments to enhance cooperation in

improving aviation security. Ongoing State Department efforts includes initiatives to improve data sharing for advance passenger prescreening, and programs to reduce stockpiles of standoff weapons, including shoulder-fired missiles, which pose a threat to civil aircraft. Also, the Department of Commerce plays a role in international trade negotiations and by developing U.S. policy and regulation regarding aviation trade an security issues, while the DOT, in coordination with the Department of State, negotiates international agreements regarding airline and other commercial aviation activities. Additionally, the intelligence community, coordinated through the Office of the Director of National Intelligence (ODNI) plays an important role in assimilating and assessing intelligence—collected through signals interception (SIGINT), imagery (IMGINT), and human collection (HUMINT)—on threats exploiting aviation security measures. Additionally, other DHS components, including the Federal Emergency Management Agency (FEMA), the Domestic Nuclear Detection Office (DNDO), and the Office of Infrastructure Protection (OIP) have various responsibilities related to infrastructure protection and critical incident response in the aviation domain. Also, the Department of Energy provides scientific and technical expertise regarding nuclear weapons, radiation detection capabilities at airports to detect possible nuclear weapons or radiological materials, and coordinating response to any radiological contamination resulting from a possible nuclear or radiological attack.

In addition to the federal role, a variety of industry advisory groups have been established to provide insight and recommendations for guiding transportation security policy and practice. Most notably, the Aviation Security Advisory Committee (ASAC) exists to support the TSA by providing advice and developing recommendations for improving aviation security methods, equipment, and

procedures. The ASAC has been in existence since before September 11, 2001, and advised the FAA on aviation security matters; it has continued in this role, now supporting the TSA in its role as the lead federal agency for aviation security issues. Also, the National Research Council (NRC) and the Transportation Research Board (TRB), components of the National Academies, provide venues for information sharing and analysis of transportation security policies and practices among researchers, practitioners, and other subject matter experts. Additionally, airports, airlines, and other aviation industry stakeholders as well as state and local security and law enforcement entities play an important role in shaping and carrying out the national aviation security policy and strategy, largely by working in cooperation and coordination with the TSA to design and execute aviation mode-specific security plans.

DATA ANALYZING

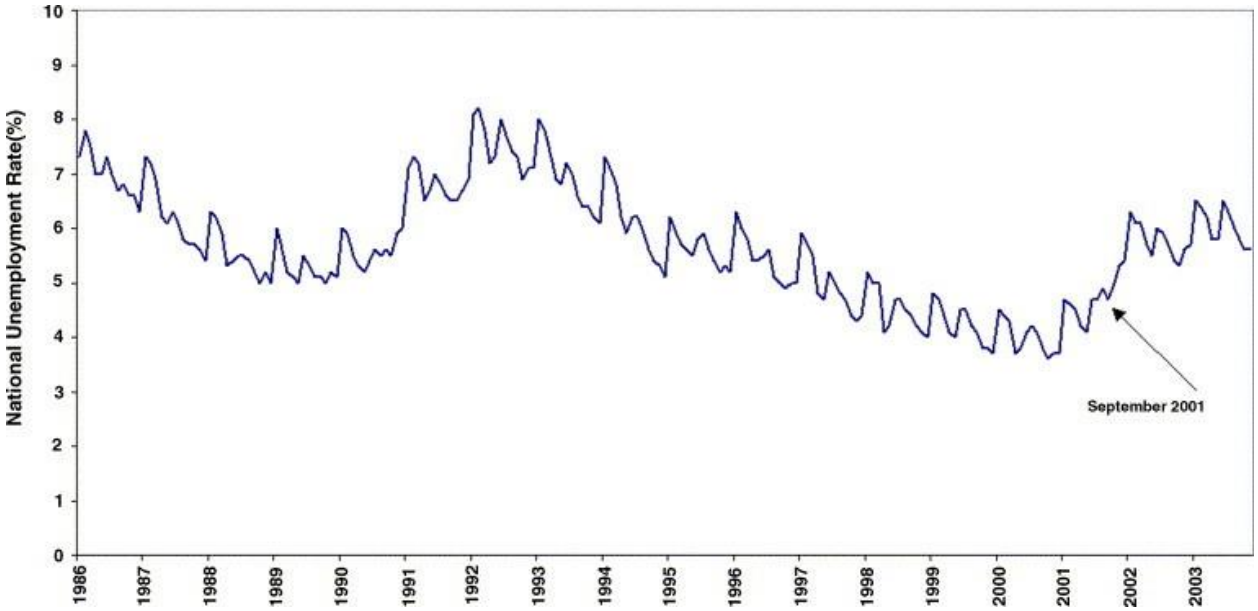
Data for U.S. airline industry demand comes from the Air Transport Association's (ATA) monthly database of passenger traffic and represents all revenue (i.e., paying) passengers carried by ATA member carriers. In light of the dramatic change in the regulatory environment following deregulation, our analysis focuses on the post-deregulatory era. Moreover, within the post-deregulatory era, we focus our analysis on domestic travel from January 1986 until November 2003, due to data availability for some of our variables.

Our primary measure of airline demand is domestic RPMs. Although the number of O&D passengers is another possible measure, we chose RPMs as our proxy for demand since the average trip length of passengers has been steadily increasing over time. Our measure of the airline prices is the average domestic monthly passenger yield (average revenue per RPM) as reported by the ATA. Our baseline model is a reduced form estimation of the natural log of quantity (RPMs) and price (yield).

Economic trend and cyclicality: Prior to September 2001, the demand for the air travel had been growing rapidly (see Fig. 1), fueled by steady economic growth and declining real airfares. The demand for air travel is also known to be highly sensitive to business cycles. To control for trend and cyclicality factors, we introduce two macroeconomic variables that we consider to be major demand-shifters. Firstly, we use the national unemployment rate as our business cycle indicator. Secondly, we use the domestic labor force to control for the long-term growth of the overall economy. While we recognize that gross domestic product is the standard variable for measuring economic activity and its fluctuations, GDP

statistics are only available on a quarterly basis, which is not sufficient for our analysis.

Fig. 3 plots the national unemployment rate from 1986 to 2003. After reaching historically low rates in 2000 and 2001, Fig. 3 demonstrates that the onset of the economic downturn is readily apparent prior to September 2001. Moreover, despite the fact that GDP resumed growing in late 2001, Fig. 3 illustrates that the labor market has remained relatively weak.



One natural question that arises is the degree to which September 11 directly or indirectly resulted in a weakened economy, and in turn, higher unemployment. Numerous researchers have studied various economic effects of September 11). Moreover, it has been well documented that at least some mass layoffs following September 11 (especially those in the travel and tourism industries) were directly attributable to the terrorist attacks rather than prevailing economic conditions. Determining aggregate job losses at the national level attributable to September 11, however, is almost impossible, since there are literally thousands of small firms whose layoffs would not be recorded by the Bureau of Labor Statistics. Thus, for

the purpose of our analysis, we do not attempt to differentiate between the sources of job losses (i.e., general economic conditions versus September 11). Consequently, to the extent that September 11 was directly or indirectly responsible for higher levels of national unemployment, our estimation results will underestimate September 11s' impact on airline demand.

In the quantity equation, the RPM and labor force variables are both upwardly trended, raising the suspicion of a spurious regression. However, a Johansen test confirmed that these two variables are indeed co-integrated with a time trend. Consequently, the estimated coefficient on the labor force variable is superconsistent, while estimates on other variables remain unbiased. An alternative model such as one using first differences with an error correction term may be able to specify the dynamic relationship between the co-integrated variables more precisely. However, the September 11 attack was a long-lag event, making the first different estimation problematic. Moreover, pinning down the precise dynamics of September 11 is not our main research focus. Rather, we would like to control for the overall economic activity level while isolating the September 11 effect.

Airline fatalities: Fear of flying is not a new phenomena. Since 1986, there have been 30 fatal airline accidents involving U.S. scheduled commercial carriers—excluding the September 11 terrorist attacks—including one known terrorist attack (the Pan-Am Lockerbie bombing in December 1988). It is reasonable to expect some travelers to experience increased apprehension of flying, especially when there have been accidents involving a large number of fatalities. We include a variable that measures the number of fatalities on U.S. carriers in order to control for the generic demand impact of airline accidents. If fear of flying from the September 11 terrorist attacks is comparable to that from other fatal accidents, we expect this variable to pick up the generic fear effect. However, it is possible that

travelers reacted more strongly to the potential for greater "systematic risk" since September 11 than the "idiosyncratic risk" inherent with air travel.

Supply-side variables: We also include two supply-side variables. The first is LCCshare, the share of domestic industry RPMs serviced by low-cost carriers in each month. Many researchers have documented the impact of low cost carriers on the U.S. airline industry. Indeed, one recent, comprehensive study of the U.S. airline industry noted that "Probably the most significant development in the U.S. airline industry during the past decade [the 1990s] has been the continued expansion of Southwest and the resurgence of low-fare entry generally". The second supply-side variable is the cost per gallon of jet fuel, as reported by the Department of Transportation. Since fuel accounts for approximately 10–15% of airline operating costs, its exogenous fluctuation is likely to influence airline pricing.

Some extraordinary events: Although the post-deregulatory U.S. airline industry experienced steady growth until 2001, a few events resulted in temporary negative "shocks" and require special attention. Our model accounts for the 1991 Gulf War, the 2003 Iraq War, and the Severe Acute Respiratory Syndrome (i.e., "SARS") epidemic. Controlling for the last two events is especially important because they may have imposed downward pressure on demand during the post-September 2001 period. Failing to control for these events, therefore, would result in over-estimating the impact of September 11.

FINDINGS

Having described the baseline model, we now turn our attention to modeling the impact of September 11. As a starting point, we first take a non-parametric approach by fitting 27 dummy variables—one for each month on and after September 2001—onto the baseline model we introduced in the previous section. For this exercise, we also included the seasonality dummy variables but excluded the Iraq War and SARS dummy variables. Fig. 4 plots the coefficient estimates of those 27 monthly dummy variables across time. Each data point represents the gap between the actual log of the RPMs/yield observation and what the baseline model predicts, after controlling for economic fluctuations and other demand and supply factors. Fig. 4 demonstrates that after the sharp drop in September 2001, there was an initial recovery phase. By mid 2002, however, the recovery began to taper off, and through November 2003, the gap for both RPMs and yield continues to hover well below zero, without any apparent tendency of closing

we construct two simple non-linear models that allow us to measure the magnitude of this ongoing stagnation while controlling for the effects of concurrent events such as the recent Iraq War and SARS epidemic (which are not isolated in Fig. 4). Both models need to accommodate for two different types of impacts from September 11: (a) an ongoing downward shift in the demand for air travel resulting from the increased apprehension of flying and inconveniences such as the hassle factor and (b) the initial panic driven fear of flying directly following September 11. We allow for the possibility of an ongoing downward shift in demand by including an dummy variable, D that takes the value 0 for all observations before September 2001 and 1 thereafter. Thus, the estimated coefficient on D will measure the relative magnitude in the downward shift in demand following September 2001. To account for the sharp decline in demand following September 11 that was likely transitory in nature, we also include a shock component that attenuates over time.

Threats to Aviation

The National Strategy for Aviation Security identifies three origins or sources of threats to the air domain: terrorist groups, hostile nation-states, and criminals. The strategy document points out that while physical attacks from terrorist groups pose the most prominent threat, terrorists may also use criminal tactics to move operatives, weapons, explosives or possibly weapons of mass destruction (WMDs) through the aviation system. The strategy notes that "[s]uch threats are particularly worrisome in areas of the world where governments are weak or provide safe haven to terrorists." Further, hostile-nation states may directly sponsor international terrorism directed against aviation by providing funding, training,

weapons, explosives, supplies, and other material support to carry out attacks against the air domain. Also, the presence of criminal elements with extensive knowledge of the aviation sector, both within the United States and in foreign countries, pose a persistent threat to aviation and could provide potentially violent domestic groups or international terrorists with specific capabilities to exploit weaknesses in aviation security. Therefore, these three threat origins or sources cannot be viewed as being mutually exclusive, as they may combine in various forms to carry out attacks either directly against aviation assets or by exploiting elements of the air domain to prepare for or carry out attacks against the homeland or U.S. interests abroad.

The strategy document defines three primary categories of threats against the aviation domain based on the target of the threat. These consist of: threats involving aircraft; threats to aviation infrastructure; and threats involving hostile exploitation of air cargo. A variety of tactics may be used to attack these targets, including hijackings, bombings, shootings, and criminal tactics such as smuggling of persons and weapons. A synopsis of the relationships between threat origins or sources, aviation targets, and tactics for attacking these aviation targets.

Aircraft-related Threats

Aircraft threats may be directed at aircraft or may involve the use of aircraft to attack other targets, as was the case in the terrorist attacks of September 11, 2001. The strategy document notes that large passenger aircraft have historically been at the greatest risk from terrorist attacks, including both hijackings and bombings, because terrorists have perceived that attacks against such aircraft have significant potential to cause catastrophic damage and mass casualties and disrupt the aviation system. The document, however, notes that terrorists may also seek to attack all-cargo aircraft, especially large all-cargo aircraft which are considered attractive as weapons to attack ground-based targets in 9/11-style attacks. All-cargo aircraft, and the air cargo system in general, may also be attractive to terrorists or criminals as a means of conveyance for weapons, explosives, or other supplies. The strategy considers large transport aircraft, both passenger airliners and to a lesser extent all-cargo aircraft, to be at risk from possible attacks using shoulder-fired guided missiles or other standoff weapons.

The strategy also indicates that small aircraft face both the threat of direct attack as well as the threat that they may be used as weapons to attack ground-targets. While the strategy notes that small aircraft appear to be relatively unattractive targets for attacks by themselves because they carry few passengers, it cautions that terrorists may use a wide variety of small aircraft, such as business jets and helicopters, to destroy ground-targets, especially critical assets and infrastructure. The most formidable threat comes from the potential use of small aircraft to either transport or deliver a WMD payload. The strategy also notes that small aircraft are also used by transnational criminal elements to carry out illegal activities, such as drugs and weapons smuggling, and pose a considerable challenge for border protection.

Finally, the strategy recognizes that non-traditional aircraft, such as unmanned aircraft, ultra-lights, and aerial-application aircraft (i.e., crop dusters), may be used as either weapons or means of conveyance for WMDs. The strategy states that terrorists may employ such aircraft for missions that are limited in range, require limited accuracy, and have a specific and small target. For example, crop dusting aircraft have been regarded as a potential threat for dispersing a chemical or biological agent. The strategy notes that such tactics deserve very close monitoring.

The strategy also briefly notes the potential threat to the air domain posed by hostile nation-states from military aircraft and missiles. However, these threats are mainly a concern for national defense and the Department of Defense (DoD), rather than a focus for homeland security, and thus have not been a major focus of the aviation security strategy and its supporting plans. This threat is, therefore, not further considered in this discussion.

Threats to Aviation Infrastructure

The strategy maintains that reported threats to aviation infrastructure, including airports and air navigation facilities are relatively few. The strategy notes that air navigation facilities, in particular, have a low public profile and are resilient to attack due to a robust multilayered design that can be quickly reconstituted thus limiting psychological and economic impacts stemming from an attack. The strategy, however, notes that there is a wide variety of potential threats to aviation infrastructure. The strategy notes in particular the potential threat to concentrations of individuals at major airport passenger terminals. Terrorists may attack passenger terminal buildings with explosives, as was attempted at Glasgow International Airport, Scotland in June 2007 and in several other historical incidents.

The strategy concludes that attacks against other facets of aviation infrastructure, such as general aviation airports and air cargo handling areas, are less likely to materialize, largely because attacks against these facilities would generally not offer the opportunity to target large numbers of people and would therefore have a more limited psychological impact. The strategy, however, was released a few months before U.S. law enforcement authorities arrested members of a suspected homegrown terrorist cell who were plotting to bomb jet fuel storage tanks at New York's John F. Kennedy International Airport (JFK) and the network of jet fuel distribution pipelines in the New York City area. While the actual vulnerability of this infrastructure to such an attack remains debatable, the plot highlighted the possibility that aviation jet fuel storage facilities and distribution systems at major U.S. airports may be at risk.

Threats Involving Exploitation of Air Cargo

The strategy recognizes that the large scale, diversity, and complexity of the air cargo industry makes it potentially vulnerable to exploitation by terrorists. The strategy, however, concludes that post-9/11 actions to enhance air cargo security have been effective in reducing the threat of stowaways aboard air freighters that could carry out a 9/11-style suicide hijacking and the threat of explosives. Nonetheless, the strategy recognizes that the enhanced regulatory framework for air cargo security is not immune to exploitation, and the air cargo system, in general, has been exploited for years by criminal elements. In addition to possible threats to all-cargo aircraft noted above, the threat of terrorist infiltration of air cargo handling operations and facilities remains a threat that could lead to exploitation of the air cargo system as a means of conveyance for terrorist operatives, and conventional weapons, WMDs, explosives, weapon components, and other terrorist items. While not discussed specifically by the strategy, it should be noted that all sorts of criminal activities, possibly including cargo-related crimes in the aviation domain, could provide revenue sources to support terrorist organizations.

RECOMMENDATIONS AND CONCLUSIONS

The aviation industry is essential to the viability of the U.S. economy, which makes it a prime target for terrorists. The complexity and size of the industry also make it an attractive environment for crime. Understanding the tenuous financial structure of airlines, the aviation industry aids the security practitioner in applying appropriate and practical security measures. Aviation security practitioners must deploy systems, measures, and procedures to counteract both terrorist and criminal perpetrators. To meet these challenges, aviation security practitioners employ layered security systems that are symbiotic with the global aviation industry.

The U.S. Congress establishes policy for protecting U.S. aviation. Federal regulators convert these policies into regulations, which are therefore established as accepted industry practices. Federal regulators implement and supervise these policies and regulations across all aircraft operators and airports.

The 9/11 Commission was tasked to assess facts surrounding the September 11, 2001, terrorist attacks. The 9/11 Commission analyzed and recommended new strategies for adoption within the United States. Because of the 9/11 Commission's work, the largest overhaul of aviation security in U.S. history was implemented. However, to thwart or reduce the risk of crime or terrorist activity, the strategies recommended by the 9/11 Commission must remain ephemeral in evolution and application. The following chapters in this text will help aviation security. Readers of this text will be better prepared to understand, develop, and apply strategies, tactics, and methods that are appropriate and practical to the future needs of aviation security.

Aviation security practitioners or students of aviation security should have a solid understanding of the nature and contributing factors regarding the attacks of September 11, 2001. Therefore, it is strongly recommended that readers review the

preceding case study on 9/11. aviation mode-specific plans that serve as a general framework for implementing the national strategy for aviation security under normal operating conditions, in response to an eminent threat or ongoing terrorist attack involving the aviation domain, and during recovery and reconstitution of aviation system functions and services following a potential attack. Specifically, the Aviation Transportation System Security Plan most directly addresses the day-to-day security measures and programs to reduce the vulnerability of the air transportation system to terrorist actions or other criminal acts. This plan is augmented by the Air Domain Surveillance and Intelligence Integration Plan which coordinates intelligence gathering, analysis, and dissemination within the air domain. In addition, the International Aviation Threat Reduction Plan and the International Outreach Plan provide a framework for working with other nations to improve the global aviation security network with an emphasis on outreach to promote the implementation of effective security practices worldwide.

Upon recognition that a terrorist or criminal attack targeting or exploiting aviation assets was taking place,. This plan is augmented by the Domestic Outreach Plan which considers the involvement and coordination of state, local, and tribal government resources and private sector entities in responding to such an event, focusing most specifically on strategies for incident communications as well as the dissemination of threat information during routine operations. An Aviation Transportation System Recovery Plan is also being developed by the DHS to facilitate rapid recovery following a possible terrorist attack or similar disruption to the air transportation system. The goal of the recovery plan is to mitigate the operational and economic impacts of such events on the aviation system.

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