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An Econometric Analysis of the NW/KLM Corporate Alliance

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**AN ECONOMETRIC ANALYSIS OF THE NW/KLM
CORPORATE ALLIANCE**

by

Boon S. Koo

A Thesis Submitted to the
Office of Graduate Programs
in Partial Fulfillment of the Requirements for the Degree of
Master of Business Administration in Aviation

Embry-Riddle Aeronautical University
Daytona Beach, Florida
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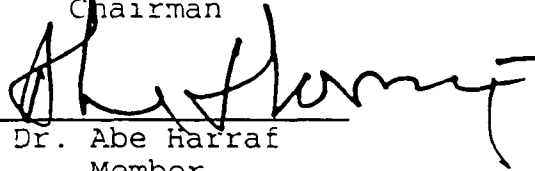
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This thesis was prepared under the direction of the candidate's thesis committee chairman, Dr. Boris Trnavskis, Department of Aviation Business Administration, and has been approved by the members of his thesis committee. It was submitted to the Office of Graduate Programs and was accepted in partial fulfillment of the requirements for the degree of Master of Business Administration in Aviation.

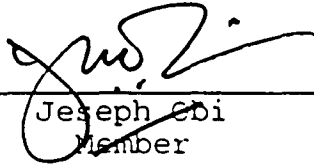
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ABSTRACT

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This thesis investigates whether a corporate alliance between international air carriers is beneficial, considering the changes in the global air transport system. Dividing the research method into three phases, the author first lists and identifies the recent changes in world air transport trends. Then, the author defines the different types of alliances and studies the advantages and disadvantages of these corporate alliances. Finally, a multiple regression analysis is performed using the KLM/Northwest Airlines alliance as a case analysis.

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CHAPTER I

INTRODUCTION

A. Problem Statement

The central issue of this thesis is to study whether corporate alliances between international air carriers are beneficial, considering the changes in the world air transport system. A qualitative and a quantitative study of corporate alliances is conducted in this thesis.

Specifically, the author's goal is to define the different types of corporate alliances and investigate the advantages and disadvantages of them. The KLM/Northwest Airlines alliance is used as the basis for a quantitative study.

B. Hypothesis

This thesis utilizes the inductive approach where a conclusion is drawn after an analysis of the facts. For example, after gathering information from selected sources and references, and analyzing the data, the author concluded that corporate alliances between international air carriers is beneficial. Therefore, an *a priori* hypothesis is not needed.

C. Introduction

Since U.S. domestic airline deregulation (Airline Deregulation Act of 1978), the previously conservative international air traffic system and structure has confronted and instituted changes. Moreover, U.S. deregulation has significantly altered the domestic market of the United States. Through the adaptation phase of deregulation, those airlines that successfully survived the environment of open competition have become more efficient and competitive.

While utilizing the aforementioned trend as a resource, the national interest of the U.S. is to increase its share of the international air transportation market. Furthermore, liberalization spread through some of the world air transport industry in the 1980s, bringing about revolutionary changes which wore away some of the traditional regulatory system aspects in certain countries.¹

Owing to the U.S. megacarriers', such as the American, United, and Delta Airlines, aggressive penetration into some foreign markets, the European nations, in concert with their planned 1992 economic integration, began to plan a consolidation process for an intra-European air transport market. The objective is to survive the strong challenge

¹Daniel, Kasper. Deregulation and Globalization. New York: Ballinger Publication. 1988.

from the U.S., protect their national carriers from international competitors, and elevate their bargaining power in bilateral agreements with other nations.²

Besides the national and regional changes, several technical modifications and innovations have occurred in the air transport industry. Privatization of companies previously owned and controlled by national governments has taken place for the purpose of promoting and stimulating efficiency and increasing productivity.³ Hub and spoke systems were inaugurated in the U.S. which increased the productivity of resources and efficiency in scheduling aircraft. This has led to congestion and saturation at some hub airports during popular departure times. Hence, access to these airports has become restricted due to limited gates and landing slots.⁴ Airlines that were able to obtain gates and slots prior to congestion and saturation of these busy airports dominated these hubs with increased frequencies and abundant destinations, while potential competitors were unable to compete due to a lack of gates and slots.

²Mark W. Lyon, "Pacific Rim Carriers Meet the Threat of Protectionism", Airline Executive, December 1989, 27.

³Kevin B. Boberg and Frederick M. Collison, International Trends in the Pacific Basin, Transportation Journal, Vol.28, No.3 (Spring 1989), 28.

⁴Paul Proctor, "System Capacity May Limit Pacific Rim Traffic Growth", Aviation Week & Space Technology, 12 February 1990, p. 41.

Also, the invention and improvement of the Computer Reservation System (CRS) took place enabling airlines with their own systems to become more productive and efficient compared to competitors. The CRSs are being used as a distribution tool for expansion into foreign markets. Besides, the concept of CRS is branching out beyond air travel and into general electronic information sales. These CRS create new revenue streams which contribute to the profits of each carrier.⁵

In developing strategies to compete effectively against some of the U.S. megacarriers, European and Asian airlines have been rapidly increasing their global reach through marketing alliances, code sharing, and joint-service routes with other U.S. carriers. This strategy enables them to gain access to new markets while minimizing financial risk. This trend is forecast to expand significantly in the future, since this corporate strategy allows the foreign carriers to circumvent the current restrictive bilateral air service agreements in place with the U.S.⁶ Therefore, it is fair to say that the issue of corporate alliances will remain one of the most complex and controversial topics in the global air transport industry.

⁵Paul S. Dempsey, "Turbulence in the Open Skies: The Deregulation of International Air Transport", The Transportation Law Journal, (1987), 46.

⁶Paul Proctor, Marketing Alliances, "Joint Services Help Asian Airlines Extend Reach", Aviation Week & Space Technology, 26 November 1990, pp. 74,75.

CHAPTER II

CORPORATE AIRLINE ALLIANCE

A. What is a Corporate Airline Alliance

An airline alliance is a partnership between two or more air carriers. The three forms of alliances are: simple alliance, strong alliance, and corporate merger. The three alliances are differentiated depending upon the amount of capital investment and the variation in the form of the functional agreements between airlines. A simple alliance consists of a generic marketing alliance, code-sharing, and joint-service routes between two or more airlines without any substantial amount of capital investment from each. A strong alliance includes all the functions served by a simple alliance with the addition of obtaining a stake in the other airline's equity. Lastly, a corporate merger involves one airline taking over the ownership control of another airline.

The three types of alliances present different advantages and disadvantages for airlines seeking to use an alliance as a corporate strategy to compete domestically and/or globally. Therefore, each airline must conduct a

careful analysis to determine its needs and circumstances before implementing a particular alliance.

Since a simple alliance does not require any capital investment on the part of the two airlines, it enables an airline to minimize its financial risk if confronted with an incompetent partner. Also, airlines can implement and/or terminate the agreement with great flexibility and, moreover, negotiate only for guaranteed agreement terms. For example, initiating a Special Prorate Agreement (SPA) between a foreign and a U.S. airline has been popular. It allows the foreign airline to transport an international passenger beyond its designated U.S. gateway or point of entry. In return, the U.S. carriers are able to transfer these international passengers into their domestic route system, thereby increasing their domestic traffic revenues. However, if the specific U.S. airline were to impose an unanticipated fare burden on the passenger of a foreign airline, the foreign airline could negotiate for more equitable terms with a different airline without suffering any penalties. A good example is the case between Thai International Airlines and American Airlines. Thai International Airlines ceased their SPA with American Airlines in 1992 and implemented an SPA with Delta Airlines when Delta offered them a preferable discount rate for their passengers. Thus, if one airline were to realize that its partner was not rendering service up to agreed standards, a

simple alliance can be unilaterally terminated. Therefore, a lack of commitment between two partners to sacrifice for their mutual benefit is probably the biggest disadvantage of a simple alliance.

Although a strong alliance is an extension of a simple alliance, it is different in terms of capital investment requirements. Specifically, the capital investment of one airline in the other exposes the investing airline to substantial financial risk if the partner was to declare bankruptcy. In exchange, the benefits that can be obtained through this particular agreement are far greater than from the simple alliance. The main benefit comes from the greater degree of mutual commitment and dedication between the two airlines. Also, it is more difficult to terminate the alliance, which creates a more permanent relationship. In addition, the airlines can integrate their operations more easily. Examples of this integration are implementing joint-service routes, sharing catering and fueling services, utilizing a single aircraft maintenance facility, honoring both frequent-flyer programs, and mutually investing, allocating, and utilizing their computer reservation systems. All this coordination and integration can help both airlines reduce their operating costs and improve their competitive positions.

A corporate merger, the third form of alliance, can present significant growth to the parent airline. From a

merger, the dominate airline will acquire the capital and the infrastructure (gates, slots, terminals, CRS) of the former competitor, realize economies of scale, and, to a degree, enjoy decreased competition. Nevertheless, not all elements of a corporate merger are beneficial. The possibility of depleting current assets and/or increasing liability through the merging process must not be overlooked. If an uncontrollable external catastrophe was to occur (fuel shortage crisis, war, conflicts with labor unions, general downturn in the economy), the ability to sustain the inflated size of the company could be far more difficult to engineer than if the company was more modestly sized. In Table 1, the major advantages and disadvantages of different airline alliance types are summarized.

Table 1. A Summary of the Major Advantages and Disadvantages of Different Airline Alliance Types

AIRLINE ALLIANCE TYPES	MAJOR ADVANTAGES	MAJOR DISADVANTAGES
SIMPLE ALLIANCE	<ul style="list-style-type: none"> * The ability to sustain and operate under their own unique corp. identity * The absence of financial burden * The ability to avoid financial losses caused by its partner * The simplicity of implementing procedures 	<ul style="list-style-type: none"> * The relatively simple terminating procedures * The lack of mutual commitment to support and sacrifice between alliance partners
STRONG ALLIANCE	<ul style="list-style-type: none"> * The presence of mutual commitment between alliance partners * The ability to monetarily profit from partner's stock valuation 	<ul style="list-style-type: none"> * The possibility of financial losses caused by partner's failure *The inability to unilaterally terminate the alliance
CORPORATE MERGER	<ul style="list-style-type: none"> * The ability to increase market share and decrease competition * The ability to attain a global critical mass 	<ul style="list-style-type: none"> * The danger of being inflexible to market fluctuations * The financial burden of investment * The confrontation with native governments on local anti-trust regulations

Source: Shin, H. Oh. "A Study of Air Transport Marketing Strategies" (Graduate Thesis, In-Ha University, 1991), pp. 80-84.

B. The Goal of Forming An Alliance

The primary goal for forming an alliance is to provide what the industry calls a "seamless product." The seamless product, within the context of air travel, requires the ability of an air carrier alliance to provide service to customers without their being aware that they are dealing with more than one company. Expressed in another way, it is similar to "one stop shopping." With one-stop shopping, the customer is able to purchase a ticket to any destination within the route system of the alliance as an "on-line" alliance customer. The customer will be served as if the entire flight was carried out by one carrier, even if one or more switches between carriers are made at intermediate stops. Hence, convenience in re-boarding procedures can be realized by every air traveller.

In addition, alliances can help to attain political and operational goals. Politically, in order to circumvent the current restrictive bilateral air service agreements in place between nations, an alliance allows a foreign air carrier to operate within a foreign country without waiting for renegotiation of the bilateral air service agreement. Operationally, efficiency can be achieved through sharing infrastructure (gates, slots, terminals), service departments (catering, fueling), and honoring mutual promotional benefits. Therefore, when all the elements of the goals are aggregated, implementation of an alliance

should provide the respective airlines a competitive edge over competing U.S. and/or international airlines.

C. Existing U.S. Alliances

Of all the U.S. domestic air carriers, the most active carriers in negotiating corporate alliances with foreign airlines are Delta and Northwest Airlines. These two carriers were ranked in 1992 as the third and fourth largest air carriers in the U.S. in terms of passenger revenue miles. The main reasons these air carriers vigorously pursue a corporate alliance are the added benefits of network coverage, frequency competitiveness, and the increased operational efficiency larger carriers enjoy domestically and globally (American and United).⁷ These two airlines, and with the recent addition of U.S. Air, realize that the absence of a corporate alliance would only allow them to be niche carriers competing in specific markets. In addition, a foreign monetary injection to some airlines with a weak financial status could allow them to maintain their competitive position in their respective markets. Hence, a corporate alliance has become an important strategic tool to fulfill an objective of sustaining competitiveness.

⁷Michael Harrington and Torbjorn Kihlstedt, "Wedding Night Jitters," Airline Business, December 1991, p. 13.

The NW/KLM Alliance. Northwest Airlines is currently ranked the fourth largest carrier in the U.S. domestic air transportation industry in terms of revenue passenger miles. However, industry experts indicate that it is too highly leveraged and must somehow expand both in the U.S. and overseas if it is to have any chance of being competitive in the global air transport industry. In this respect, Northwest Airlines, under CEO Al Checchi, initiated a corporate alliance agreement with Dutch carrier KLM in 1989. KLM invested \$3.68 billion U.S. dollars in Northwest Airlines. In return, KLM holds 20% of Northwest's parent company's (Wings Holding) common stock, which also represents 20.5% of the voting stock.⁸

This alliance between Northwest and KLM enabled both parties to mutually expand market links by using the "seamless product" concept. A vast on-line and single code network ensured that a passenger is funnelled into the Northwest/KLM system. Also, being able to provide a more convenient re-boarding procedure enhances their service quality and benefits their overall advertising campaign. Moreover, plans to integrate their sales operations will allow both Northwest and KLM to market each other's passenger and cargo operations, coordinate schedules, plan joint strategic objectives, pool revenue, market third party

⁸Jean Cole, "Northwest's Global Reach," Minnesota Pioneer Press, 19 August 1992, p. E4.

services, and share personnel. This alliance has great potential to increase the productivity and efficiency of both carriers.

Other than the alliance with KLM, Northwest has also aggressively sought to implement multiple alliances. Table 2 provides the percentage figures of KLM and Northwest Airlines' equity stake in other airlines. In 1991, Northwest made a bid for 80% of Philippine Airlines, for more than \$370 million U.S. dollars. The rationale and purpose of this alliance was to capitalize on Philippine Airlines' extensive route network in Southeast Asia and to establish a major maintenance facility in the Philippines.⁹ This alliance could provide Northwest with a significant decrease in maintenance costs due to lower labor costs in the Philippines, while Northwest would also have the opportunity to enjoy a stake in the high traffic growth rates in the Pacific air transport market. However, the domestic U.S. airline unions oppose foreign repair stations, and this has been the biggest hurdle in implementing the alliance.

Northwest's vision of a global network also includes a 49% stake in Qantas Airways, an Australian carrier. Northwest envisioned its current partner, KLM, and future potential partners, Philippine Airlines and Qantas Airways,

⁹Jean Cole, "Northwest's Global Reach," Minnesota Pioneer Press, 19 August 1991, p. E4.

as forming a global network of airlines that could surpass the efficiency and productivity of all competitors in the respective regions.

Although the intentions of Northwest are considered to be sound, the issue of capacity has to be confronted and solved by Northwest Airlines. Compared to some other U.S. megacarriers (United, American, and Delta), Northwest is currently limited in gates and slots. Therefore, without plans for expansion, Northwest would not be able to offer its partner and future partners adequate access to U.S. markets. Northwest made plans to acquire Midway Airlines and become a prime contender in the bidding process for Continental. Unfortunately, the U.S. airline industry has experienced a severe downturn in the 1990s. Once dominant megacarriers, such as American and United Airlines, have recorded staggering financial losses, and Northwest is not an exception. Hence, the required financial muscle for Northwest to make the needed expansion has to come from external sources at this time.

KLM is currently seeking an alliance with British Airways. If the proposed alliance takes place, Northwest would indirectly benefit by being able to receive the needed capital for expansion, plus an extended network of international routes. If all the anticipated alliances and the desired growth of Northwest are successful, Northwest will certainly be in a position as one of the leaders in the

U.S. and the global air transport industry.

Table 2. KLM and Northwest Airlines' Equity Stakes

CARRIER	PARTNER	CARRIER'S EQUITY in PARTNER (%)
KLM	Air UK	14.9
	MARTINAIR	29.8
	KLM CITYHOPPER	100
	NORTHWEST	20
	TRANSAVIA	40
NORTHWEST	HAWAIIAN	25
	PHILIPPINE *	80
	QANTAS *	49

* Potential alliance partners

Source: M. Harrington and T. Kihlstedt, "Wedding Night Jitters," Airline Business, December 1991, p. 17.

Delta's Alliances. In order to maintain their position as the third largest air carrier in the U.S. domestic air transport industry (in terms of revenue passenger miles in 1992) and to maintain their competitiveness in the global air transport industry, Delta Airlines set up a three-airline alliance network with Swissair and Singapore Airlines in 1989. This particular alliance is a strong alliance involving equity swaps among the three carriers. Delta obtained a five percent equity stake in Swissair and a three percent equity stake in Singapore Airlines. Singapore

Airlines secured five percent of Delta and three percent of Swissair, while Swissair acquired five percent of Delta and one percent of Singapore Airlines' stocks. Table 3 shows Delta Airlines' alliance activity.

Although the initial process of building global linkups between international carriers was forecast to be complex and time consuming (due to the difficulty of integrating different computer systems, flight schedules, and corporate cultures), the three airlines aggressively developed the alliance. The benefits of integrating three carriers that serve three different yet important markets (U.S., Europe, and Pacific) were projected by all respective carriers to provide concrete dividends and efficiency. An advantage of this alliance was that it provided an opportunity for these three carriers to offer a seamless product to international air travellers having beyond point-of-entry destinations.

Delta Airlines extended Swissair and Singapore Airlines rights to a priority display on its international reservation system to generate more traffic. Hence, the ability to offer better service in terms of increased frequencies, more worldwide destinations, and enhanced convenience and comfort for international travellers (from simplifying the re-boarding procedures) has put the three airlines in a more competitive position in the global air transport industry. Moreover, the capability to create more traffic demand from the industry by using favorable

reservation displays has added to the benefits of the three airlines. Additionally, joint use of aircraft and personnel between Swissair and Singapore Airlines, joint flights, revenue pooling, sharing maintenance facilities, and enhanced communication links between the three carriers were cost saving gains of this particular alliance.

If the implemented alliance was to mature and develop a stronger tie, the three carriers would be able to attain critical mass, increase international network coverage, reduce operating costs, and become more efficient globally, which will eventually impose significant threats to the U.S. megacarriers and some other international carriers.

Table 3. Delta Airlines' Equity Stake

CARRIER	PARTNER	EQUITY (%)
DELTA	SINGAPORE	2.8
	SWISSAIR	5

Source: M. Harrington and T. Kihlstedt, "Wedding Night Jitters," Airline Business, December 1991, p. 17.

USAir Alliance. Although USAir is ranked as the fourth largest air carrier in the U.S. domestic air transport market (in terms of revenue passenger miles) in 1992, USAir is currently operating without a significant stake in the international aviation market. Therefore, USAir's success is heavily dependant upon two elements: traffic volume

growth in the U.S. domestic air transport market and the competition in its domestic markets. Unfortunately, in the 1990s, the U.S. domestic air transport market has been growing slowly and has also been extremely competitive. Consequently, USAir has lost more than one billion U.S. dollars before taxes in the last two years.¹⁰ In addition, severe price competition has reduced yields and the profitability of the U.S. air transport industry overall, leaving USAir with a total debt of more than two billion U.S. dollars. The only carrier that has remained profitable is Southwest Airlines, which is considered a niche carrier in the U.S. domestic air transport market.¹¹

Unlike Southwest, USAir competes directly against major U.S. carriers and airlines operating under Chapter XI bankruptcy protection. Hence, USAir is at a disadvantage competing against carriers that can off-set their domestic losses with international revenues and carriers who can offer fares that are below marginal costs (TWA, Continental, and America West).¹²

In devising a survival strategy, USAir chose to seek corporate alliances with foreign airlines. The alliance

¹⁰Mead Jennings and Richard Whitaker, "Airlines Oppose BA's US Deal," Airline Business, September 1992, p. 30.

¹¹Mead Jennings and Richard Whitaker, "Airlines Oppose BA's US Deal," Airline Business, September 1992, p. 30.

¹²David Cammeron, "Every Questions Answered," Airline Business, April 1992, p. 51.

benefits expected by USAir are a much needed injection of capital and the generation of traffic feed from its partner's international hub to USAir's domestic hub. In return, USAir's position of being the largest carrier (by departures) at Boston, New York/La Guardia, Philadelphia, Washington National, Charlotte, Pittsburgh, Indianapolis, and Tampa provided prominent leverage to international carriers seeking feed in the north-eastern U.S. markets.¹³ In addition, considering the absence of international service rights by USAir, an alliance partner's worry about servicing redundant international routes would not exist, which makes an alliance more appealing to any international carrier.

In 1992, USAir initiated a simple alliance with Air Canada to promote joint fares, implement marketing coordination, enforce code sharing, and integrate frequent flyer programs. The agreement also contained a pledge to change the simple alliance into a strong alliance in the future, which will enable both airlines to offer joint purchasing rights for equipment, share maintenance, gates, slots and technical facilities, and an equity swap. The benefit gained by both carriers was mutually increased traffic feed from one's hub to the other's.

Apart from the simple alliance with Air Canada, USAir

¹³Mead Jennings and Richard Whitaker, "Airlines Oppose BA's US Deal," Airline Business, September 1992, p. 30.

is on the verge of inaugurating a strong alliance with British Airlines. British Airlines has offered USAir an investment of \$750 million. In return, BA will obtain 44% of USAir's capital share and 21% voting rights.¹⁴ If the proposed alliance takes place, the potential benefit for both airlines will be the ability to offer a seamless product. Secondly, cost savings can be realized by both carriers through joint purchasing, catering, and sharing of structural facilities and personnel. Since the combined annual operating costs for both airlines exceeds \$14 billion, a potential 1% reduction in cost can mount up to \$140 million; in the long run, there is the possibility of a gradual increase, percentage wise.¹⁵

USAir's plan for implementing an alliance with BA is currently experiencing severe challenges from its competitors. United, American, and Delta Airlines are strongly opposed to the alliance. They contend that putting BA and USAir together would create the world's largest airline by passenger numbers, with 80 million passengers carried in 1991. Also, the issue of cabotage is an element raised by USAir's competitors. The competition claims that the USAir/BA alliance will indirectly allow BA to get around the current restrictive U.S. cabotage rights. Therefore,

¹⁴Mead Jennings and Richard Whitaker, "Airlines Oppose BA's US Deal," Airline Business, September 1992, p. 30.

¹⁵Mead Jennings and Richard Whitaker, "Airlines Oppose BA's US Deal," Airline Business, September 1992, p. 31.

without an equitable exchange of rights such as allowing U.S. carriers to operate within Europe, these competing carriers argue that the alliance between USAir and BA must be stopped by the U.S. government. USAir and its 45,000 employees have a different perspective. They insist that the proposed alliance should be granted by the U.S. Department of Transportation based on two reasons. First, if the proposed alliance is denied, the ability of USAir to survive in the current competitive U.S. domestic air transport market is questionable. Second, the job security of its 45,000 employees will be in jeopardy.¹⁶

D. Challenges of Alliances

The benefits of implementing an alliance between some U.S. airlines and other international carriers would be positive for the respective airlines for a variety of reasons. These include reduced costs, increased efficiency, better utilization of resources, and enhanced service quality for international passengers. However, there are external and internal challenges associated with an alliance.

Externally, the respective governments have the power to veto any alliance agreement in order to protect the interests of their national or flag carrier. Since an

¹⁶Mead Jennings, "BA Stakes Out USAir," Airline Business, August 1992, p. 10.

alliance agreement between a U.S. and a foreign air carrier enables the foreign carrier to legally transport U.S. passengers domestically and internationally, the U.S. government imposes restrictions to limit the alliance agreements. For example, Korean Airlines negotiated a Code Sharing Agreement with TWA in 1990 to transport U.S. passengers from Honolulu to Los Angeles. Without a Code Sharing Agreement, offering services on this particular route is illegal for Korean Airlines. A popular tactic used by the U.S. government to restrict the alliance formation process is to invoke anti-trust laws. The coordination of prices between airline partners in an alliance is a direct violation of U.S. anti-trust laws. In addition, limiting foreign ownership of U.S. airlines is another method of restricting alliances. Presently, 49% foreign ownership of a U.S. carrier is allowed with no more than 25% voting rights and no more than one third foreign representation on the U.S. firm's board of directors.¹⁷ Other foreign governments impose even stricter foreign ownership limitations, except for Australia. The Australian government has foreign ownership limitation laws identical to those of the U.S. On the other hand, the Japanese government does not allow a foreign corporation to invest in a Japanese firm, while the British government imposes a

¹⁷Mead Jennings, "BA Stakes Out USAir," Airline Business, August 1992, p. 10.

significantly more restrictive foreign investment law (25% foreign ownership and no more than 10% voting rights).¹⁸ The intentions of all these restrictions by local governments is to simultaneously protect the local industry from foreign penetration and to provide leverage for their local air carriers to obtain favorable terms from other governments with more liberal policies and more global distribution possibilities.

Apart from governmental challenges, another external difficulty of implementing an alliance is the objection from competitors and labor unions. The recent alliance discussions between BA and USAir are an excellent example. Bob Crandall, the CEO of American Airlines, has stated that he had serious intentions of putting American Airlines up for sale if the proposed alliance were to go through. The rationale behind his statement is twofold. First, he fears that permitting the deal will provide his competitors considerable market benefits, assuming the proposed alliance can be made to function effectively. Second, it is a way to register a complaint regarding his inability to undertake similar investments in European carriers, although the rules have yet to be tested by a real bid. Moreover, the inability of American Airlines to obtain increased traffic rights beyond the UK has been a significant factor in its

¹⁸"BA-USAir Forces Another Bermuda," Airline Business, November 1992, p.7.

complaints. Crandall insists that the U.S. DOT (Department of Transportation) must secure equal opportunities for U.S. carriers, through amending the existing bilateral air agreement between the U.K. and the U.S., before the proposed alliance is approved. Crandall would like new U.S. gateways to London; allowing U.S. carriers as many routes out of Heathrow as U.K. carriers have; unlimited access to secondary U.K. cities; more liberal capacity and fares control; more beyond rights; reciprocal opportunities to buy into U.K. carriers; and better access to slots at Heathrow.¹⁹ In this sense, Crandall's view has validity if market access is the critical issue; therefore, his position becomes one of the hurdles of an alliance. However, Crandall's fear of his competition becoming more productive through an alliance is considered as merely an insecurity factor fueling his strong opposing view of an alliance.

The airline labor unions are also strongly opposed to these types of alliances. They claim that their jobs would be lost if they had to compete against some foreign labor rates that are considerably lower than theirs. Any form of an alliance that enables airlines to share personnel and structural facilities, such as maintenance, catering, and ticketing facilities, could indeed affect job security and the viability of U.S. airline labor unions. Consequently,

¹⁹Mead Jennings and Richard Whitaker, "Airlines Oppose BA's US Deal," Airline Business, September 1992, p. 30.

the airline labor unions are actively lobbying governmental regulatory groups to block any proposed alliances between U.S. and foreign airlines.

Another alliance challenge is the probable internal conflict between the alliance partners. The dispute over national pride, ownership, conservatism, and the belief in the "our way of doing things is best" concept has a major effect on the viability of an alliance. Although most airline managers would find merit in an alliance which would leave them in a leading role in the global air transport industry, in international markets, equal partnerships are noted to be difficult to forge and even harder to sustain. Therefore, resistance to transborder acquisitions will be particularly high when the forces of nationalism are brought to bear.

CHAPTER III

RESEARCH METHOD and ANALYSIS

A. Rationale for Using a Regression Model

Although this thesis has qualitatively discussed the advantages and disadvantages of implementing an alliance, the student wanted to test and evaluate alliances using a quantitative analytical technique. A regression analysis was used to study whether implementing an alliance has any measurable quantitative gains and/or losses for the respective airlines.

In the regression model, the student hypothesized that the aggregate traffic revenue of KLM would increase, depending on the increased number of U.S. domestic destinations gained from a corporate alliance with Northwest Airlines. Therefore, the prediction of increased traffic revenue can be quantified once the number of increased destinations has been established. In this regression model, KLM's traffic revenue is designated as the dependant variable and the number of destinations as an independent variable. Thus, the numerical benefit and/or cost of an alliance in terms of traffic revenue can be tested and

measured.

A regression analysis enables the student to quantify the increase or decrease in KLM's traffic revenue by taking the increased number of destinations into account. However, predictions of the dependant variable (KLM'S traffic revenue) based on a model containing only a single independent variable (number of destinations) may be too simplistic. For example, the gross domestic product (GDP) of the Netherlands, the currency exchange rate between the U.S. and the Netherlands, the available seat miles (ASM) of KLM, and the fare levels of KLM could pose a significant influence over the changes in KLM's traffic revenue. Hence, a multiple regression analysis which considers more independent variables should provide a more precise quantitative prediction of the dependant variable, KLM's traffic revenue.

In summary, assuming that alliances are beneficial overall, the student would expect the multiple regression model to show that KLM's traffic revenues increased after the alliance.

B. Regression Model

Model Variables and Data Sources. The KLM/Northwest Airlines alliance was selected as a case analysis for this thesis. The main reason is that KLM and Northwest Airlines

were the first major airlines to develop a strong alliance in 1989. Prior to the alliance between KLM and Northwest Airlines, there were simple alliances between various international carriers. However, the goal of this project was to use a strong alliance as a study case and to perform a regression analysis of this alliance in order to quantify the benefits of such a permanent alliance. Therefore, a simple alliance which entails agreements such as joint marketing, code-sharing, and joint pooling was not selected since it is not as long lasting or substantial. Simple alliances can be easily terminated unilaterally depending on the needs of a particular airline.

For the multiple regression analysis, KLM's aggregate semi-annual traffic revenue was chosen as the dependant variable. The U.S. GDP growth rate, the currency exchange rate between Netherlands Guilders and U.S. cents, KLM's average one-way economy fare from Amsterdam to St. Paul/Minneapolis, and the number of KLM's U.S. gates from 1986 to 1991 were selected to be the independent variables. That is, the student wanted to investigate whether KLM's traffic revenue would respond to changes in the U.S. GDP growth rate, U.S. domestic destinations, KLM's fare levels, and the currency exchange rate between Netherlands guilders and U.S. cents. The sample years from 1986 to 1991 were specifically selected to allow a "before and after" alliance comparison. To be more precise, the student wanted to study whether

KLM's traffic revenue increased after its alliance with Northwest Airlines in 1989.

KLM's aggregate traffic revenue, currency conversion rates between Netherlands and the U.S., and the number of KLM's U.S. gates were obtained primarily from the annual financial reports of KLM and Northwest Airlines. The U.S. GDP growth rate data are published by the U.S. Bureau of Economic Analysis. Data on KLM's average economy fare from Amsterdam, Netherlands to St. Paul/Minneapolis were acquired from Assistant Manager Jackie Thon, who currently works for the International Tariff Department at the U.S. Department of Transportation, located in Washington D.C.

In Table 4, the number of KLM's U.S. gates remained the same from 1986 through 1988. With the addition of Baltimore, Orlando, and Halifax, it increased to thirteen in 1989. However, after the alliance with Northwest Airlines, it dramatically increased to 211. Most of these 211 U.S. gates are served by Northwest Airlines.

The U.S. GDP growth rate increased steadily from 1986 through 1988. The highest growth percentage rate reached 7.9% in 1988. But from 1989 it decreased, falling to its lowest growth rate of 2.9% in 1991. The downturn of the U.S. economy and the decrease in consumer demand confidence are the major contributing factors to this decrease.

The currency exchange rate from 1986 through 1991 fluctuated constantly around a general growth trend.

Therefore, a regular or predictable growth pattern or cycle cannot be observed. The inability to control the value of U.S. currency in international markets and the inability to predict global political changes are reasons for the inconsistent fluctuations in the currency exchange rate between the U.S. and the Netherlands.

The one-way economy fare charged by KLM from 1986 through 1991 increased on a semi-annual basis. The two biggest increases were in 1990 (11%) and in 1991 (13%). However, the KLM fare shown in Table 4 is only one out of more than 150 fares offered by KLM from the Netherlands to the U.S. The results of the regression model will be affected by the necessity of selecting one fare to represent the "price" of the air service.

KLM's traffic revenue increased in 1987, 1989, 1990 and decreased in 1988 and 1991 with respect to the previous years. The biggest increase was in 1989 and 1990 (14% and 22%). The major influence of this increase seems to be the changes in the number of KLM's U.S. gates. In 1989, there was an increase of three gates and in 1990, there was an increase of almost 200. Although the number of gates remained the same in 1991, KLM's traffic revenue decreased by 12% compared to the figures in 1990. A significant decrease in the U.S. GDP growth rate can be considered the prime factor for this decrease.

Table 4. Summary of the Data Used for the Regression Analysis

YEAR	TRAFFIC REVENUE (Mil.\$)	NUMBER OF GATES	U.S. GDP GROWTH (%)	CURRENCY RATE (cents / guilder)	KLM's FARE (US \$)
JUNE 86	833	10	5.7%	40.4	\$ 815
DEC. 86	834	10	5.7%	45.6	\$ 850
JUNE 87	934	10	6.4%	48.6	\$ 850
DEC. 87	935	10	6.4%	56.3	\$ 875
JUNE 88	878	10	7.9%	48.7	\$ 900
DEC. 88	878	10	7.9%	50.0	\$ 900
JUNE 89	1003	13	7.0%	45.4	\$ 915
DEC. 89	1003	13	7.0%	52.2	\$ 950
JUNE 90	1226	211	5.1%	53.2	\$ 995
DEC. 90	1227	211	5.1%	59.2	\$1055
JUNE 91	1084	211	2.9%	51.7	\$1129
DEC. 91	1084	211	2.9%	51.7	\$1197

Source (Traffic Revenue): KLM's Annual Financial reports.
(Gates) : NW/KLM's Annual Financial reports.
(GDP) : U.S. Bureau of Economic Analysis.
(Currency Rate) : KLM's annual Financial Report.
(KLM's Fare) : J. Thon, U.S. Department of
Transportation

Regression Model Calibration. To investigate whether KLM's traffic revenue will increase after an alliance with Northwest Airlines, a correlation analysis was included in the regression analysis. KLM's aggregate traffic revenue was set as the dependant variable with the number of U.S. gates set as an independent variable.

However, realizing that a single independent variable may not render reliable regression results, other independent variables were added to obtain a better fit or explanation of the dependant variable (KLM's traffic revenue). Consequently, the student chose the U.S. GDP growth rate, KLM's average economy fare from Amsterdam, Netherlands, to St. Paul/Minneapolis, and the currency exchange rate between U.S. cents and Netherlands Guilders as the other independent variables.

The reason for selecting these variables was to offset the overstatement of KLM's traffic revenue. To be more precise, the student hypothesized that a healthy U.S. economy could create the big possibility of inducing more leisure traffic demand through increased disposable income by every citizen. Furthermore, higher fare levels for every KLM passenger could increase the operational yield, increasing the actual amount of traffic revenue. Lastly, a favorable foreign exchange rate between the Netherlands and the U.S. could also increase the actual traffic revenue. Hence, the student concluded that the aforementioned

variables must be included in the regression analysis in order to eliminate the possibility of overstating KLM's traffic revenue, and to obtain a more accurate correlation relationship between the traffic revenue and the number of increased gates.

By performing a regression analysis with these variables, the goal was to obtain a correlation coefficient that shows a statistically significant relationship between the dependant and the independent variables. For example, if the coefficient between traffic revenue and gates resulted in a -1.00 , this would mean that traffic revenue is inversely related to the number of gates; therefore, traffic revenue would decrease when the number of gates increases. On the other hand, a coefficient of $+1.00$ suggests that traffic revenue will increase with an increased number of gates. T-Statistics were used to investigate whether the regression coefficients were statistically significant based on the sample size or simply due to chance.

The student used two investigative instruments to calibrate the regression model. One was the Lotus 1-2-3 Release 2.2 and the other was the Stat + software program. Both programs were used for running the regression analysis and obtaining outputs.

C. Analysis of the Regression Model and Findings

The study of a multiple regression analysis contains various objectives. It can be used to forecast traffic revenues and/or can be utilized to test a quantitative relationship between variables. In this thesis, the multiple regression analysis is used to investigate the quantitative relationship between the dependant and the independent variables. However, it is crucial to note that this investigation does not prove the cause and effect between the variables. The specific regression elements the student wishes to uncover are the correlation coefficient of the dependant and the independent variables, the constant for the regression equation, the coefficients of every independent variables, and the T-Statistic ratios for every independent variable. Before analyzing the results of the multiple regression, the student will list and define the outputs of the multiple regression analysis.

The regression equation obtained through the multiple regression analysis is as follows :

$$Y_i = 521.77 + 5.29X_1 + 1.61X_2 + 30.96X_3 - 0.10X_4 + E$$

Y_i = The dependant variable (KLM's traffic revenue)

X_1 = Number of KLM's U.S. gates

X_2 = Currency exchange rate

X_3 = U.S. GDP growth rate

X_4 = KLM's average economy fare

The calibrated equation can be used to predict the changes in KLM's traffic revenue by inserting values for the independent variables. However, the logic of this model must be defined first. In this particular model, the student hypothesized that KLM's traffic revenue will fluctuate depending upon a corporate alliance with Northwest Airlines. Therefore, if one can measure or represent a corporate alliance using the four independent variables (X1,X2,X3,X4), then the model suggests that KLM's traffic revenue would increase upon the increase of all the independent variables, except for KLM's average economy fare.

There may be an inverse relationship between fare level and traffic revenue. Rigas Doganis theorizes that "the relationship between price changes and the demand for air travel can be measured by the price elasticity of demand."²⁰ Using this price elasticity of demand theory, KLM's total traffic revenue will decrease as the fares charged by KLM increase when the overall demand is elastic. The regression equation supports this finding as traffic revenue (Yi) is inversely related to fares (X4). Therefore, if the overall demand is elastic, the findings of the regression equation are correct. However, if the overall demand is inelastic, the results of the regression equation

²⁰Rigas Doganis, "Airline Marketing - The Role of Passenger Demand," Flying Off Course, (New York: Routledge, Chapman, and Hall, 1992), p. 221.

can be distorted. A more thorough analysis of the regression results must be performed to draw any conclusions of the regression model.

In Table 5, the constant value of 521.77 indicates the value of the dependant variable's Y-intercept. To be more specific, the dependant variable equals the constant when all independent variables equal zero.

Table 5. Regression Analysis Output

CONSTANT	521.77
Std. Err. of Y Est.	63.60
R SQUARED	0.87
No. of OBSERVATIONS	12
DEGREES of FREEDOM	7

The Standard Error of Estimate (+/- 63.6 million dollars) provides the changes in the regression formula's estimate of KLM's traffic revenue. The lower the standard error of estimate, the better the regression equation is at predicting the actual value of the dependant variable.

The R Squared for the multiple regression is 0.87 or 87%. Generally, R Squared values in excess of 0.90 or 90% are preferred. The R Squared value of 87% suggests a strong relationship between the variations of the dependant and the

chosen independent variables. To be more precise, 87% of KLM's variations in traffic revenue can be explained by the variations of the independent variables, which are the growth of U.S. GDP, KLM's average economy fare, number of KLM's U.S. gates, and the currency exchange rate between the U.S. and the Netherlands. The remaining 13% affecting the outcome of the variations in KLM's traffic revenue may come from other external and/or internal influences, such as KLM's in-flight service quality levels and/or degree of commitment to advertising expenditures.

Another statistic used to evaluate the overall significance of a regression equation is the F Statistic. For a small sample size, it is a more useful measure than the R Squared. For the regression equation, the value of the F Statistic is 11.22. Considering the degrees of freedom (7), the number of observations (12), and the confidence level (95%), the F Statistic value must exceed 3.09 to imply that the equation as a whole is significant. Therefore, a F Statistic value of 11.26 indicates that the calculated regression equation as a whole is significant for this particular regression model.

Table 6 gives the residual values of the dependant variable (KLM's traffic revenue). The residual is the difference between the actual reported KLM traffic revenue and the values calculated or estimated by the regression equation. Ideally, residual values should satisfy the

Table 6. Residual Values for the Dependant Variable

YEAR	RESIDUAL VALUE
JUNE 1986	-9.40
DECEMBER 1986	-33.26
JUNE 1987	30.22
DECEMBER 1987	-7.90
JUNE 1988	-68.03
DECEMBER 1988	-74.91
JUNE 1989	99.02
DECEMBER 1989	66.72
JUNE 1990	30.11
DECEMBER 1990	4.64
JUNE 1991	-22.20
DECEMBER 1991	-15.10

homoscedasticity assumption which says that the variance of the actual and calculated values are constant over the entire range of the dependant variable. The residual values appear to be heteroscedastic. The analysis of residuals is given in Appendix A. Heteroscedasticity occurs when the variances of the residuals either increases or decreases over the range of the dependent variables. The results suggest the regression equation is not as robust or reliable as possible. The small number of observations may have contributed to this result.

An autocorrelation analysis can be used to determine if the R Squared of the regression equation is artificially inflated or if the residuals are correlated with each other.

If the residuals are autocorrelated, the strength of the relationship between the dependant and the independent variables may be exaggerated. The Durbin-Watson statistic is used to test for autocorrelation of residuals. In this regression model, the value of the Durbin-Watson statistic is 1.55. A Durbin-Watson value of 1.5 suggests there is no autocorrelation present in the regression model. Therefore, the student's regression model is not autocorrelated. However, a more detailed analysis with more observations is recommended since the Durbin-Watson statistic value (1.55) is borderline.

Table 7 provides the T-Statistic values for all of the selected independent variables. The procedure for interpreting these values involves a hypothesis testing procedure. The initial stage is to utilize and examine a table that displays how large a coefficient needs to be in order to be significant at a given probability level. A confidence level of 95%, or an alpha level of +/- 5%, implying the probability of a Type I error is +/- 5%, was used to analyze the regression coefficients. Hence, the numerical T-Statistic value for every independent variable of this regression must exceed +/- 1.89 (two tailed test) to reject the null hypothesis that the regression coefficient is equal to zero. Table 7 reveals that the only independent variable that provides a T-Statistic value that is statistically significant is the number of KLM's U.S gates,

Table 7. Regression Coefficient and T Statistics

X VARBLs.	X1	X2	X3	X4
OUTPUT	GATES	CURRENCY	GDP	FARE
X Coef.	5.29	1.61	30.96	-0.10
Std. Err. of Coef.	5.24	0.51	23.55	0.35
T Stat.	3.17	1.32	1.01	-0.30

with a T-Statistic value of 3.17. The variations in the U.S. economic growth rate, KLM's fare structure, and the currency exchange rate between the U.S. and the Netherlands are not statistically significant with respect to the variations of KLM's traffic revenue.

Based on the regression analysis findings, the variations in the number of KLM's U.S. gates seems to have an influence on the variations of KLM's traffic revenue. However, variations of the other independent variables have an inconclusive impact on the variations of KLM's traffic revenue. There could be numerous reasons for this.

First, the numerical fluctuations of the independent variables, besides the number of KLM's U.S. gates, could have been too severe considering the relatively short time span of the observations. This point can be seen in Table 4. The values of the GDP and the currency rates do not have

consistent trends; therefore, a regular or predictable growth pattern or cycle cannot be observed. Hence, the small number of observations probably reduced the statistical significance of the two variables. If the study were to observe at least two or more economic cycles and divide it into quarterly observations (32 observations), higher T-Statistic values would be expected for the remaining independent variables, including KLM's U.S. number of gates.

To supplement the study of the correlation relationship between the dependant and the independent variables, the results of the correlation matrix have been calculated and are shown in Table 8. The purpose of this correlation matrix is to study multicollinearity, or the correlation relationship between the dependant and the independent variables, and also the relationship between the independent variables.

When referring to Table 8, the correlation between the dependant and the independent variables shows a strong positive relationship except for GDP. GDP has a negative relationship with the dependant variable (-0.54). Generally, correlation coefficients of at least +/- 0.60 are considered strong enough to be included in the model. This finding supports the theory that the variations of KLM's traffic revenue can be explained by the variations of the independent variables. However, the negative relationship

between KLM's traffic revenue and GDP is hard to explain. When looking at the regression equation, the only

Table 8. Correlation Matrix

VRBLS	REV.	GATES	GDP	CRNCY.	FARE
REV.	1.00	0.87	-0.54	0.69	0.73
GATES	0.87	1.00	-0.82	0.54	0.88
GDP	-0.54	-0.82	1.00	-0.22	-0.77
CRNCY.	0.69	0.54	-0.22	1.00	0.52
FARE	0.73	0.88	-0.77	0.52	1.00

independent variable having an inverse relationship is KLM's fare level, not the GDP.

The second use of the correlation matrix is to test for multicollinearity or if there are any strong correlations among the independent variables. If a multicollinearity relationship exists between the independent variables, the overall regression results can be ambiguous.²¹ Generally, correlations that are 80% or higher are considered unacceptable.²² Referring to Table 8, gates and GDP (-0.82), gates and fare (+0.88), and GDP and fares (-0.77) are strongly correlated to each other. Therefore, the student

²¹Bertram Price and Samprit Chatterjee, "Analysis of Collinear Data," Regression Analysis by Example (New York: John Wiley & Sons, 1991), p. 173.

²²Donald R. Cooper and William C. Emory, "Multivariate Analysis: An Overview," Business Research Methods (Boston, MA.: Richard D. Irwin, 1991), p. 634.

must exercise extreme caution about drawing any substantive conclusions based on a regression analysis in the presence of multicollinearity. A strategy to overcome this result is to delete KLM's fare from the regression model or substitute a new variable. However, it is important to know that multicollinearity is not a modeling error. It is a condition of deficient data. In the sub section titled "Model Variables and Data Sources", the limitations of selecting KLM's fare level was introduced. Based on the given circumstance, it is not practical or possible to improve or change the data. Therefore, the student feels that focusing on conscious interpretation of the given data and the regression results is the most effective method of analysis.

This multiple regression analysis suggests that a substantial proportion of the variations in KLM's traffic revenue can be explained by the variations of KLM's number of U.S. gates. Furthermore, this underlying fact is statistically significant, as proven by the acceptable T-Statistic value. Therefore, one can conclude that KLM's traffic revenue will increase as it increases its access to U.S. gates. Hence, implementing a corporate alliance with the Northwest Airlines seems to have benefitted KLM in terms of traffic revenue.

D. Critical Evaluation of the Analysis and the Study's Limitations

The student investigated the benefits of a strong corporate alliance between KLM and Northwest Airlines using a multiple regression analysis. The reported results generally support the logical expectation or widely accepted view that alliances are beneficial. However, the results are not as strong or robust as the writer would prefer.

First, a corporate alliance is one of the most modern, if not the newest, trend in the global air transport industry. Therefore, it is difficult to obtain a long time series of data involving corporate alliances between international airlines. The only quantitative study of the numerical benefit(s) of an alliance(s) available was reported by Richard Whitaker and Mead Jennings in an Airline Business article that dealt with the proposed alliance between the British Airways and USAir. They estimated that cost savings of more than one percent can be achieved through a corporate alliance between British Airways and USAir ranging from "purchasing to yield management and from catering to engineering which could result to the sum of more than \$14 billion U.S. dollars for both carriers".²³ However, there are internal studies done by the airlines to investigate the quantitative benefits of an alliance, but

²³Mead Jennings and Richard Whitaker, "Airlines oppose BA's and US deal," Airline Business, September 1992, p.31.

public access to those findings is restricted. In summary, there is little published, hard quantitative evidence to support or disprove the value of a corporate alliance, or to express its value in quantitative terms.

Second, obtaining financial information to conduct a quantitative study on a corporate alliance(s) is difficult because it involves sensitive, proprietary internal information. For example, load-factor figures on KLM's flights between St. Paul/Minneapolis and Amsterdam, Netherlands, were requested from KLM but were not provided, for competitive reasons. Therefore, the student had to conduct his quantitative study relying solely on publicly available financial information. For example, to study whether the variations in KLM's traffic revenue can be explained by the variations in the independent variables, KLM's traffic revenue figures should have only included the traffic revenue generated from the U.S. But, these figures were not available. As a result, the correlation between the dependant and the independent variables could be over or understated utilizing KLM's total traffic revenue. To be more specific, we do not know how much of KLM's overall traffic revenue was generated by the St.Paul/Minneapolis and Amsterdam route, specifically. If the majority of KLM's traffic revenues were produced by the U.S. market, the R Squared between the dependant and the independent variables should be larger. Hence, the regression model may have

distorted results.

The average economy fare, one of the independent variables, is also difficult to establish or measure. There are more than 150 different fare levels on this particular route. For simplicity, an average economy fare was selected to represent all of the fares charged. However, if a different fare were chosen from the 150, a different result might have been produced.

Another element complicating the quantitative analysis is the inability to quantify the added benefits of a corporate alliance(s). As the literature review reveals, the "seamless product" concept may contribute numerous intangible benefits in addition to the increase in traffic revenue for the respective airlines. For example, the loyalty for selecting KLM and/or Northwest Airlines over other competitors can be enhanced from the existing and potential demand due to the increase in passenger convenience. Hence, the dependant variable of KLM's traffic revenue may have a strong correlation with other independent variables not included in the regression analysis.

Finally, the values used to study KLM's quantitative alliance benefits with Northwest Airlines begins from 1990. Consequently, the number of needed observations to run an effective multiple regression analysis turned out to be much less than the student initially desired. This shows up in the analysis of the T-Statistics.

CHAPTER IV

SUMMARY OF FINDINGS & RECOMMENDATION FOR FUTURE STUDY

A. Summary of Findings

There are three forms of airline alliances; these are: simple alliance, strong alliance, and corporate merger. The three alliances are differentiated depending upon the amount of capital investment and the variation in the form of the functional agreements between airlines.

The three types of alliances present different advantages and disadvantages for airlines seeking to use an alliance as a corporate strategy to compete domestically and/or globally. Therefore, each airline must conduct a careful analysis to determine its needs and circumstances before implementing a particular alliance.

The student used a regression analysis to study whether implementing an alliance has any measurable quantitative gains or losses for the respective airlines. The KLM/Northwest Airlines alliance was selected as a case analysis. The main reason is that KLM and Northwest Airlines were the first major airlines to develop a strong alliance in 1989.

For the regression model, KLM's aggregate semi-annual traffic revenue was chosen as the dependant variable. The independent variables consisted of U.S. GDP growth rate, the currency exchange rate between Netherlands Guilders and U.S. cents, KLM's average one-way economy fare from Amsterdam to St. Paul/Minneapolis, and the number of KLM's U.S. gates from 1986 to 1991.

In this thesis, the regression equation suggests that KLM's traffic revenue will increase as all the independent variables increase, except for KLM's average economy fare. There seem to be an inverse relationship between fare level and traffic revenue due to elasticity of demand.

The regression equation is significant based on R Squared and the F statistic. The R Squared is 0.87 or 87% and the F Statistic is 11.22. However, the residual values of the dependant variable suggest that the regression equation is not as robust or reliable as desired. This is because the residual values appear to be heteroscedastic.

The regression model is not autocorrelated since the Durbin-Watson statistic value is 1.55. This implies that the R Squared of the regression equation is not artificially inflated and the residuals of the dependant variables are not correlated to each other.

The T-statistic values imply that the number of KLM's U.S. gates is the only independent variable that is statistically significant (3.17). The other independent

variables have an inconclusive impact on the variations of KLM's traffic revenue.

The correlation matrix provides information that shows a multicollinearity relationship between gates and GDP, fare and gates, and GDP and fares. If a multicollinearity relationship exists between the independent variables, the overall regression results can be ambiguous. However, this does not mean that there is a modeling error. It is a condition resulting from deficient data.

The reported results generally support the logical expectation or widely accepted view that alliances are beneficial. However, the results are not as strong or robust as the writer would prefer. The hardship in obtaining a long time series of data involving corporate alliances between international airlines has been a key contributing factor. A greater number of observations is a critical need to conduct a thorough study.

In summary, the regression model suggests that a substantial proportion of the variations in KLM's traffic revenue can be explained by the variations of KLM's number of U.S. gates. This result is statistically significant as proven by the significance of the regression equation and the T-Statistic value. However, variations of other independent variables have an inconclusive impact on the variations of KLM's traffic revenue. Therefore, the student can conclude that KLM's traffic revenue will increase as

they increase their access to U.S. gates.

The hypothesis that KLM's traffic revenue will increase depending upon an alliance with Northwest Airlines has been proven. Thus, KLM has benefited from the alliance with Northwest Airlines as their number of U.S. gates increased.

B. Recommendation for Future Study

There are three recommendations the student wishes to make for future study. First, this thesis can be studied more thoroughly using an increased number of observations and/or different dependant and/or independent variables. The data will certainly be available as years go by. With an increased number of observations, the results of the regression model will be more accurate and significant. The usage of other variables will provide information that has not been covered by this thesis. These findings can enhance the overall study of the KLM/NW Airlines alliance case.

Second, another alliance case can be used to study the benefits of an alliance. The most recent alliance approved by the U.S. Department of Transportation (in 1993) is an alliance between British Airways and USAir. As this thesis documents, this particular alliance is carefully monitored by numerous USAir competitors. Therefore, studying the development and the results of this alliance can be extremely useful and interesting.

Finally, a qualitative study regarding the challenges

of an alliance is recommended. This thesis indicates that disputes over cultural differences can spoil the prosperity of an alliance. Also, the concept of "our way of doing things is best" can effect the viability of an alliance. Hence, a thorough analysis of conflicts in cultural and operational differences between alliance partners can be beneficial regarding the study of an alliance.

REFERENCE LIST

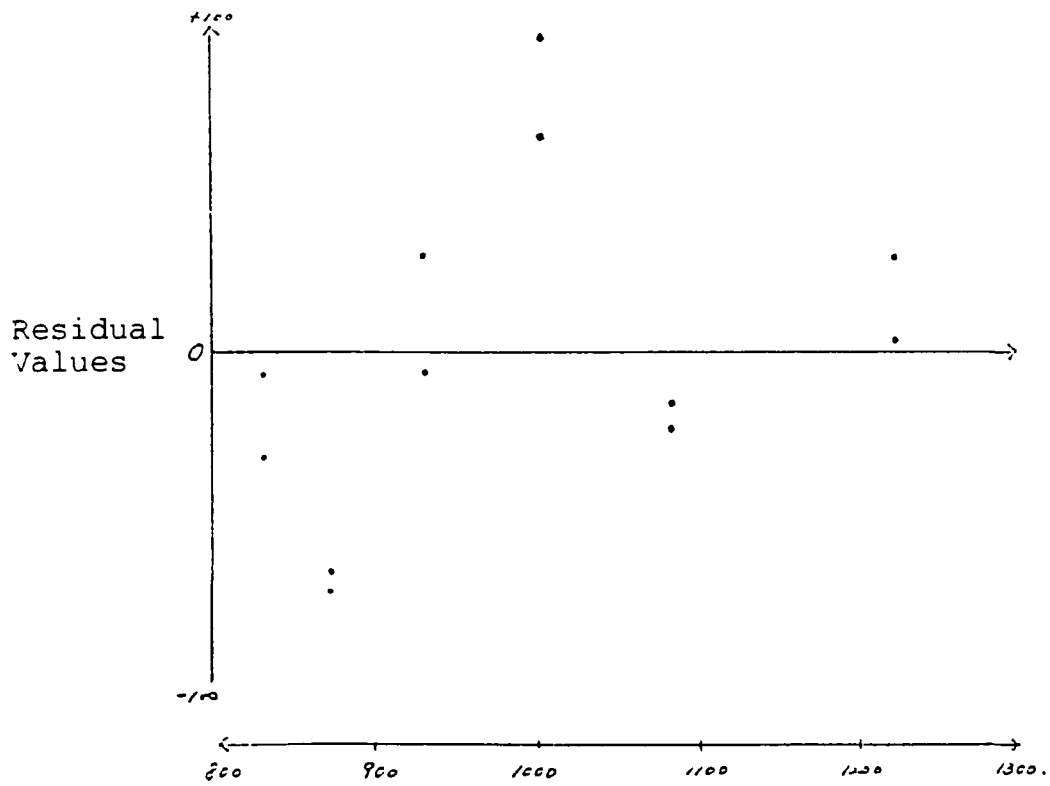
- "BA-USAir Forces Another Bermuda." Airline Business, November 1992, 7.
- Boberg, B. Kevin, and Frederick M. Collison, "International Trends in the Pacific Basin," Transportation Journal 3 (Spring 1989): 28.
- Cammeron, David. "Every Question Answered." Airline Business, April 1992, 51.
- Chatterjee, Samprit, and Price, Bertram. 1991. Regression Analysis by Example. New York: John & Son.
- Cole, Jean. "Northwest's Global Reach." Minnesota Pioneer Press, August 1992, E4.
- Cooper, Donald, and Emory, William. 1991. Business Research Methods. Boston, M.A.: Richard D. Irwin.
- Dempsey, S. Paul, "Turbulence in the Open Skies: The Deregulation of International Transport," The Transportation Law Journal (Spring 1987): 46.
- Doganis, Rigas. 1991. Flying Off Course. New York: Routledge Chapman and Hall.
- Feldman, M. Joan. "Megacarriers Expand Abroad Slowly but Steadily." Air Transportation World, October 1987, 19.
- French, Trevor. "Seoul Searching." Airline Business, December 1989, 27.
- Harrington, Michael, and Kihlstedt, Trobjorn. "Wedding Night Jitters." Airline Business, December 1991, 13.
- Jennings, Mead. "BA Stakes Out USAir." Airline Business, August 1992, 51.
- Jennings, Mead, and Whitaker, Richard. "Airlines Oppose BA's USAir Deal." Airline Business, September 1992, 30-31.
- Kane, M. Robert. 1990. Air Transportation, 10th ed. Dubuque, Iowa: Kendall/Hunt Publishing Company.
- Kasper, Daniel. 1988. Deregulation and Globalization. New York: Ballinger Publication.

- Kusserow, Volker. 1990. The Effects of the Proposed European Market and Unification of Germany on the Air Traffic Rights of U.S. and EEC Scheduled Carriers. Florida: Embry-Riddle Aeronautical University.
- Lyon, M. Mark. "Pacific Rim Carriers Meet the Threat of Protectionism." Airline Executive, December 1989, 27.
- Proctor, Paul. "Marketing alliances, Joint Services Help Asian Airlines Extend Reach." Aviation Week & Space Technology, November 1990, 74-75.
- Proctor, Paul. "Pacific Rim Carriers Struggle to Cope with Impending Traffic Boom." Aviation Week & Space Technology, November 1989, 110-111.
- Proctor, Paul. "System Capacity May Limit Pacific Rim Traffic Growth." Aviation Week & Space Technology, February 1990, 41.
- Shaw, Stephen. 1988. Airline Marketing and Management, 2nd ed. Malabar, Florida: Robert Krieger Publishing Co. Inc.
- Shin, H. Oh. 1991. A Study of Korean Air in the World Air Transport System. Seoul: In-Ha University.
- Taneja, K. Nawal. 1982. Airline Planning: Corporate, Financial, and Marketing. Lexington, Massachusetts: Lexington Books.
- Taneja, K. Nawal. 1988. The International Airline Industry. Lexington, Massachusetts: Lexington Books.
- Thornton, L. Robert. 1978. International Airlines and Politics. London: University Microfilms International.
- Wheatcroft, Stephen. "Air Transport in a Competitive European Market." The Economist Intelligence Unit, November 1986, 23.

**APPENDIX A: A GRAPHICAL ANALYSIS OF KLM'S
TRAFFIC REVENUE RESIDUALS**

A Graphical Analysis of KLM's Traffic Revenue Residuals

Graph 1. KLM's Traffic Revenue Residuals



Y = KLM's Traffic Revenue (Mil. U.S. \$)

**APPENDIX B: KLM'S ACTUAL vs. CALCULATED
TRAFFIC REVENUE AND RESIDUALS**

Table 9. Actual vs. Calculated KLM's Traffic Revenue and Residuals

YEAR	ACTUAL TRAFFIC REVENUE (Mil.\$)	CALCULATED TRAFFIC REVENUE (Mil \$)	TRAFFIC REVENUE RESIDUALS
JUNE 86	833	843	- 9.40
DEC. 86	834	867	-33.25
JUNE 87	934	904	30.22
DEC. 87	935	942	- 7.90
JUNE 88	878	946	-68.04
DEC. 88	878	953	-74.91
JUNE 89	1003	904	99.02
DEC. 89	1003	936	66.72
JUNE 90	1226	1196	30.11
DEC. 90	1227	1222	4.64
JUNE 91	1084	1106	-22.20
DEC. 91	1084	1099	-15.07

Source : Values obtained through Stat+ software program