AIR DISASTERS AND THEIR FINANCIAL EFFECTS ON THE INTERNATIONAL AVIATION INDUSTRY: JUSTIFICATION FOR THE WARSAW CONVENTION?

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I. INTRODUCTION

The Warsaw Convention[1] was enacted in 1929. Its stated purpose was to protect the fledgling aviation industry from the disastrously large judgments which could result from an air accident and to provide some uniformity between countries as to the content of tickets, baggage claim checks, and airbills.[2] Most of the information found on the standard airline ticket, which makes no sense to the average air traveler, is required pursuant to this Convention.[3]

The original Warsaw Treaty was the result of two separate international conferences conducted to draft a law which would aid the development of the fledgling airline industry.[4] The idea for this Convention grew out of the French *Avant-Project* proposal with the stated purpose of fixing liability and providing for uniformity in the

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1. Warsaw Convention, Oct. 12, 1929, 49 Stat 3000, T.S.No. 876 (1934), *reprinted in* 49 U.S.C. app. § 1502 (19). *See also* 137 L.N.T.S. 11 thereinafter *Warsaw Convention].*

[2] Andreas Lowenfeld & Allan Mendelsohn, *The U.S. and the Warsaw Convention,* 80 HARV. L. REV. 497, 498-501 (1967).

3.Subsequent to its enactment, the treaty has been the subject of a number of conferences and meetings. Eastern Airlines, Inc. v. Floyd, 111 S. Ct. 1489, 1497-1501 (1991). *See also infra* notes 16-22 and accompanying text.

[4] Lowenfeld, *supra* note 2, at 499.

regulation of international aviation.[5] This proposal was formally submitted by France to the 1925 Paris Conference on Private International Air Law, the first of the two conferences held for this purpose, and the resulting document was the first draft of the Warsaw Treaty.[6] A commission was formed and a panel of experts was appointed and were charged with studying the problems of aviation and presenting proposed solutions to an international convention which would be called specifically to ratify these proposals.[7] The commission was called the Comite International Technique d'Experts Juridiques Aeriens.[8] The committee worked on this problem for four years and made their final report to the second conference held in Warsaw Poland in 1929.[9] There the treaty was ratified by the member nations in October 1929,[10] and went into effect on February 13, 1933.[11]

At the 1929 Conference, forty-four nations and the League of Nations[12] were invited to attend. Thirty-two nations and the representatives of the League of Nations and the International Commission of Air Navigation[13] made official appearances. The United States sent a representative but did not make a formal appearance as a participant. It was listed only as an unofficial attendant at this Conference.[14] The United States became a formal signatory to the treaty in 1934.[16]

From the beginning, the United States did not like the treaty because of what it considered to be an inadequately low liability limit in cases of personal injury or death.[16] Under Article 22(1) of the Warsaw Convention, the total damages allowed was one hundred and

[5] Georgette Miller, Liability in International Air Transport **13 (1977).**

[6] *Id.*

[7] **G. Nathan Calkins,** Jr., *The Cause of Action Under The Warsaw Convention,* **26** J.Air L. & Com. **217, 220, 227 (1959).** *See also* Second International Conference On Private Aeronautical Law, Minutes, **October 4-12, 1929, at 18 (Robert Horner and Didier Legrez tran. 1975) [hereinafter** *Minutes],*

[8] **Calkins,** *supra* **note 7, at 218 n.7.**

[9] *Id.* **at 227.**

[10] *Id.*

[11] **Lowenfeld,** *supra* **note 2, at 501.**

[12] *Minutes, supra* **note 7, at 3.**

[13] **Barbara J. Buono,** *The Recoverability of Punitive Damages Under the Warsaw Convention in Cases of Willful Misconduct; Is the Sky the Lim.it?,* 13 Fordham Int'l **L.J.** 570, 575 (1990).

[14] **Lowenfeld,** *supra* **note 2, at 504.**

[15] *Id.*

[16] *Id.*

twenty-five thousand Poincare francs,[17] or eighty-three hundred dollars.[18] The United States made matters even more unacceptable by first freezing the value of gold and then abandoning the gold standard altogether, even though the treaty made gold the basis for determining the value.[19] Had the United States allowed gold to continue as a standard for the measure of damages, then periodic changes in the value of a dollar against an ounce of gold would have provided some avenue for a regular and periodic increase in the damage limits, if for no other reason than as an adjustment for inflation.[20] As a result of this abandonment, however, the damage limits were frozen at the last official U.S. gold to dollar exchange rate set by the Civil Aeronautics Board in 1958.[21] The United States then sought ways to avoid the limits of the Convention because of these low recovery rates.[22]

As a result, member nations sought avenues for agreement, and as such, the treaty was the subject of a number of subsequent conferences and meetings.[23] Few of these meetings led to any major changes in the operation of the Convention.[24] The most important treaty modifications were the Hague Protocol,[25] the Montreal

[17] *Warsaw Convention, supra* **note 1. The text of Article 21 of the treaty provides that "[I]f the carrier proves that the damage was caused by or contributed to by the negligence of the injured person the court may, in accordance with the provisions of its own law, exonerate the carrier wholly or partly from his liability."** *Id.*

[18] **Lowenfeld,** *supra* **note 2, at 499.**

[19] **Rene Mankiewicz,** *The Judicial Diversification of Uniform Private Law Conventions,* **21** Int'l & Comp. **L.Q. 718, 719 (1972).**

[20] **Trans World Airlines, Inc. v. Franklin Mint Corp., 446 U.S. 243 (1984).**

[21] *Id.*

[22] *Warsaw Convention, supra* **note 1, art. 22(1). The convention allowed total damages of one hundred and twenty-five thousand Poincare francs or eighty-three hundred dollars.**

[23] **Eastern Airlines Inc. v. Floyd, 111 S. Ct. 1489, 1497-1501 (1991).**

[24] **Miller,** *supra* **note 5, at 38, 258.**

[25] **Hague Protocol, 478 U.N.T.S. 371 (1955). Note that this agreement, which was ratified by the other member nations in 1955, was so unpopular in the United States that it was not submitted to the Senate for confirmation until 1961. Though the entire purpose of the Hague convention was to appease the United States, its decision to raise the maximum damage award to only sixteen thousand dollars was still too low for the United States and this Protocol was still the subject of bitter debate in 1966 when the Montreal Agreement was placed into effect. It was never formally ratified in this country.** *See* **Miller,** *supra* **note 5, at 37.**

Agreement,[26] The Guatemala Treaty[27] and the Guadalajara Treaty.[28] However, none of these later treaties were acceptable to the United States, and none were ever ratified by the Congress.[29] Only the Montreal Agreement has become a part of American law through administrative action by the Civil Aeronautics Board and by a private agreement among the major airlines of the world.[30]

Criticism of the treaty and the limit on damage awards had been intense in America.[31] This tension reached its climax in ***Ross v. Pan American Airways.***[32] The protest surrounding this case led nations who were the High Contracting Parties to the treaty to seek a compromise of the treaty amount in an attempt to satisfy the United States without offending other nations.[33] This led to the 1955 Hague Protocol which raised the treaty limits to two hundred fifty-thousand Poincare francs, or sixteen thousand six hundred dollars.[34] The United States, having demanded twenty-five thousand dollars, reject

[26] **The Conference Agreement Relating to Liability Limitations to the Warsaw Convention and the Hague Protocol, May 16, (1966), [hereinafter** *Montreal Agreement*], **CAB Agreement 18900,** *reprinted in* **49 U.S.C.A. § 1502 (19_____) (approved by CAB Order E-23680, 31 Fed. Reg. 7302). In 1965 those opposing the treaty and the compromise of the Hague Protocol prevailed and the United States officially filed a Notice of Denunciation of the treaty which was the first step in withdrawing from the Warsaw Convention. This led to further negotiations among the member nations and among the airlines in an attempt to keep the United States under the Warsaw Convention. In a special meeting of the major air carriers of the member nations which was held in Montreal, Canada in February of 1966, a private agreement with the United States was reached in which the liability limit for personal injuries or death was raised to seventy-five thousand dollars. In addition, the individual airlines waived the normal negligence defenses and accepted strict liability for claims arising in international air transportation. This agreement mollified, but did not eliminate criticism of the Convention within the United States as evidenced through its courts.** *See* **Miller,** *supra* **note 5, at 37.**

[27] **Miller,** *supra* **note 5, at 38, 258. This 1971 Protocol raised the limits for damages for nations signing it to one hundred thousand dollars. However, this was one of a number of later modifications to the Warsaw Convention that the United States did not sign.**

[28] *Id.* **This Protocol sought to solve the problems which arose when the contracting carrier used a third party carrier for some part of the international flight.**

[29] **Lowenfeld,** *supra* **note 2, at 506, 510, 515, 545-552.**

[30] *Id.* **at 595-96.**

[31] *Id.* **at 502-4.**

[32] **299 N.Y. 88, 85 N.E.2d 880 (N.Y. 1949).** *See also supra* **note 26.**

[33] **Lowenfeld,** *supra* **note 2, at 507.**

[34] *Id.* **at 504-9.**

ed this compromise.[35] Congress never ratified the Hague Protocol, though the debate over its ratification both within the Office of the President and within the Congress lasted for ten years.[36]

In 1965 those opposing the treaty and the compromise of the Hague Protocol prevailed and the United States officially filed a ***Notice of Denunciation,*** the first step in its withdrawal from the Treaty.[37] This action led to further negotiations among the member nations and among the airlines in an attempt to keep the United States under the Warsaw Convention.[38] In a special meeting of the major air carriers of the member nations held in Montreal in February of 1966, a private agreement with the United States was reached in which the liability limit for personal injuries or death was raised to seventy-five thousand dollars.[39] In addition, the individual airlines waived the normal negligence defenses and accepted strict liability for claims arising in international air transportation.[40] This agreement mollified, but did not eliminate, criticism of the Convention within the United States. The United States courts continued rendering judgments which in essence overruled the treaty by allowing numerous and easy exceptions to the limitations of the Convention.[41]

However, beginning in 1989 with ***Chan v. Korean Air Lines, Ltd.,***[*2] the United States Supreme Court and the appellate courts issued a series of rulings which have sharply limited the ability of lower courts to look for rights and remedies outside the Warsaw Convention in adjudicating cases which arise under it.[43] In ***Chan,*** the Supreme Court eliminated the American Rule in its interpretation of

[35] *Id.* **at 506.**

[36] *Id.* **at 510, 515, 545-552.**

[37] *Id.* **The United States was fully prepared to denounce the treaty unless the limits of liability were raised to at least one hundred thousand dollars.** *See also Notice Of Denunciation,* **53** Dep't St. Bull. **923, 924-25 (1965).**

[38] **Lowenfeld,** *supra* **note 2, at 549-51.**

[39] *Id.* **at 595-96.**

[40] *Montreal Agreement, supra* **note 26. All subsequent discussion of damage limitations under the Warsaw Convention will refer to the seventy-five thousand dollar limit of the Montreal Agreement.**

[41] **Larry Moore,** *Mental Injury and Lesion Corporelle in International Aviation under the Warsaw Convention: Eastern Airlines v. Floyd,* **22** Acad. Of Legal Stud. In Bus. Nat'l Proc. **504 (1993).**

[42] **490 U.S. 122 (1989).**

[43] **L.** Goldhirsch, The Warsaw Convention Annotated: A Legal Handbook **(1988).**

the Warsaw Convention.[44] In addition to the ***Chan*** decision, the Supreme Court in ***Eastern Airlines Incorporated v. Floyd***[46] also rejected mental or psychic injury as an independent grounds for recovering damages under the Warsaw Convention.[46] At the same time, in a ruling which made the decisions of the court of appeals uniform, the Second Circuit in ***In Re Air Disaster in Lockerbie Scotland,*"*** held that punitive damages would not be allowed under the treaty and also ruled that the Convention was the sole cause of action for international air accidents.[48] These rulings, taken as a whole, have eliminated a number of deviations in interpreting the treaty which were peculiar only to the United States. In doing so, the court, while not eliminating the almost sixty years of unhappiness with the low damage awards within the United States, at least took the American judicial system out of the controversy.[49]

II. ECONOMIC CONSIDERATIONS

Plaintiffs in Warsaw Convention cases tried in the United States are now strictly limited to the seventy-five thousand dollars which can be awarded under the Montreal Agreement where the accident involves developed nations whose airlines subscribe to this modification.[50] Otherwise, the amount is either sixteen thousand six hundred dollars

[44] *Chan,* **490 U.S. 122 (1989).** *See also* **Ludecke v. Canadian Pacific Airlines Ltd., 98 D.L.R. 3d 52 (Can. 1979); Larry Moore,** *Chan v. Korean Air Lines: The United States Supreme Court Eliminates the American Rule to the Warsaw Convention,* **13** HASTINGS Int'l & Comp.L. Rev. **229 (1990). The American rule, as it is called in other countries, is based upon a provision of the Montreal Agreement which required that international airline tickets print the liability limits in ten point type. Many American courts held that any deviation from this rule by the use of smaller type would result in these limits being removed and unlimited liability allowed. The Supreme Court held in** *Chan* **that the Montreal Agreement, while it set out ticket guidelines, set no penalties for their violation. Hence, the Warsaw Convention could not be set aside, and the lower courts could not provide remedies outside the Convention as they had no power to modify a treaty which was otherwise Constitutional.**

45. 111 S. Ct. 1489(1991).

46.Id. See also **Moore,** *supra* **note 41.**

[47] **928 F.2d 1267 (2d Cir. 1991) [hereinafter** *Lockerbie***].** *See also* **Larry Moore,** *The Lockerbie Air Disaster: Punitive Damages in International Aviation under the Warsaw Convention,* **15 Hous. J.** Int'l **L. 67 (1993).**

[48] *Lockerbie,* **928 F.2d 1267 (2d** Cir. **1991).** *See also* Larry Moore, *Air Disasters; Cause of Actions In International Aviation Under the Warsaw Convention; Burying the Ghost of Komlos,* **2** Se. **J.** Legal Stud. Bus. **57 (1993).**

[49] **Moore,** *supra* **note 41.**

[50] **Lowenfeld,** *supra* **note 2, at 595-6.**

for nations which have accepted the Hague Protocol, or eighty-three hundred dollars under the original agreement which includes most developing and third world nations.[61] This in turn raises the question as to whether or not, sixty-five years after the creation of this treaty and sixty years after it has been ratified by the United States, the Warsaw Convention is still needed to prevent airlines from being driven out of business by a single airline disaster. It will be the purpose of this paper to determine if those shareholders familiar with the possible effects of this type of catastrophe on the aviation industry still share the fears of the early proponents of this treaty. This will be accomplished by comparing the response of the stock markets to a series of international air crashes where there is a limitation on damage awards to the market's response to a series of purely domestic air crashes in which there is no such liability limit.

The need for the liability limits during the early years is not difficult to fathom. There was quite a bit of danger in traveling by air in those early years.[52] From 1925 to 1929 all the airlines combined, in both domestic and international flights, logged only four hundred million passenger miles.[53] The fatality rate during this period was forty-five per one hundred million passenger miles.[54] One of the goals of the Convention was to grant liability liberally with a modest but reasonable rate of recovery.[55] The practical effect of all of this was to allow an airline to be able to determine immediately its maximum losses from an international air crash, to limit the airline's own legal cost in defending this matter, and to provide quick compensation for the injured.

A 1967 study of the economic impact of the Convention on victims found that the amount necessary to constitute full recovery for at least eighty percent of American workers killed or disabled in an air crash was four hundred eighty-eight thousand dollars.[56] The average value of the economic losses to their dependents was two hundred sixty-seven thousand dollars.[57] The study also found that the minimum compensation provided to the nation with the lowest potential economic losses to the dependents of a manufacturing worker was

[51] *Id.* **at 499.**

[52] *See Minutes, supra* **note 7, at 38.**

53. Lowenfeld, *supra* **note 2, at 498.**

54.Id. **at 498.** [55] *Id.* **at 500.**

[56] **P. Jacobs and B.F. Kiker,** *Accident Compensation for Airline Passengers: An Economic Analysis of Liability Rules Under the Warsaw Convention,* **53 J. Air L. & Com. 589, 604 (1986). This amount was based upon constant 1977 dollars and based upon a study conducted in 1983.**

[57] **Id. at 606.**

eleven thousand dollars for the Central African Republic.[58] The current level of recovery is inadequate to compensate even poor third world nations not governed by the Montreal Agreement. However, to developed nations, the difference between even the recovery under the Montreal Agreement of seventy-five thousand dollars, and the actual losses suffered by a victim can create an impression of unreasonableness. This is especially true if the market stock places no great concern upon the viability of an airline company following an international air crash.

III. METHODOLOGY AND SAMPLE CONSTRUCTION

In order to compare the financial impact of a domestic air crash to that of an international disaster upon the stock of an American air- carrier, the event study methodology common in the financial economics literature was employed.[59] The essence of this approach is to determine if there is a significant stock price reaction for the firm on the days immediately surrounding the announcement of some event of interest after subtracting the expected component of return. Any significant return remaining is then attributed to the influence of the event under study. In applying the event methodology approach, researchers generally examine the pattern of daily stock returns over a period surrounding the event of interest. Such a longer period of analysis allows one to determine if there is evidence of information leakage prior to the event or a lingering effect in the post-event period. Usually, the impact on shareholder wealth is concentrated on the actual event day itself. This is because financial markets are rapid to respond to events that contain information relevant to a firm's future financial performance. In this study, the results for a total of twenty days surrounding the air crash are presented.

As noted previously, the actual daily rates of return on the firm's stock are adjusted for the expected rate of return. The estimation of daily expected rates of return for a stock is accomplished through the

[58]*Id.*

59.The event study methodology was created by Eugene F. Fama and has been used in hundreds of studies. *See* **Eugene F. Fama** *et al., The Adjustment of Stock Prices to New Information,* **10** Int'l Econ. Rev. **1 (1969). An analysis of the relative effectiveness of the methodology under a number of different scenarios has been evaluated as well.** *See* **Stephen Brown & Gerald Warner,** *Measuring Security Price Performance,* **8 J.** Fin. Econ. **205 (1980); Stephen Brown & Gerald Warner,** *Using Daily Stock Returns: The Case of Event Studies,* **14 J.** of Fin. Econ. 3 **(1985). For an overview of the issues and choices involved in the application of the event methodology** *see* **Pamela Peterson,** *Event Studies: A Review of Issues and Methodology,* **28 Q. J. Bus. &** Econ. **26 (1989).**

use of a return model called the Capital Asset Pricing Model (CAPM).[60] Extensively tested and applied, CAPM predicts a stock's expected return as follows:

EXPECT	= RISKFREE + BETA*(MARKET - RISKFREE), where
EXPECT	= expected daily rate of return for the stock;
RISKFREE	= return on a riskless asset (for example, U.S. Government Bond);
BETA	= a measure of the firm's systematic risk; alternatively, an index of the stock's sensitivity to the performance of a market-wide measure of stock return; and
MARKET	= expected return on the market portfolio for that day, often provided by the Standard and Poors 500 Index return.

Thus, an expected return for the day can be estimated for each stock. It is this expected component of return that incorporates the impact of marketwide macroeconomic factors, for example, Gross National Product, unemployment, and interest rates. This expected component then can be subtracted from the actual return to obtain an excess component of return:

EXCESS = ROR - EXPECT, where
EXCESS = excess rate of return; and
ROR = actual or realized daily rate of return.

This ***excess*** return is the component of the return attributable to firm-specific activities, rather than to aggregate market influences. For example, in this study an airline crash is a firm-specific event and may not impact the shareholders in that firm. It should not affect the aggregate equity market. An excess rate of return was calculated in order to control for factors that systematically influence the level of stock returns and could thereby distort the estimate of the rate of return attributable to firm-specific performance. These

60.For a discussion of the origins and development of CAPM *see* William Sharpe, *Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk,* **19 J.** Fin. **425 (1964);** John Litner, *The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets,* **47** Rev. Econ. Stat. **13 (1965);** Jan Mossin, Equilibrium in a Capital Asset Pricing Model, **34** Econometrica **168 (1966).** For a review of such studies see Eugene F. Fama, *Efficient Capital Markets: II,* **46** J. Fin. **1575(1991).**

excess returns, therefore, serve as the focus of analysis in the event methodology approach.

On each day in the period of analysis, referred to as the ***event window,*** a firm-specific excess return is calculated. These excess returns are then cross-sectionally averaged across the firms in each of these samples in order to obtain an average daily excess return. These values are reported on both a daily and cumulative basis in the empirical results. Because of the use of excess returns, arguments relying upon aggregate market movement to explain a stock's response to an event can be eliminated. Thus, if one observes a negative excess rate of return for a stock upon the announcement of some event, it can confidently be attributed to that event, rather than to a generally depressed stock market.

The air crashes examined in this study were tabulated from editions of the National Transportation Safety Board's ***Annual Review of Aircraft Accidents Data*** and a listing of crashes supplied to the authors by the Federal Aviation Administration. The period spanned by these sources extended from 1962 through 1989. These events were then further screened on the basis of stock return availability. That is, the crash had to involve an air carrier whose stock return history was available on the returns file compiled by the ***Center for Research in Security Prices*** (CRSP).[61] This resulted in a final sample of one hundred one crashes, with thirteen of them occurring abroad.

IV. EMPIRICAL RESULTS

A. INTERNATIONAL CRASHES

For the set of international air crashes[62] it was observed that the excess rates of return vary without statistical significance in the ten days preceding the disaster. Thus, the variation in these excess rates of return may be viewed as random fluctuations driven by chance rather than by economic factors. On the event day, however, an

61. CRSP is located at the University of Chicago and is recognized as the leading supplier of equity price data to both academics and analysts. Its daily time-series of equity returns extends to July 1962 and is updated annually. Virtually every empirical study in financial economics requiring equity return data utilizes this source. *See* EUGENE F. FAMA, FOUNDATIONS OF FINANCE **(1976) for a basic discussion of this data.**

62 *See* **Appendix 1.**

excess return of -1.02 percent was observed.[63] Estimation of the widely used ***t*** statistic indicates that the likelihood of obtaining this sized excess return by chance is less than one percent.[64] The implication of this result is that the shareholders of the airlines involved in the accident incurred a loss of wealth of about one percent. For the ten days following the crash, the excess rates of return again vary without statistical significance. Thus, the empirical findings from the event methodology clearly attributes a significant shareholder wealth loss to the airliner's shareholders following a crash.

B. DOMESTIC CRASHES

The findings for domestic air crashes[66] are similar to the findings reported for international air disasters. The excess returns fluctuate randomly in the ten-day period preceding the crash. This is to be expected, since unlike other events studied by financial economists, air crashes can not be anticipated, and there is no existing information to be leaked in advance.[66] On the event day, a significant excess return of -2.36 percent was obtained. This loss is over twice as large as that reported for international crashes.[67] That is, shareholders in those firms suffering domestic air crashes lose 2.36 percent in the value of their equity positions on the event day. For the following ten days after the crash, however, there was no significant gain or loss to the airlines's shareholders.

C. ECONOMIC INTERPRETATION

The results[68] indicate that the stock market response to an airline crash is much more pronounced for a domestic accident than for an international disaster. This result is consistent with the argument that the potential losses from an international crash are less

63.The event day may or may not be the actual day of the crash. If, for example, the crash occurred during the weekend or after the close of the stock market, the event day then becomes the first trading day after the disaster.

64.For an excellent introductory discussion of the interpretation of statistical levels of significance and use of the *t* **statistic, see** JOHN FREUND & RONALD WALPOLE, MATHEMATICAL STATISTICS **(1980).**

65.*See* **Appendix 2.**

66.See Raymond Ball and Paul Brown, *An Empirical Evaluation of Accounting Income Numbers,* **6 J.** ACCT. **Res. 159 (1968) for an example of market anticipation of an event.**

67 See Appendix 1.

68 *See* **Appendices 1 and 2.**

because of the liability limitations imposed by the Warsaw Convention of 1929. The stock market appears to be able to discriminate between potentially unlimited liabilities associated with a domestic crash and the constrained liability imposed by international treaty.

A model of stock prices contends that the current value of a stock is the discounted value of its future earnings.[69] An airline crash, because of the associated losses due to liability, can be anticipated to reduce the level of future earnings for the firm, which consequently will result in lower current stock prices. To the extent that the earnings decline will be greater for a domestic crash because of the absence of liability limitations, the fall in the stock price will be more significant. A declining share price will produce the negative rates of return.™ Thus, the market anticipates a greater impact upon earnings for a domestic crash and discounts the value of the firm's equity more severely.

V. CONCLUSIONS

From a study of the economic data of both what would constitute a reasonable compensation for an industrial worker injured in an international air crash, and what effects a crash has on the company and its shareholders, several conclusions can be drawn about the operation of the Warsaw Convention. First, in terms of the justification for the treaty, that is the preservation of airlines from financial destructions as a result of an international air crash as measured by the response of the stock market, the Warsaw Convention is a success. Second, in comparison with a domestic accident, which is outside of the purview of the treaty, a shareholder's wealth is subject to a negative excess return which is 134 percent more in a domestic accident

69.Discounting the earnings of a firm means adjusting the value of earnings for the time value of money. The time value of money recognizes the productivity of capital and contends that a future sum has a current worth less than its nominal value. This concept is a fundamental principle of investment and all aspects of finance. All introductory textbooks in finance will contain a discussion of this principle. *See, e.g.,* LAWRENCE S. SCHALL & CHARLES W. HALEY, INTRODUCTION TO FINANCIAL MANAGEMENT **(1991). For a discussion of the discounted earnings model of equity valuation see generally Zvi** BODI, ALEX KANE, & ALAN MARCUS, INVESTMENTS **(1993).**

[70.]*See* Appendices **1** and **2.** The use of daily rates of return rather than the level of stock prices to examine the impact of information-laden events on shareholder wealth is well established in the literature of financial economics. *See, e.g.,* JOHN MARTIN, STEPHEN COX & RICHARD MACMINN, THE THEORY OF FINANCE: EVIDENCE AND APPLICATIONS **263-385 (1988)** (review of major studies using this approach).

than in an international one. Third, the maximum amount of recovery is far less than modern industrial workers would need in the event of an accident in order to be fully compensated for their injuries, even in a developing nation.

Based upon these observations, the authors would recommend that the Warsaw Convention and the Montreal Agreement be maintained in their current structure, but that the compensation level be raised to at least eleven thousand dollars in pure Warsaw Convention cases, and four-hundred eighty-eight thousand dollars in cases arising under the Montreal Agreement. These represent maximum caps with an inflation factor built into the amounts based upon some objective measure, such as the cost of gold. In light of the potential judgments possible in such cases in the United States, such an increase is modest, and therefore should have a minimum impact on the firm's value to its shareholders whose main fear seems to be the open-ended multimillion dollar judgments which would have the potential to destroy an airline or its insurer. At the same time this solution would provide reasonable compensation that would more accurately reflect the real loss to injured individuals or to their families if they do not survive.

APPENDIX 1

DAILY EXCESS STOCK RETURNS SURROUNDING AN INTERNATIONAL AIRLINE CRASH

Event Day	Excess Return	t Statistic
-10	0.0041	0.829
-9	0.0001	0.384
-8	0.0020	0.851
-7	0.0002	0.255
-6	-0.0010	-1.078
-5	0.0060	1.192
-4	-0.0028	-0.706
-3	-0.0003	-1.084
-2	0.0017	0.943
-1	0.0012	0.711
0	-0.0102	-2.821*
1	0.0017	0.327
2	0.0031	-0.539
3	-0.0007	-0.706
4	0.0001	0.125
5	0.0079	0.484
6	0.0024	0.433
7	-0.0054	-0.197
8	0.0061	0.681 9
	0.0033	0.433
10	0.0014	0.295

***indicates statistical significance at the one percent level.**

APPENDIX 2

DAILY EXCESS STOCK RETURNS SURROUNDING A DOMESTIC AIRLINE CRASH

ent Day	Excess Return	*t* Statistic
-10	**0.0001**	0.173
-9	0.0017	0.848
-8	-0.0014	-1.254
-7	-0.0005	-0.692
-6	0.0012	0.975
-5	**0.0001**	0.992
-4	0.0008	1.128
-3	-0.0004	-1.098
-2	0.0012	1.261
-1	-0.0006	-0.907
0	-0.0236	-2.769*
1	0.0018	0.756
2	0.0003	0.434
3	0.0024	1.112
4	-0.0003	-0.943
5	-0.0051	-0.726
6	0.0014	0.431
7	0.0032	0.815
8	0.0007	0.613
9	0.0015	0.329
10	-0.0039	-1.117

indicates statistical significance at the one percent level.