SYSTEMATIC RISK IN THE DEREGULATED AIRLINE INDUSTRY

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INTRODUCTION

Deregulation has been a focus of political attention in recent years, as regulatory changes have been proposed or effected in the structures of several major industries. Nevertheless, there has been little empirical research by financial economists on the impact of deregulation, though there has been discussion on whether the cost of capital is endogenous to the regulatory process (see, for example, Marshall, Yawitz and Greenberg (1981)). Various studies argue that a firm's systematic risk is affected by regulation, but there is little evidence to show the actual impact of regulatory reform on systematic risk over a transitional and post-transitional period.

The purpose of this study is to analyse the impact of deregulation on the systematic risk of firms by considering the case of the airline industry. Because the airline industry has now operated in an unregulated environment for several years, sufficient data are available to show the differences in the systematic risk of the carriers for a period of regulation, a period of transition to deregulation, and a post-transitional period. Moreover, because scheduled airlines are large, publicly listed firms, there is an abundance of financial market information that can be used to assess the relationship between deregulation and the cost of capital.[1]

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[1] This study is limited to major scheduled public carriers: that is, those actively traded on one of the two principal exchanges in the United States. This ensures a continuous measure of market prices by which to assess market performance which would not be available for commuter airlines, for example. Thus, our sample of firms is not subject to the problem of non-synchronous trading.

There have been numerous studies of the changing managerial strategies, economics, and financial performance of the airline industry under regulation and deregulation.[2] These studies, however, do not consider the relationship between regulation, deregulation, and systematic risk. One of the few studies in the financial economics literature related to the deregulation of the airline industry is Michel and Shaked (1984). They use an event study methodology to focus on the impact of deregulation on returns to shareholders, and conclude that nearly all airlines achieved substantial gains in shareholders' wealth before deregulation. Regional carriers maintained these gains after passage of the 1978 Airline Deregulation Act, but the gains were largely eliminated for the trunk carriers. However, Michel and Shaked do not consider whether the structure of the pattern of returns required by shareholders was changed by deregulation through a change in systematic risk associated with the change in regulatory structure. In an early study Cavarra, Stover and Allen (1981) suggest that a deregulated environment increases systematic risk, and that shareholders will therefore require appropriately higher returns. In contrast, in a study of motor carriers immediately after the passage of the 1980 Motor Carrier Act, Morash, Brunning and McQuin (1981) indicated that systematic risk decreased among the largest carriers, though it increased among smaller carriers. In a recent study of electric utility regulation, Norton (1985) reports cross-sectional evidence suggesting that the systematic risk of electric utilities is sensitive to regulation: it is lower in states with strong statewide regulation than in states where regulation is less stringent. As a consequence, the empirical evidence on the impact of deregulation on the systematic risk of regulated firms remains unclear. Thus, our work can be viewed as an important step in adding to the sample of regulatory events which can be considered as affecting the impact of regulation on risk.

There is no generally accepted theory of the impact of regulation on the systematic risk of firms. There has been a great deal of argument in the literature about the relationship between risk and regulation, but they reach opposite conclusions about the direction of the effect. Peltzman (1976) has developed what is perhaps the best known model of regulation; this can be viewed as a generalisation of the earlier work by Stigler (1971). Peltzman's model takes the view of a legislator seeking to maximise support for policy by taking into account differences in income and demand elasticities for the product as well as the cost structure of the firms being regulated. Peltzman argues that the presence of regulation reduces the impact of demand and cost shocks on the industry, and thus decreases the volatility of profits and lessens risk. For example, if costs rise, regulators will increase prices, so that profits are not affected and instead consumers share the burden. Likewise if costs fall, regulators reduce prices, and consumers share the benefits. Thus Peltzman indicates that regulation decreases risk because it serves as a buffer, protecting firms from cost and demand shocks, and reduces risk.

However, Joskow and MacAvoy (1975) and Keran (1976) have argued that

[2] Among the main studies of the airline industry before deregulation are Caves (1962), Douglas and Miller (1974), Jordan (1970) and Fruhan (1972). The main studies of airline deregulation include Meyer and Oster (1981), Taneja (1981), Bailey, Graham and Kaplan (1985), Brenner, Leet and Schott (1985), and Moore (1986).

regulation increases risk. They argue that in practice regulators are slow to act in response to cost and demand shocks, so that corporate adjustments to these shocks are slower for regulated firms than they would be for unregulated firms. Thus they argue that the implication of this regulatory lag is that regulation increases risk, instead of reducing it. Regulation may also increase systematic risk because of its effect on capital intensity. Averch and Johnson (1962) have argued that rate-of-return regulation increases a firm's capital intensity. Since there is empirical evidence for public utilities that capital intensity increases systematic risk, the implication is that systematic risk is greater for a regulated firm than for a similar unregulated firm.[3]

Thus the impact of deregulation on systematic risk must be regarded as largely an empirical issue. The case of the deregulation of the airline industry is particularly apt as a basis for analysing this issue, because scheduled airlines were tightly regulated during the period from 1938 to 1978. The Civil Aeronautics Board controlled virtually all managerial variables in the airline industry, including pricing, product quality, entry and exit, and mergers and acquisitions.[4] Further, the Civil Aeronautics Board established a statutory rate of return on investment, and sought to prevent major bankruptcies in the industry by merging weaker firms with stronger firms.

Deregulation radically altered the competitive environment for airline carriers. The Airline Deregulation Act of 1978 directed the Civil Aeronautics Board to reduce and phase out all route controls by the end of 1981; and all authority over pricing, mergers, acquisitions, and entry was to cease by the end of 1982. In reality, however, *de facto* Civil Aeronautics Board policy was to implement deregulation rapidly, and this led to considerable managerial control over these variables at a much earlier date than that specified in the legislation. The new freedom gave airline managers an opportunity to formulate new forms of competitive managerial strategy. Innovative pricing and product schemes were introduced and evaluated in the marketplace. Innovative developments included "no-frills" and luxury services, frequent flyer programmes, and hub and spoke scheduling of aircraft.

There have been a variety of studies of the profitability of the airline industry during its transition from regulation to deregulation. It is clear from these studies that most measures of profitability of the airline industry that are based on historical accounting returns have not improved since deregulation.[5] But these analyses of accounting data throw little light on the effect of deregulation on the terms under which the airlines can tap the capital markets. The data reflect a broad range of important developments since the dramatic changes of the early 1980s in the economic environment for the airline industry: for example, rapid increases in fuel prices, a severe economic slump, and a controllers' strike. Each

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[3] For evidence on the relationship between capital intensity and risk, see Lev (1974).

[4] See Fruhan (1972) for an excellent analysis of the degree of control that the regulatory authorities had over the managerial variables relevant in the airline industry.

[5] See, for example, Gritta (1982) and Brenner, Leet and Schott (1985). Moreover, since the initiation of deregulation, there have been several recent bankruptcies of airlines – most notably those of Braniff International and Air Florida.

of these factors would have had an important impact on earnings shown in the accounts, even if regulation had continued. Thus it is difficult to sort out these impacts from the effect of deregulation by examining the accounting data reported by airlines. Moreover, such measures of profitability largely reflect past investment decisions and may have little relevance for the cost of capital, since the market's expectations for the future are an integral part of valuation in the financial market.

EMPIRICAL RESULTS

In this paper we test the two alternative hypotheses about the impact of deregulation on systematic risk by examining the pattern of stock market returns in the airline industry over the period before, during and after the deregulation of the industry. The data are drawn from the daily stock return file of the Center for Research in Security Prices at the University of Chicago. The sample of firms includes all the airlines on the CRSP tapes available for the period 1974 to 1983 which were not involved in proceedings for a merger. Eight of these firms are classified as trunk carriers, and seven as regional carriers. The trunk carriers are: American, Delta, Eastern, Northwest, Pan American, Trans World, United and Western. The seven regional airlines are: Alaskan, Frontier, Hawaiian, Ozark, Pacific Southwest Airlines (PSA), Southwest, and U.S. Air.

We use these daily return data to estimate beta coefficients by the market model, using an ordinary least squares regression for each firm:

$$\tilde{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i \tilde{R}_{mt} + \tilde{\epsilon}_{it} \qquad (1)$$

where $\tilde{R}_{it}$ is the daily return of airline i on day t, $\tilde{R}_{mt}$ is the daily rate of return on the Standard and Poor's 500 stock index, $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the estimated parameters and $\tilde{\epsilon}_{it}$ is the disturbance term.[6] We estimated these regressions over four separate sample periods: (1) 1 January 1974 to 23 February 1977, which covers the period before President Carter's announcement that he would support deregulation; (2) 24 February 1977 to 24 October 1978, the date when the Airline Deregulation of 1978 was passed; (3) 25 October 1978 to 31 December 1979, a period immediately after the passage of the Act; and (4) 1 January 1980 to 31 December 1983. We regard the third period as one of transition from regulation to deregulation; the fourth subsample belongs to the period after deregulation.

The resulting beta coefficients for the carriers are shown in Table 1. To examine whether the changes in beta coefficients between specified periods are significant, the paired difference test was used. The paired difference test is based on the pairings of adjacent betas where the paired variance is

[6] We also estimated these regressions with weekly data, to ensure that our results are not sensitive to potential bias associated with thin trading. Though there is some variability associated with the results for individual firm betas, the pattern of the results for each group of airlines remains quite similar to that reported in Table 1. Results obtained from weekly data can be obtained from the authors.

TABLE 1

Beta Coefficients

Trunks	*Period 1*	*Period 2*	*Period 3*	*Period 4*
American	2.02	2.18	2.01	1.47
Delta	1.40	1.47	1.05	1.20
Eastern	1.96	1.72	2.38	1.28
PanAm	1.35	1.59	1.90	1.00
TWA	2.27	2.16	2.64	1.58
United	1.71	1.73	2.05	1.46
Western	1.66	0.95	2.25	1.06
Northwest	1.85	2.03	1.81	1.20
Mean for Trunks	1.78	1.73	2.01	1.28
t Statistic for paired difference		(0.43)	(−1.42)	(4.70)§
Regionals				
Alaskan	0.92	0.84	0.94	0.76
Frontier	1.03	1.32	0.99	0.93
Hawaiian	0.56	0.49	0.22	0.14
Ozark	0.43	0.66	1.52	1.20
PSA	1.31	0.96	1.80	0.95
Southwest	1.34	0.79	1.10	0.94
U.S. Air	1.06	0.82	2.71	1.43
Mean for Regionals	0.95	0.84	1.33	0.91
t Statistic for paired difference		(0.96)	(−1.64)	(2.36)*
Mean for All Airlines	1.39	1.32	1.69	1.11
t Statistic for paired difference		(0.99)	(−2.22)†	(4.86)§

* *t* Statistic significant at the 10% level
† *t* Statistic significant at the 5% level
§ *t* Statistic significant at the 1% level

Sample Periods:
Period 1: 1 January 1974 to 23 February 1977
Period 2: 24 February 1977 to 24 October 1978
Period 3: 25 October 1978 to 31 December 1979
Period 4: 1 January 1980 to 31 December 1983

$$\sigma^2 = \sum_{i=1}^{n} (D_i - \bar{D})^2/(n-1) \quad (2)$$

and D is the paired difference and n is the number of pairs. The resulting statistic has the student t distribution with $n - 1$ degrees of freedom. The relevant t statistics for the differences between adjacent periods are reported in parentheses for each group of airlines.

The beta coefficients for the first two sample periods indicate that systematic risk was relatively stable; it fell slightly during the period before the signing of the Airline Deregulation Act, though the differences are clearly not significant. With the signing of the Airline Deregulation Act, however, the beta coefficients for the carriers increased substantially. The mean of the beta coefficients for all carriers rose from 1.32 to 1.69. The mean of the beta coefficients for the trunk carriers increased from 1.73 to 2.01, while that of the regional carriers rose from 0.84 to 1.33. For the trunk carriers, five beta coefficients increased and three fell. For the regionals, five beta coefficients increased and two decreased. Moreover, on the basis of the pairings of beta coefficients for the two periods, we can reject the null hypothesis of no difference between the betas for the airlines as a whole at the 5 per cent level of significance, though not for each group if analysed separately. On this basis, it could be concluded that the process of carrying out deregulation increased the systematic risk of airlines.

The pattern of the results for the most recent period, however, indicates that the rise in the beta coefficients was temporary, and that the period of deregulation has been one of significantly lower systematic risk. The empirical results indicate that for the period 1980–83 the beta coefficients fell sharply for both types of carriers by comparison with the period immediately after the Airline Deregulation Act. The t statistics of the paired differences are 4.70 for the trunk airlines, 2.36 for the regional airlines, and 4.86 for the airlines as a whole. Only one trunk carrier had an increase in its beta coefficient, while those of all the remaining carriers fell sharply. In the case of the regional carriers, every beta fell. Moreover, the coefficients for the trunk carriers fell to a level that is significantly below that of the first sample period (which covers a time span before President Carter's announcement of his intent to seek deregulation). The t statistic for this paired difference is 7.00. For the regional carriers, the beta coefficients fall to a level that closely approximates the initial period.

Thus, the general pattern of the results suggests that the period immediately after deregulation was one of generally increased systematic risk. But for both types of carriers the rise in systematic risk was temporary, and has been followed by a lengthy period in which systematic risk has fallen to a level below that of the regulated period for trunk carriers and about equal to that of the regulated period for the regional carriers.[7]

[7] It should also be noted that there were no substantial shifts in the ratio of debt to the market value of equity in the airline industry. Thus, given the substantial scale of the change in the estimated parameters reported in Table 1, it is unlikely that the pattern of these results could be rationalised on the basis of the financial market's expectations about shifts in leverage. Similar results for these parameters are obtained when weekly data are used for the regressions, so thin trading also is unlikely to have induced these results.

The evidence suggests that throughout the period of regulation, and into the period of transition toward deregulation, the systematic risk of trunk carriers was substantially greater than that of regional carriers. If regulation entails higher systematic risk, as these tests strongly suggest for the trunk carriers, then this difference in systematic risk between the trunk and regional carriers is consistent with Fruhan's (1972) evidence that regulators had greater regulatory control over the relative profitability of the larger carriers than of the smaller carriers. Moreover, the results for the period after deregulation indicate that the difference in the degree of systematic risk between the regional and trunk carriers has fallen. It should also be noted that, within the group of regional carriers, U.S. Air (formerly Allegheny) had a particularly sharp increase in systematic risk during the transition to deregulation, and its beta has remained high during the period 1980–83 by comparison with other regionals. It is interesting that this is a carrier that formerly was locally oriented but made dramatic changes in its geographical scope during the period of deregulation, becoming, in effect, a coast-to-coast carrier.

IMPLICATIONS AND CONCLUSIONS

Our results have several important implications. First, they indicate that, at least in the case of the main airline carriers, a free market environment significantly lowered systematic risk relative to the period of regulation. This implies that analysts who argued that regulatory reform would necessarily worsen the terms of the availability of outside capital to finance the industry were not correct.

Second, despite this eventual decrease in systematic risk, the period of transition immediately after the passage of the Airline Deregulation Act raised systematic risk significantly for most of the carriers, both regional and trunk. This sharp rise in risk implies that, if an industry is to be deregulated, the authorities should consider keeping the transition as short as possible. If deregulation is rapidly implemented, managers must respond quickly by making without delay the necessary capital investment, and changes in labour rules and management personnel or retraining. Management's ability to postpone such changes is limited. The disciplinary forces of product and factor markets are strengthened, and market control is substituted for regulatory control of managers.

Third, the financial market results imply that national carriers have greater systematic risk than regional carriers, though the difference is much less in a non-regulated than in a regulated environment. This implies that in a deregulated environment, investors do not distinguish between large and smaller carriers in terms of systematic risk as much as they do in a regulated environment. Presumably this is because smaller carriers have the freedom to become national in scope, and large carriers can attack the route systems of smaller carriers.

From a managerial point of view, our results imply that, in evaluating capital budgeting plans in an industry facing deregulation, managers must approach estimating the cost of capital with great care, because systematic risk rises in the transition to deregulation, while in the steady state of a deregulated environ-

ment it falls. Likewise, if managers in a regional firm in a regulated industry intend to broaden its operations to a national scope, they cannot utilise its then current cost of capital in evaluating the net present value of the investment plan. Managers can expect that the cost of capital will eventually decline with deregulation, but they must estimate the cost on the basis of the systematic risk of a national, not of a regional, firm.

A variety of studies have found that deregulation in transport has led to lower prices and a greater variety of services for the consumer than prevailed in the uniformity under regulation. In a deregulated environment, consumers are free to compare the costs and benefits of the services offered; and managers have greater freedom to respond to their demands.[8] The evidence reported in this paper suggests that, at least in the case of the large airlines, deregulation also lowered the degree of systematic risk and thus the rate of return required to persuade shareholders to hold airline equity. As a result, airline firms in a deregulated environment will find that investors do not require as high a rate of return on invested capital before they assign a positive net present value to airline transport projects. This suggests that deregulation increases the range of acceptable investment projects in the airline industry.

This paper reports empirical tests of changes in the systematic risk of airline stocks during regulation and sequential stages of deregulation. The conclusions are interesting, but the analysis is limited to one industry. Moreover, it is possible that there may be other explanations for the observed changes in the pattern of systematic risk. Thus, further empirical work is needed to determine whether these results can be generalised to other industries undergoing deregulation.

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[8] For an excellent summary of these effects, see Bailey, Graham and Kaplan (1985).

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