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## The Rise and Fall of Railtrack plc:
## An Event Study

**Anthony Glass**

# The Rise and Fall of Railtrack plc: An Event Study

**Anthony Glass**
Department of Economics
Manchester Metropolitan University

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**Abstract**
Forming Railtrack was a key part of the privatisation of British Rail (BR). Railtrack took over ownership of BR's fixed infrastructure in April 1994 and its parent company, the Railtrack Group, was floated in May 1996 on the London Stock Exchange. Despite the group posting some excellent financial results in the early years, Railtrack's record on infrastructure improvement and safety was frequently criticised. This apparent inconsistency between shareholder interests and public service obligations culminated in Railtrack being placed in administration in October 2001. In view of this apparent inconsistency the reaction of the stock market to 19 key events is modelled. Among other things, we find when Railtrack announced after the Hatfield crash that there would be a six month programme of emergency track repairs, the group's share price was marked down but it did not plummet. Even though Railtrack was in panic mode, it appears that investors decided to hold on to their shares, believing that the panic would have no long term repercussions. This proved to be a huge error of judgement.

**Address for Correspondence**
Dr Anthony Glass, Department of Economics, Manchester Metropolitan University, Mabel Tylecote Building, Cavendish Street, Manchester M15 6BG
e-mail: a.glass@mmu.ac.uk
tel:      +44   161   247   3887      fax:      +44   161   247   6302

# 1. Background

The implementation of the 1993 Railways Act involved privatising British Rail (BR) by vertically separating ownership and control of the fixed infrastructure from operations. Among other things, this involved forming an infrastructure authority, Railtrack. On 1 April 1994, ownership and control of the fixed infrastructure (track, signals, depots and stations) was transferred from BR to Railtrack (a separate government owned company). Upon the transfer of the infrastructure, Railtrack became responsible for: (i) providing train operators with access to the track; (ii) organising the maintenance and renewal of the infrastructure;[1] (iii) investment in the infrastructure; (iv) timetabling all of the services; (v) managing signalling across the network; and (v) monitoring track safety. Another facet of the implementation of the 1993 Railways Act involved setting up the Office of the Rail Regulator (ORR). The Rail Regulator is independent of the government and is primarily concerned with preventing the infrastructure authority from abusing its position as the monopoly supplier of fixed infrastructure. For example, the Rail Regulator has always been responsible for setting the rate of return that the infrastructure authority may earn from the access charges it levies on rail operators.

As Welsby and Nichols (1999) note, prior to the 1993 Railways Act and in the early stages of its implementation, there were no plans to privatise Railtrack. This was because Railtrack was a difficult candidate for privatisation (Wolmar, 2005, page 79), as its assets were difficult to value, having been built up over 170 years with many of them already written off. Also, unlike the public utilities that were privatised

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[1] The privatisation of BR involved, among other things, maintenance and renewal of the track being contracted out. In January 2003, Railtrack's successor, Network Rail, announced that maintenance in three areas would be brought in-house when the existing contracts expired (Wolmar, 2005, page 209). In October 2003, it was announced that maintenance in the remaining four areas would also be integrated into Network Rail.

in the 1980s and early 1990s, Railtrack was heavily reliant on public subsidy. In the summer of 1994, however, the government decided Railtrack should be privatised as soon as possible, when a less ambitious schedule would have been more sensible (Bartle, 2003, page 51). On 20 May 1996, all the shares in the Railtrack Group, whose main operating subsidiary was Railtrack, were sold by way of a fixed price public offer. The group was floated on the London Stock Exchange at 390p per share which equated to a market valuation of £1.95bn. Following the write-off of £869m of Railtrack's debt to the government resulting in a new debt of £586m, total sale proceeds were £2.49bn.[2]

The initial offer of shares in the Railtrack Group was ten times oversubscribed which may suggest that the group was underpriced. Florio and Manzoni (2004) provide evidence to support this view. Using the percentage change in the offer price at the close of trading on the first day as their measure of underpricing, they find that the initial offer of shares in the Railtrack Group was underpriced by 8 per cent. This was below the average of 13 per cent for their sample of 55 British firms privatised over the period 1977-1996 and was well short of the levels reported for a number of the early government sell-offs. For example: the sale of the first tranche of shares in British Telecom in December 1984 (underpriced by 32 per cent); the sale of all the shares in British Airways in February 1987 (underpriced by 35 per cent); and the sale of all the shares in Rolls Royce in May 1987 (underpriced by 36 per cent). Underpricing of shares in British public utilities

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[2] Prior to privatisation Railtrack owed the public sector £1.5bn most of which was owed to the National Loans Fund. This would not have been allowed to continue following privatisation because the fund and other public sector lenders are not permitted to lend to private sector companies. The government therefore decided to write-off a large portion of the debt leaving a new debt of £586m. Most of this new debt was paid off shortly after flotation and the remainder was sold by the government in July 1996.

and lax regulation of market power in the early years following privatisation were the reasons given by the Labour government in the 1997 Budget for imposing a one-off tax on the past profits of over 30 such companies, one of which was the Railtrack Group.[3] The so-called windfall tax levied on the Railtrack Group was £156m and was provided for in the profit and loss account for the year ended 31 March 1998 (Railtrack Group PLC, 1998).

The initial public offer of shares in the group was underpriced to ensure that there was enough demand for the shares and possibly also to deepen share ownership, which is where people who already own shares add a further stock to their portfolios. The shares were not underpriced to widen share ownership because it was recognised that Railtrack was towards the end of a long series of government share offers so there was limited opportunity to attract new investors. Also, unlike a lot of earlier government offers, there was a great deal of negative publicity surrounding the privatisation of BR. If there had been insufficient demand for shares in the Railtrack Group the sale would have failed, which would have threatened the entire rail privatisation scheme. The National Audit Office (NAO) have since suggested that the government could have raised much more from the sale of Railtrack Group if the offer had been postponed until autumn 1996 to allow the market more time to get a better understanding of the restructured rail industry, and/or by selling the shares in stages (NAO, 1998). The NAO estimate a further £1.5bn could have been raised with a well structured phased sale of shares.

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[3] The tax retrospectively clawed back some of the windfall gains enjoyed by the companies' shareholders and raised a total of £5.2bn in two stages. £3.5bn was used to finance the welfare-to-work scheme which helped the young and the long-term unemployed into employment.

The railways in other countries such as Sweden, Germany and Argentina have been privatised by vertically separating ownership and control of the infrastructure from operations. Great Britain, however, is the only case where the state did not retain ownership and control of the fixed infrastructure.[4] It was no coincidence either that in Great Britain the infrastructure authority experienced financial difficulties. As the then chief executive of Railtrack, Gerald Corbett, candidly put it:

> 'There is a tension between shareholder interests and public service obligations. The only way we can make profits is by not doing the things that we should do to make the railways better'.[5]

This tension was at the heart of the group's turbulent experience on the stock market. In the early years following privatisation, the group posted some excellent financial results and was the darling of the stock market; its share price peaking at 1768p on 23 November 1998 valuing the company at £8.97bn. The group reported end of year pre-tax profit of £346m, £388m and £428m for 1996/97, 1997/98 and 1998/99, respectively (Railtrack Group PLC, 1997; 1998; 1999). But these results did not quell criticism of Railtrack's record on infrastructure improvement and safety. Intense criticism of Railtrack's record on safety by, among others, the journalist Christian Wolmar (2001, page 249) and former BR safety officer Stanley Hall (2003, page 120) may have been unfair because, using annual data from 1967-2003, Evans (2007) finds no statistical evidence to suggest that there was a deterioration in rail

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[4] We do not carry out an assessment of rail privatisation in various countries here, the reader is instead directed to Shires et al (1994) for a review of seven cases of rail privatisation including those countries where there has been vertical separation of the infrastructure from operations. For a more detailed commentary on rail privatisation in Great Britain see Kain (1998), and Welsby and Nichols (1999).
[5] Interview on the *Today* programme on BBC Radio 4, 17 December 1999.

safety following the privatisation of BR. On the other hand, it could be argued the criticism is justified in light of the letter which the Rail Regulator sent to Gerald Corbett in November 1999 to express concern about the increase in the number of broken rails on the network. In July 1999 there were 937 broken rails, 337 more than Railtrack predicted there would be. There was no appreciable reduction in the number of broken rails by August 2000, so the Rail Regulator announced that independent consultants would be appointed to assess Railtrack's efforts.

In October 2000, a high speed GNER (Great North Eastern Railway) service from London Kings Cross to Leeds derailed near the Hertfordshire town of Hatfield, killing four people and injuring more than 70 others, four of whom were seriously injured. There was a lot of speculation in the media that the accident could have been caused by a broken rail which should have been replaced. The Health and Safety Commission (HSC) directed the Health and Safety Executive (HSE) to investigate the accident but it was not until the HSE published its second interim statement on the crash in January 2001 that it was confirmed the crash was in fact caused by a broken rail which should have been renewed (HSE, 2001).

The Hatfield derailment clearly raised serious concerns at Railtrack about the condition of the track because hundreds of speed restrictions were imposed across the network whilst a large number of sections of track were inspected. The track inspections revealed that the track was in a worse state than Railtrack had thought. Thus, the emergency track repairs and the compensation to operators for the disruption to services was more costly than was anticipated. Railtrack was therefore forced to approach the Rail Regulator for a £1.5bn advance of public support which it

was set to receive over the period 2006-2011. Shortly after Railtrack received the first instalment of the £1.5bn advance, the group revealed that it would pay a final dividend totalling £88.5m even though it had made its first full-year pre-tax loss of £534m (Railtrack Group PLC, 2001).[6] This once again brought to the attention of the government the tension between shareholder interests and public service obligations.

On 1 October 2001, the government withdrew its support by withholding £162m that Railtrack had understood to be guaranteed as part of the £1.5bn advance. The government was of the opinion this rendered Railtrack insolvent and applied to the High Court to have the company placed in administration. Sitting in an emergency session on 7 October 2001 the judge concluded that Railtrack was indeed insolvent, and placed the company in administration. Trading in the group's stock was suspended with its share price having plummeted to 280p, equating to a market valuation of just £1.45bn. Wolmar (2005, page 196) argues, however, that Railtrack was only deemed to be insolvent because senior executives at the company opted to concur with the government's view, rather than try to increase the company's income by applying to the Rail Regulator for an interim review of its access charges.

Railtrack remained in administration for around a year as the government had no clear idea about its successor (Wolmar, 2005, page 212). Eventually the government decided to set up Network Rail to purchase the infrastructure from Railtrack. The model on which Network Rail is based was proposed by Grayling (2001). It is very different from Railtrack in that it is a not-for-profit commercial

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[6] The loss was largely because the bill for the emergency track repairs and compensation stood at £644m, and was set to continue rising. In November 2000, which was before Railtrack had carried out a thorough assessment of the condition of the track, the company predicted that the bill for the track repairs and compensation would be £250m.

company which is limited by guarantee with around 100 stakeholder members as opposed to shareholders. On 3 October 2002, Network Rail purchased the infrastructure from Railtrack for £500m and took responsibility for its £7.1bn of debt.[7]

Initially, the government did not offer any compensation to shareholders when Railtrack was placed in administration. Two shareholder action groups were then formed to campaign for compensation. The first group consisted of around 49,000 small private investors and the second group was made up of institutional investors. When Railtrack went into administration £370m which belonged to the parent group was frozen. The government responded to the creation of the two action groups by offering to distribute the £370m, which equated to compensation of 70p per share. Both groups rejected the offer and brought separate claims against the government for increased compensation. The government then increased its offer by using a combination of tax revenue and £400m raised from the sale of the concession of the right to operate the first phase of the Channel Tunnel rail link from Folkestone to north Kent, which at the time was still under construction. The increased offer of 250p per share was sufficient to persuade the institutional group to drop its claim. The group of private investors, however, continued with their claim for a further 650p per share.[8] Their claim, which was heard at the High Court in July 2005, was

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[7] By taking over Railtrack, Network Rail became culpable for the charges brought against the former in relation to the Hatfield derailment. Network Rail was charged with manslaughter due to gross negligence, and also faced charges relating to health and safety offences. Six men and the company that was responsible for maintenance at the site, Balfour Beatty Rail Maintenance, faced the same charges. The charges against the six men were upheld as were the manslaughter charges against Railtrack and Balfour Beatty. Railtrack and Balfour Beatty were found guilty of health and safety offences. Network Rail was fined £3.5m and Balfour Beatty was fined £10m, but this was reduced to £7.5m on appeal. During the trial it was uncovered that a fault with the track at the site had been discovered some 21 months prior to the accident and for 6 months a new rail had been lying beside the defective section of track waiting to be installed (Wolmar, 2005, page 157).
[8] 900p being the average share price for the previous three years.

thrown out because they did not show that the then Secretary of State for Transport, Stephen Byers, had maliciously and actively sought Railtrack's bankruptcy.

In view of the Railtrack Group's turbulent experience on the stock market an event study methodology is used to quantify the reaction of the stock market to a number of key events. Underpinning event studies is the assumption of semi-strong capital market efficiency (Fama, 1965), which posits that share prices respond immediately to any price sensitive news. To determine how much better/worse than expectations each event was for investors we calculate post event abnormal returns, where an abnormal return is the difference between the actual post event return and the expected return in the absence of the event. All the post event abnormal returns are calculated from an estimate of the market model, which relates the return from holding a particular security to the return from holding the market portfolio.

There are a number of examples of early US studies which analyse stock market reaction to regulatory announcements (for example, Schwert, 1981; Schipper and Thompson, 1983; Binder, 1985; Rose, 1985). More recently, there have been several UK studies which examine stock market reaction to various announcements by public utility regulators such as the Office of Electricity Regulation (OFFER) (Dnes et al., 1998; Robinson and Taylor, 1998; Dnes and Seaton, 1999a); the Office of Water Services (OFWAT) (Sawkins, 1996; Morana and Sawkins, 2000; 2002); and the Office of Telecommunications (OFTEL) (Dnes and Seaton, 1999b). Following the above studies, we examine stock market reaction to a number of announcements by the ORR. But in order to capture fully the various different types

of event which affected the Railtrack Group, we also analyse the stock market reaction to a number of non-regulatory events.

The layout of the remainder of this paper is as follows. In section 2, the 19 key events that have been selected are described. The data and methodology that are used in the empirical analysis are discussed in section 3. In section 4, the results from the econometric models are presented and analysed. Section 5 concludes with a summary of the main findings and a brief comment about a worthwhile area for further work.

## 2. The Key Events

The archives of the *Financial Times* from the flotation of the Railtrack Group (20 May 1996) to the last day of trading before Railtrack entered administration (5 October 2001) are used to select a number of key events to analyse. A number of events are ruled out because there is not a sufficient number of data points prior to the event to undertake the statistical analysis (for example, the Rail Regulator instructed Railtrack to speed up investment in the infrastructure, which was reported in the *Financial Times* on 17 January 1997). Other events are not selected because another event occurred on the same day or soon after making it impossible to disentangle the reaction to each event in isolation (for example, Railtrack's admission that planned investment in the infrastructure for the next ten years would be insufficient because rail travel was set to grow faster than it had predicted was reported in the *Financial Times* on 5 November 1999, as were details of the Railtrack Group's interim results). In all a manageable 19 events are selected for analysis.

A brief summary of the selected events and the date of each is provided in table 1. A more detailed description of the events is available from the author on request. It should be noted, the brief summary of each event and the detailed description are based on the information available on the day of the event as provided in the relevant article(s) in the *Financial Times* and, where the event is of a regulatory nature, in the relevant ORR publication.


[Table 1 about here]


## 3. Data and Methodology

The data which is used to estimate the market models consists of: the daily adjusted closing share price for the Railtrack Group; the daily cash dividend payment per share in the Railtrack Group; and the daily FTSE All-Share Index at the close of trading. All the data was extracted from Datastream so the necessary adjustments for various capital changes (share buy-backs, share splits, rights issues and stock dividends) were made prior to the analysis. The raw data, however, included bank holidays so these observations were excluded. The closing share price for the Railtrack Group from flotation to the suspension of trading in the group's shares is presented in figure 1.


[Figure 1 about here]

As indicated by figure 2, we calculate 255 daily returns for the Railtrack Group which are denoted as $R_i$ in equation 1. From equation 2 we obtain the corresponding number of daily returns for the market portfolio.[10]

[Figure 2 about here]

$$R_i = \frac{P_i + D_i - P_{i-1}}{P_{i-1}} \qquad (1)$$

$$M_i = \frac{FTSE_i - FTSE_{i-1}}{FTSE_{i-1}} \qquad (2)$$

where $R_i$ is the daily return per share in the Railtrack Group on day $i$; $D_i$ is the cash dividend per share in the Railtrack Group on day $i$; $P_i$ and $P_{i-1}$ are the closing share prices for the Railtrack Group on days $i$ and $i$-1, respectively; $M_i$ is the market return on day $i$; and $FTSE_i$ and $FTSE_{i-1}$ are the FTSE All-Share indices at the close of trading on days $i$ and $i$-1, respectively. The FTSE All-Share Index is a better measure of market performance than the FTSE 100 Index because the former accounts for approximately 99 per cent of the capital value of all qualifying UK companies. Inspection of the daily volume of shares in the Railtrack Group that were traded between flotation and suspension indicates that there are no thin trading issues which we need account for in the modelling. This is not surprising because for the majority of the period between flotation and suspension, the Railtrack Group was in the FTSE 100. Specifically, the Railtrack Group entered the FTSE 100 on 18/07/96 and remained there until 18/07/01.

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[10] The date for each event in table 1 corresponds to Day 251 in figure 2.

In terms of the above time line, daily returns for 250 days prior to an event are used to estimate the following market model using both OLS and robust estimators:[11]

$$R_s = \alpha + \beta M_s + \varepsilon_s \qquad (3)$$

where $R_s$ is the daily return per share in the Railtrack Group on day $s$ and $M_s$ is the market return on day $s$. The robust estimators which we use are as follows: Least Absolute Error; Gastwirth (1966); Five-quantile (Judge et al., 1988); Trimean (Tukey, 1970); and Trimmed Least Squares (Ruppert and Carroll, 1980). When the market model is estimated using OLS the residuals are usually characterised by non-normality. This is usually because there is excess kurtosis in the residuals (the distribution of the residuals has fatter tails than the normal distribution). When this is the case, instead of using OLS a robust estimator should be used (Chan and Lakonishik, 1992; Mills et al., 1996; Cable and Holland, 1999) because irrespective of the distribution of the residuals robust estimators are reasonably efficient.

The OLS estimator minimises the sum of the squared residuals and therefore attaches a relatively heavy weight to outliers. This will increase the possibility of a distribution of residuals which has fat tails. In contrast, robust regression techniques are a special form of Weighted Least Squares and attach a smaller weight to outliers. Formally, robust regression estimators minimise the following function:

$$\sum_{s=1}^{S} \psi_\theta(\varepsilon_s) \qquad (4)$$

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[11] All the estimates of the market model reported in this paper are obtained using SHAZAM version 10 (Whistler et al., 2004)

where for $0 < \theta < 1$:

$$\psi_\theta(\varepsilon_s) = \begin{cases} \theta|\varepsilon_s| & \text{if } \varepsilon_s \geq 0 \\ (1-\theta)|\varepsilon_s| & \text{if } \varepsilon_s < 0 \end{cases}$$

When $\theta = 0.5$ we obtain the Least Absolute Error estimator. If the value of $\theta$ is larger (smaller) than 0.5, a bigger penalty is attached to large positive (negative) residuals. By varying $\theta$ between 0 and 1 we obtain a set of regression quantile estimators, $\hat{\rho}(\theta) = (\hat{\alpha}, \hat{\beta})$. We can see from equations 5, 6 and 7 that the general form of the Gastwirth, $\hat{\rho}_{\text{Gast}}$, Five-quantile, $\hat{\rho}_{\text{Five-quant}}$, and Trimean, $\hat{\rho}_{\text{Trimean}}$, estimators are very similar:

$$\hat{\rho}_{\text{Gast}} = 0.3\hat{\rho}(0.33) + 0.4\hat{\rho}(0.5) + 0.3\hat{\rho}(0.67) \tag{5}$$

$$\hat{\rho}_{\text{Five-quant}} = 0.05\hat{\rho}(0.1) + 0.25\hat{\rho}(0.25) + 0.4\hat{\rho}(0.5) + 0.25\hat{\rho}(0.75) + 0.05\hat{\rho}(0.9) \tag{6}$$

$$\hat{\rho}_{\text{Trimean}} = 0.25\hat{\rho}(0.25) + 0.5\hat{\rho}(0.5) + 0.25\hat{\rho}(0.75) \tag{7}$$

The general form of the Trimmed Least Squares estimator, $\hat{\rho}_{\text{Trimmed}}$, is as follows:

$$\hat{\rho}_{\text{Trimmed}} = \frac{1}{1-\gamma} \int_\gamma^{1-\gamma} \hat{\rho}(\theta)\, d\theta \tag{8}$$

where $0 < \gamma < 0.5$. This technique involves calculating $\hat{\rho}(\gamma)$ and $\hat{\rho}(1-\gamma)$, and excluding all observations that lie on or below the $\gamma$-th regression quantile and all

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those that lie on or above the $(1-\gamma)$-th quantile. The remaining observations are used to run an OLS regression.[12]

Without wanting to say too much about the findings of the empirical analysis at this stage, in general, it turns out that all five robust specifications of the market model for each event do not perform well when subjected to the Jarque-Bera test for non-normal residuals. It is argued in due course though that a robust estimate of the market model which is characterised by non-normal residuals is not a great cause for concern. Generally, the Trimean estimate outperforms the other robust specifications when the Jarque-Bera test is carried out. For this reason, further in the paper we draw on the Trimean estimates to proceed with the analysis.

Once the robust estimate of the market model has been obtained the parameters are used to calculate daily abnormal returns for the test period. We follow Cox and Portes (1998) and use a five-day test period:

$$AR_t = R_t - \hat{\alpha} - \hat{\beta} M_t \qquad (9)$$

where $AR_t$ is the abnormal return on day $t$ in the test period; $R_t$ is the actual return per share in the Railtrack Group on day $t$ in the test period; and $M_t$ is the market return on day $t$ in the test period. If the regression residuals are normally distributed the following test statistic, which is due to Patell (1976), can be used to perform a

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[12] When applying the Trimmed Least Squares technique we follow Mills et al. (1996) and employ two specifications of the estimator, one with a trimming proportion of $\theta=0.1$ and one where $\theta=0.2$.

one-tailed test to establish if we may reject the null hypothesis of a zero standardised abnormal return (SAR):[13]

$$\frac{AR_t}{\hat{\sigma}\sqrt{\Phi}} \sim \tau_{S\text{-}2} \qquad (10)$$

where:

$\tau$ is used to denote the *t*-distribution;

$\hat{\sigma} = \sqrt{\dfrac{\sum\limits_{s=1}^{S} AR_s^2}{S-2}}$ is the standard deviation of the abnormal returns over the estimation period;

$\Phi = 1 + \dfrac{1}{S} + \dfrac{(M_t - \overline{M}_s)^2}{\sum\limits_{s=1}^{S}(M_s - \overline{M}_s)^2}$ is the adjustment for the increase in the variance

of the abnormal returns because of prediction outside the estimation period;

and $\overline{M}_s = \dfrac{1}{S}\sum\limits_{s=1}^{S} M_s$ is the mean market return.

Specifically, if the residuals are normally distributed then the test statistic follows a *t*-distribution with *S*-2 degrees of freedom. We standardise the abnormal returns because an abnormal return is a prediction error and it has been known for some time that the variance of prediction errors is larger than the variance of regression residuals (Theil, 1971, pages 122-123). This is because prediction errors depend not just on the disturbance variance but also the estimation error in the parameters.

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[13] Throughout this study we follow Dnes and Seaton (1999a) and perform one-tailed tests.

To capture the entire reaction to an event, a cumulative standardised abnormal return (SCAR) is calculated by aggregating the SARs across the five-day test period. If the residuals are normally distributed, the test statistic below, which is again due to Patell (1976), follows a *t*-distribution with *S*-2 degrees of freedom and can be used to perform a one-tailed test of the null hypothesis that the SCAR is zero:[14]

$$\frac{1}{\sqrt{T}} \sum_{t=1}^{T} \frac{AR_t}{\hat{\sigma}\sqrt{\Phi}} \sim \tau_{S\text{-}2} \tag{11}$$

It has been noted above that in general the five specifications of the market model for each event do not perform well when they are subjected to the Jarque-Bera test for non-normal residuals, but this is not a cause for concern. Even though rejection of the null of normal residuals implies we should exercise caution when making statistical inferences, as robust estimators are asymptotically normally distributed and the sample size is large, it is not unreasonable to assume that a regression coefficient/abnormal return is significant if the associated test statistic is large.

Moreover, abnormal returns are dependent over time because any two abnormal returns that are calculated from the same sample will be a function of the same parameter estimates. In line with most event studies we use test statistics which do not adjust for this dependence. This is because assuming that abnormal returns are serially independent is not a great cause for concern when the test period is short relative to the length of the estimation period (Cowan, 1993). For estimation and test

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[14] The Patell test statistics originate from the accounting literature and were introduced to economics by Dodd and Warner (1983).

periods of varying lengths, Cowan calculates two test statistics for mean abnormal returns across a large number of securities. The first test statistic includes a correction for serial dependence and the second does not. In terms of the notation used in figure 2, the relevant findings are as follows. When $S=240$ the uncorrected and corrected test statistics which relate to a daily abnormal return coincide. Other things being unchanged, the uncorrected test statistic which relates to the cumulative abnormal return becomes increasingly biased as $T$ increases. To illustrate, when $T=2$, $T=11$ and $T=100$ the uncorrected test statistic exceeds the corrected one by 0.1 per cent, 1.9 per cent and 18.5 per cent, respectively, but only in the latter case is the difference significant.


## 4. Results and Analysis

The OLS estimates of the market model are presented in table 2. Following Mills et al. (1996), the OLS estimates are the subject of four standard diagnostic tests: LM test for ARCH residuals; Ramsey RESET test; Box-Pierce-Ljung test for residual serial correlation; and Jarque-Bera test for non-normal residuals. In general, the OLS estimates yield residuals which are not characterised by ARCH. Only the estimate for Event 17 failed the test for ARCH residuals at the 5 per cent level. Moreover, the RESET test results suggest that the specification of the model is only a concern for seven events and there is only evidence to suggest that residual serial correlation is a problem for ten events. The results of these three tests on the OLS estimates are regarded as satisfactory, which is important because as we noted above robust regression techniques were intended only to address the problem of non-normal residuals.

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[Table 2 about here]


As we expected when the Jarque-Bera test is performed on the OLS estimates there is widespread evidence of non-normal residuals. Specifically, for all 19 events the null of normal residuals is rejected at the 5 per cent level. The issue, however, is whether using a robust regression estimator affected the non-normality of the residuals. When the Jarque-Bera test is performed on all six robust specifications for each event, with the exception of the Gastwirth estimate for Event 3, the null is rejected at the 5 per cent level.[15] Hence, in general, for each event the distribution of the test statistics for: (i) the regression coefficients; (ii) the SARs; and (iii) the SCAR will not be known in a finite sample. This is not a cause for concern because as the sample size is large, we can draw on the fact that the robust estimators which we use in this study are asymptotically normally distributed. Thus, it is not unreasonable to conclude that a robust regression coefficient/abnormal return is significant if the associated test statistic is greater than any reasonable critical value. To calculate the abnormal returns we use the Trimean estimates which are presented in table 3.[16] This is because when the six robust specifications are subjected to the Jarque-Bera test, for 17 of the events the Trimean estimate yields the lowest test statistic.[17]


[Table 3 about here]

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[15] In light of the findings of Cable and Holland (2000) it should not be surprising that robust estimates of the market model for a single security yield non-normal residuals. They conclude that an estimate of the market model is only likely to yield normal residuals if a robust regression technique is used in conjunction with average daily return data across at least 60 securities.

[16] The other robust estimates of the market model are available from the author on request.

[17] Moreover, the Box-Pierce-Ljung test results suggest that using a robust estimator has no impact on the serial correlation. Where OLS residuals are serially correlated this is also the case for robust residuals, irrespective of which robust estimator is used.

Before we calculate the abnormal returns we note, compared to the corresponding OLS estimate when the Trimean technique is used, with the exception of Event 19, the constant decreases and in each case the associated test statistic increases, which is what we would expect when less weight is attached to outliers. A similar comparison of the OLS and Trimean coefficients on $M_s$ is not so conclusive. When the Trimean technique is used the coefficient on $M_s$ only decreases for 12 events, but in every case the absolute value of the associated test statistic increases.[18]

The SARs and the SCAR for each event and the associated test statistics are presented in table 4. If the abnormal return is positive (negative) then the group's stock has done better (worse) than was anticipated. Dnes et al. (1998) note that significant abnormal returns are not particularly common in event studies. We, however, obtain at least one SAR which is significant for all but four events (Event 4, Event 10, Event 11 and Event 15) which, to some degree, confirms that the Railtrack Group did indeed have a turbulent experience on the stock market.

[Table 4 about here]

It is remarkable there are no significant negative SARs for Event 15, as this event revealed the scale of the disruption to services as a result of the Hatfield derailment. Railtrack 'panicked' (Wolmar, 2005, page 156) after the Hatfield derailment and embarked on an extensive programme of emergency track repairs.[19]

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[18] The coefficient on $M_s$ for Event 3 is the only Trimean parameter which is not significant but this does not imply that the parameter is zero. Thus, $R_s = 0.0205 - 0.1323 M_s$ is the estimate of the market model which is used to calculate the abnormal returns for Event 3.

[19] The panic following the Hatfield derailment was because Railtrack did not have sufficient knowledge about the condition of the track. The Rail Regulator had been aware of this for some time and took steps to address the issue in November 1999. He proposed a modification of Railtrack's

Negative SARs on test days one, three, four and five for Event 15 are observed which suggests that the group's stock was marked down. Failure to observe significant negative SARs implies that although Railtrack appeared to be in panic mode the group's share price did not go into freefall. It appears that investors held onto their shares, believing that the panic which had set in at Railtrack would not have any long-term implications. This proved to be a serious error of judgement.

We can see from figure 1 that the group's share price when into freefall in early 2001. It appeared the market finally recognised that the panic at Railtrack would have long-term repercussions. For example, it was reported in the *Financial Times* on 16 January 2001 that the increased focus on safety following the Hatfield derailment combined with other funding problems had caused Railtrack's debt to spiral. It was reported that the Rail Regulator might be prepared to sanction a £1bn advance of public support which the company was set to receive over the period 2006-2011, to ensure that expenditure on track maintenance and track replacement was not cut, and big enhancement projects such as second phase of the Channel Tunnel Rail Link were not put on hold.

Smith (2006) carried out a cost-benefit analysis of the two-year period of increased focus on safety following the Hatfield derailment. He found the annual reduction in passenger fatalities from 28 to 15.5 yielded an annual increase in social welfare of £42m. This was dwarfed by the annual increase in industry costs of £2.1bn. These figures suggest the cost of saving an additional life over the two-year

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network licence, which would require the company to establish and maintain an asset register to document the condition and capacity of its assets (ORR, 1999b). This change to Railtrack's network licence came into force in April 2001 (ORR, 2001a). The asset register is now the responsibility of Network Rail.

period was £168m. It is apparent from a simple comparison of this figure with the value of a rail fatality for 2001/02 (£3.35m), as suggested by the Rail Safety and Standards Board, that Railtrack's increased focus on safety after the Hatfield derailment was a gross overreaction.

For eight events only one significant SAR is reported (Event 5, Event 6, Event 7, Event 12, Event 13, Event 16, Event 17 and Event 19). The SARs for Event 13, Event 16 and Event 19 are worthy of further discussion. We might have expected a significant negative SAR on test day one for Event 13. It seems, however, there was no knee-jerk reaction by the market on the day of the Hatfield derailment. We suggest therefore that investors took time to acquire information about the crash. As it became clearer that Railtrack might be to blame, there was a dramatic mark down of the group's stock, hence the negative SAR on test day two. The absence of any significant SARs for the remainder of the test period suggests that the market did not speculate any further about the cause of such an important event. It appears instead that the market chose to postpone its response until the facts about the crash came to light.

The significant SAR on test day three for Event 16 is interesting because some additional news broke on this day. Only two working days after Railtrack's finance director, Steven Marshall, had been promoted to replace Gerald Corbett, it was announced that the chairman of the shadow Strategic Rail Authority (sSRA), Sir Alistair Morton, had been asked by the government to carry out an emergency review of the company's senior management. Although Morton denied he was considering recommending widespread restructuring of Railtrack, he did admit he might favour a

new chief executive and chairman. The market did not take kindly to the prospect of more upheaval in the boardroom, even though it could have been argued that Marshall lacked the necessary experience to spearhead the company's revival in the wake of the Hatfield derailment, having only been in the rail industry for a short period.

Event 19 highlighted the tension between shareholder interests and public service obligations because having embarked on an extensive programme of emergency track repairs following the Hatfield derailment, the Railtrack Group announced that it would pay a final dividend of 17.15p per share totalling £88.5m, even though it had posted its first full-year pre-tax loss of £534m. With an interim dividend of 9.75p per share, the total dividend per share of 26.90p remained unchanged from the previous year. The board's decision to pay a final dividend clearly appeased investors as we report no significant negative SARs.

A number of events yielded more than one significant SAR such as Event 1, Event 14 and Event 18. In the case of Event 1 it is clear the news was worse than the market anticipated because the significant SARs are negative. More specifically, Event 1 refers to the launch of the periodic review of Railtrack's access charges. The Rail Regulator announced that he planned to undertake a wide-ranging review of Railtrack's sources of profit. We may infer from this that the Rail Regulator planned to be much tougher in the future. Alternatively, it could be argued that significant negative SARs indicate that the market overreacted to the news. After all Event 1 marked the beginning of a two-year review so there was plenty of time for the stance of the Rail Regulator to soften.

The significant positive SARs on test days two and three for Event 14 indicate that the news was better than investors expected. In contrast, we conclude from the significant negative SARs on test days two, three and four for Event 18 that the news was worse than anticipated. It is therefore suggested that investors began reacting to both events on test day two. For Event 14, we posit that the delay before the market reacted to the Rail Regulator's final conclusions on the periodic review was because investors needed some time to carry out the necessary calculations. We note with reference to Event 18, however, that the news about the further increase in the cost of the west coast main line upgrade was widely anticipated. Thus, this news would have been capitalised before the event day. It is suggested therefore that there was a delay before investors reacted to Event 18 because they were reluctant to speculate about the conditions which the government would attach to the £1.5bn advance. Instead investors waited for these conditions to be confirmed on test day two. In exchange for the advance, the deputy prime minister revealed that Railtrack had agreed to appoint a government approved director of consumer and public interests. Furthermore, it was announced that Railtrack had lost its monopoly on big enhancement projects that were not already underway.

We also report a significant negative SAR on test day four for Event 14 and a significant positive SAR on test day five for Event 18. These significant SARs were both due to additional pieces of news. The former was because Railtrack revealed it had incorrectly announced that the Carlisle-Glasgow part of the west coast main line would be closed for several days for rail replacement work. It turned out that the track on this section of the line was in better condition than the company thought. Hence,

this section of the line did not remain closed for several days, which again highlights how ill-informed Railtrack was about the condition of the track. The latter was because it was anticipated Railtrack's long-term freight revenue would increase. Specifically, the Strategic Rail Authority (SRA) revealed it had agreed to increase the public subsidy to Railtrack by £497m over the next five years to finance a 50 per cent cut in freight access charges, in an effort to promote an increase in freight movement by rail (ORR, 2001b).

Finally, we briefly discuss an alternative way of presenting the findings. This involves using the SARs in conjunction with the market valuation of the group to calculate the daily and cumulative wealth effects in table 5. A daily wealth effect is the daily change in the market value that can be attributed to the event, and the cumulative wealth effect is the sum of the daily effects across the five-day test period. The daily wealth effect is calculated by simply multiplying the market value at the close of trading on the previous day by the relevant SAR (for example, the daily wealth effect on test day 1 for Event 1 is the market value at the close of trading on Tuesday 9 December 1997, £5443.09m, multiplied by –0.0827).

[Table 5 about here]

## 5. Concluding Remarks

In Great Britain the railways were privatised by vertically separating ownership and control of the infrastructure from operations. Other cases of rail privatisation where there has been vertical separation include Sweden, Germany and Argentina. In each of these three cases the state retained ownership and control of the

fixed infrastructure. In Great Britain, however, the parent company of the infrastructure authority was floated on the London Stock Exchange.

Here we analyse how the stock market reacted to key events involving Railtrack. Such a study is interesting as the Railtrack Group had a turbulent experience on the stock market which culminated in Railtrack being placed in administration and shareholders having to start legal proceedings to extract an offer of compensation from the government. At the outset the group was very much the darling of the stock market. This is evident as the group entered the FTSE 100 just over two months after flotation. There appeared to be, however, an inconsistency between the interests of shareholders and the group's public service obligations, as its excellent financial performance in the early years was marred by criticism of its record on infrastructure improvement and safety.

Most surprising were the results for Event 15, which proved to be integral in the demise of Railtrack. When Railtrack revealed after the Hatfield crash that there would be a six month programme of emergency track repairs because the problem of broken rails was worse than the company thought, we might have expected a number of significant negative SARs. We report some negative SARs which indicates that the group's stock was marked down, but none were significant. This suggests that although panic had set in at Railtrack, the group's share price did not plummet. It appears that many investors held onto their shares, believing that the overreaction by Railtrack would have no long-term impact. This proved to be a huge error of judgement.

The programme of repairs was completed within the six-month timescale that Railtrack set itself. The bill for the repairs and compensation to operators for service disruption, however, was well above Railtrack's original prediction. In early 2001 there was speculation that the post-Hatfield programme of repairs and the ensuing compensation could have some long-term implications, which sent the group's share price into freefall. Specifically, it was revealed that the post-Hatfield safety measures combined with other funding problems had left a big hole in Railtrack's finances and to prevent spending on maintenance and renewal of the track being cut, and/or work on big enhancement projects being put on hold, the Rail Regulator had indicated that he might be prepared to advance the company £1bn of public support that it was set to receive over the period 2006-2011. In April 2001, the Rail Regulator agreed to advance Railtrack £1.5bn of public support that it was set to receive over the next five-year regulatory period, thereby confirming the long-term repercussions of the Hatfield derailment.

Event 19 highlighted the inconsistency between the interests of investors vis-à-vis the interests of rail users because just weeks after Railtrack had received the first instalment of the £1.5bn advance, the group announced that it would pay a final dividend totalling £88.5m even though it had made its first full-year pre-tax loss of £534m. The board's decision to pay a final dividend clearly appeased investors because we report no significant negative SARs. A further instalment of the £1.5bn advance which was due to be paid on 1 October 2001 played a key role in Railtrack's downfall. Railtrack was under impression that the £162m instalment was guaranteed but it was withheld by the Secretary of State for Transport, which ultimately led to company being declared insolvent.

As a final point a worthwhile area for further work is proposed. In this study stock market reaction to a wide range of different types of event has been modelled. It would be worthwhile, however, to use share price data for the Railtrack Group to carry out a study which focuses solely on the reaction to announcements by the ORR. Such a study would complement work which has analysed the stock market reaction to announcements by UK public utility regulators. Moreover, in such a study a comparison could be made between the reaction to announcements by John Swift (Rail Regulator, December 1993-November 1998) and Tom Winsor (Rail Regulator, July 1999-July 2004). This would be interesting because it was widely felt that the regulation of Railtrack by John Swift was too lenient. Tom Winsor on the other hand was much tougher. After presiding over a number of regulatory reforms Winsor was of the opinion that rail regulation was 'fit for purpose' (Winsor, 2002), the suggestion being that there was regulatory failure in the earlier years.

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**Table 1:** Brief Details of the Events

| EVENT NUMBER | EVENT DATE | BRIEF SUMMARY |
|---|---|---|
| 1 | Wednesday 10 December 1997 | The Rail Regulator launched the periodic review of Railtrack's access charges by announcing that he intended to carry out a wide ranging review of the company's sources of profit (ORR, 1997). |
| 2 | Tuesday 2 June 1998 | Railtrack rescued the troubled £5.4bn rail link connecting London with the Channel Tunnel by agreeing to purchase from the construction company, London and Continental Railways, phase 1 of the link upon its completion. |
| 3 | Wednesday 9 December 1998 | The Acting Rail Regulator unveiled plans to cap Railtrack's profit for the next five-year regulatory period which was to begin in April 2001, because he felt the company was making excessive returns on routine track maintenance (ORR, 1998). |
| 4 | Monday 1 February 1999 | Railtrack announced that it plans to commit to riskier projects. |
| 5 | Tuesday 5 October 1999 | A high-speed Great Western service and a local Thames Trains service collided at Ladbroke Grove. |

| 6 | Friday 15 October 1999 | Railtrack has provisionally committed to take over ownership of London Underground's sub-surface lines for a period of ten years. |
|---|---|---|
| 7 | Wednesday 1 December 1999 | Railtrack has had its exclusive option on the 30-year ownership rights for London Underground's sub-surface lines withdrawn. |
| 8 | Wednesday 14 December 1999 | As the Rail Regulator was expected to provisionally conclude that the cap on Railtrack's profit would be loosened for the next five-year regulatory period,[9] the company announced that the cost of the upgrade of the west coast main line linking London and Glasgow had increased to £5.8bn, almost two and half times the original budget. |
| 9 | Tuesday 21 March 2000 | Railtrack learned that it would face a much tougher performance target with respect to reduced delays for 2000/2001 than it had hoped for, but the fine for missing its 1999/2000 performance target would be around £10m and not £40m as had been suggested. |
| 10 | Friday 14 April 2000 | The key features of the Rail Regulator's provisional conclusions on the periodic review of Railtrack's access charges were some new incentives for the company, and a proposal which would make the company more accountable as it would be required to provide the Rail Regulator with detailed information (ORR, 2000a). |

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[9] These details are speculation about the Rail Regulator's provisional conclusions on Railtrack's revenue requirements (ORR, 1999a), which were published the following day and formed part of his periodic review of the company's access charges. The source for these details was an article published in the *Financial Times* on Wednesday 14 December 1999.

| 11 | Tuesday 20 June 2000 | The Rail Regulator announced that he planned to allow Railtrack to increase its access charges over the course of the next two five-year regulatory periods, to claim back nearly all of the overspend on track renewal on the west coast main line over this ten-year period (ORR, 2000b). |
|---|---|---|
| 12 | Thursday 27 July 2000 | The Rail Regulator revealed that he planned to significantly loosen the cap on Railtrack's income for the next five-year regulatory period, and he also intended to monitor the company's spending plans more closely (ORR, 2000c). |
| 13 | Tuesday 17 October 2000 | A high-speed GNER InterCity service from London Kings Cross to Leeds derailed near the Hertfordshire town of Hatfield with four people pronounced dead at the scene and further 30 seriously injured. |
| 14 | Monday 23 October 2000 | The Rail Regulator's final conclusions on the periodic review of Railtrack's access charges (ORR, 2000d) included a number of major departures from the policy proposed in earlier publications, and was regarded as an excellent outcome for the company. |
| 15 | Thursday 2 November 2000 | Railtrack revealed following the Hatfield derailment that there would be a six month programme of emergency track repairs. |
| 16 | Friday 17 November 2000 | Railtrack's chief executive, Gerald Corbett, had his second offer to resign accepted by the company's board of directors. |

| 17 | Thursday 15 February 2001 | Railtrack admitted that the cost of the upgrade of the east coast main line linking London and Edinburgh had soared. |
|----|---------------------------|------------------------------------------------------------------------------------------------------------------------|
| 18 | Monday 2 April 2001 | As the government was about to approve the advance of a £1.5bn subsidy which Railtrack would otherwise have received over the period 2006-2011, the company announced that the cost of the west coast main line upgrade had increased to £6.3bn. |
| 19 | Thursday 24 May 2001 | The Railtrack Group made its first full-year pre-tax loss of £534m, but still announced that it would pay a final dividend totalling £88.5m. |

**Table 2**: OLS Estimates of the Market Model

| EVENT | OLS MODEL | |
|:---:|:---:|:---:|
| | $\alpha$ | $\beta$ |
| 1 | 0.0325* (29.06) | 0.8337* (5.88) |
| 2 | 0.0272* (20.90) | 0.9574* (6.42) |
| 3 | 0.0216* (14.90) | -0.0994 (-0.54) |
| 4 | 0.0202* (14.34) | 0.5024* (4.25) |
| 5 | 0.0177* (12.71) | 0.5184* (4.05) |
| 6 | 0.0171* (12.18) | 0.3977* (2.95) |
| 7 | 0.0176* (12.48) | 0.4307* (3.05) |
| 8 | 0.0178* (12.96) | 0.4444* (3.21) |
| 9 | 0.0216* (12.31) | 5.038* (2.90) |
| 10 | 0.0253* (13.19) | 0.3808* (2.02) |
| 11 | 0.0277* (14.37) | 0.3441 (1.96) |
| 12 | 0.0289* | 0.3603* |

|  |  |  |
|---|---|---|
|  | (14.96) | (2.00) |
| 13 | 0.0303* | 0.3247 |
|  | (16.04) | (1.75) |
| 14 | 0.0301* | 0.3681 |
|  | (15.73) | (1.96) |
| 15 | 0.0305* | 0.4663* |
|  | (15.69) | (2.45) |
| 16 | 0.0311* | 0.4636* |
|  | (16.24) | (2.49) |
| 17 | 0.0318* | 0.5218* |
|  | (18.99) | (3.11) |
| 18 | 0.0294* | 0.7520* |
|  | (19.97) | (5.36) |
| 19 | 0.0304* | 1.0179* |
|  | (17.38) | (5.90) |

Notes:

▪ Test statistics are in parentheses.

▪ If we assume the residuals are normally distributed, the parameters denoted by a * are significant at the 5 per cent level.

**Table 3**: Robust Estimates of the Market Model

| EVENT | TRIMEAN MODEL | |
|:---:|:---:|:---:|
| | $\alpha$ | $\beta$ |
| 1 | 0.0319* | 0.8149* |
| | (55.82) | (11.24) |
| 2 | 0.0269* | 0.9519* |
| | (40.44) | (12.47) |
| 3 | 0.0205* | -0.1323 |
| | (23.92) | (-1.22) |
| 4 | 0.0188* | 0.5875* |
| | (22.99) | (8.56) |
| 5 | 0.0167* | 0.5630* |
| | (20.71) | (7.62) |
| 6 | 0.0158* | 0.4611* |
| | (19.89) | (6.05) |
| 7 | 0.0163* | 0.5410* |
| | (20.70) | (6.85) |
| 8 | 0.0163* | 0.5645* |
| | (20.77) | (7.13) |
| 9 | 0.0192* | 0.4749* |
| | (19.12) | (4.76) |
| 10 | 0.0223* | 0.4806* |
| | (20.91) | (4.61) |
| 11 | 0.0247* | 0.3359* |
| | (22.15) | (3.30) |
| 12 | 0.0269* | 0.3182* |

| | | |
|---|---|---|
| | (24.14) | (3.06) |
| 13 | 0.0284* | 0.2234* |
| | (27.09) | (2.17) |
| 14 | 0.0282* | 0.2054* |
| | (27.36) | (2.03) |
| 15 | 0.0287* | 0.3046* |
| | (25.77) | (2.79) |
| 16 | 0.0291* | 0.3109* |
| | (26.59) | (2.92) |
| 17 | 0.0305* | 0.3116* |
| | (32.29) | (3.31) |
| 18 | 0.0282* | 0.5816* |
| | (35.91) | (7.76) |
| 19 | 0.0312* | 0.7800* |
| | (38.83) | (9.84) |

Notes:

- Test statistics are in parentheses.

- The sample size is large and the robust regression estimators used in this study are asymptotically normally distributed. In light of this, we conclude that the parameters denoted by a * are significant at the 5 per cent level.

**Table 4:** Abnormal Returns

| EVENT | TEST DAY 1 ABNORMAL RETURN | TEST DAY 2 ABNORMAL RETURN | TEST DAY 3 ABNORMAL RETURN | TEST DAY 4 ABNORMAL RETURN | TEST DAY 5 ABNORMAL RETURN | 5-DAY CUMULATIVE ABNORMAL RETURN |
|---|---|---|---|---|---|---|
| 1 | -0.0827* (-4.69) | -0.0503* (-2.83) | 0.0142 (0.81) | -0.0396* (-2.24) | -0.0111 (-0.63) | -0.1696* (-4.29) |
| 2 | 0.0436* (2.13) | 0.0166 (0.81) | 0.0525* (2.56) | -0.0128 (-0.62) | -0.0108 (-0.53) | 0.0892* (1.95) |
| 3 | -0.0473* (-2.06) | -0.0308 (-1.34) | -0.0119 (-0.51) | 0.0903* (3.94) | -0.0327 (-1.43) | -0.0324 (-0.63) |
| 4 | 0.0263 (1.17) | -0.0201 (-0.90) | -0.0019 (-0.09) | 0.0143 (0.64) | 0.0043 (0.19) | 0.0228 (0.45) |
| 5 | -0.0085 (-0.38) | -0.0351 (-1.59) | -0.0305 (-1.38) | 0.0217 (0.99) | -0.0428* (-1.94) | -0.0950* (-1.92) |
| 6 | 0.0471* (2.10) | -0.0012 (-0.05) | 0.0256 (1.15) | -0.0049 (-0.22) | -0.0043 (-0.19) | 0.0625 (1.24) |
| 7 | -0.0580* (-2.60) | -0.0154 (-0.69) | 0.0004 (0.02) | -0.0132 (-0.59) | -0.0199 (-0.89) | -0.1062* (-2.13) |
| 8 | 0.0893* (4.10) | 0.1482* (6.79) | 0.0624* (2.87) | 0.0311 (1.43) | -0.0249 (-1.14) | 0.3061* (6.28) |
| 9 | 0.0700* (2.52) | 0.1229* (4.42) | 0.0273 (0.98) | 0.0328 (1.17) | 0.0078 (0.28) | 0.2609* (4.19) |
| 10 | 0.0508 (1.64) | -0.0496 (-1.59) | 0.0408 (1.33) | 0.0149 (0.48) | -0.0030 (-0.10) | 0.0538 (0.79) |
| 11 | 0.0016 | 0.0225 | 0.0009 | -0.0130 | 0.0201 | 0.0321 |

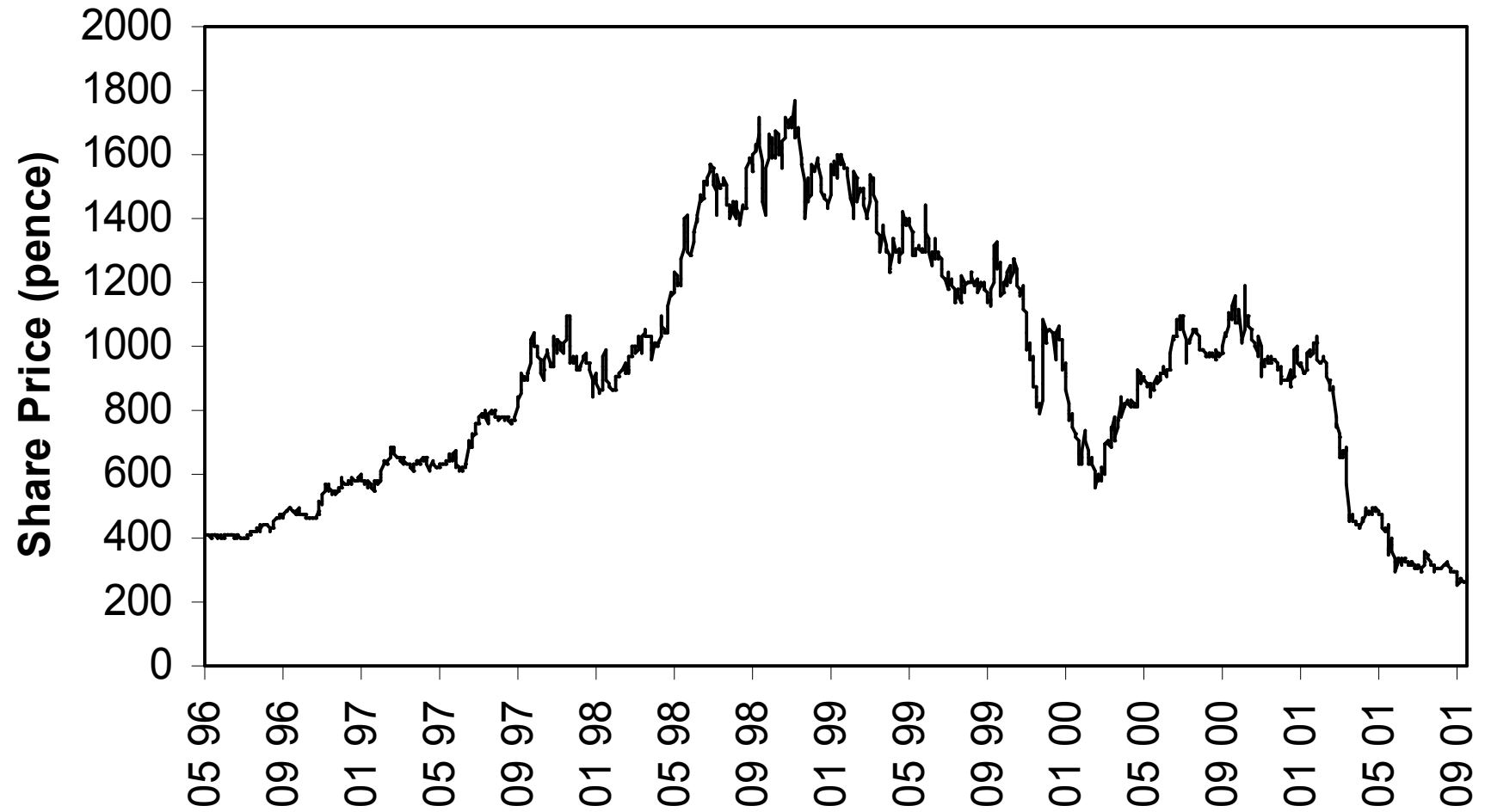| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.05) | (0.73) | (0.03) | (-0.42) | (0.65) | (0.47) |
| 12 | 0.0096 | 0.0555* | 0.0017 | 0.0073 | 0.0060 | 0.0802 |
| | (0.31) | (1.81) | (0.06) | (0.24) | (0.20) | (1.17) |
| 13 | 0.0117 | -0.0832* | -0.0186 | 0.0063 | 0.0289 | -0.0550 |
| | (0.39) | (-2.76) | (-0.62) | (0.21) | (0.96) | (-0.82) |
| 14 | 0.0293 | 0.0515* | 0.0665* | -0.0524* | -0.0354 | 0.0595 |
| | (0.96) | (1.69) | (2.18) | (-1.72) | (-1.16) | (0.87) |
| 15 | -0.0197 | 0.0021 | -0.0307 | -0.0145 | -0.0192 | -0.0820 |
| | (-0.64) | (0.07) | (-0.99) | (-0.47) | (-0.62) | (-1.19) |
| 16 | 0.0184 | -0.0374 | -0.0909* | 0.0498 | -0.0005 | -0.0606 |
| | (0.60) | (-1.23) | (-2.98) | (1.64) | (-0.02) | (-0.89) |
| 17 | -0.0214 | -0.0574* | -0.0065 | -0.0039 | 0.0087 | -0.0805 |
| | (-0.80) | (-2.15) | (-0.24) | (-0.15) | (0.32) | (-1.35) |
| 18 | 0.0313 | -0.1575* | -0.1232* | -0.0436* | 0.0845* | -0.2086* |
| | (1.34) | (-6.74) | (-5.21) | (-1.86) | (3.60) | (-3.97) |
| 19 | 0.0439 | -0.0132 | -0.0358 | 0.0275 | 0.0472* | 0.0695 |
| | (1.57) | (-0.47) | (-1.29) | (0.99) | (1.69) | (1.12) |

Notes:

▪ Test statistics are in parentheses.

▪ The sample size is large and the robust regression estimators used in this study are asymptotically normally distributed. In light of this, we conclude that the abnormal returns denoted by a * are significant at the 5 per cent level.
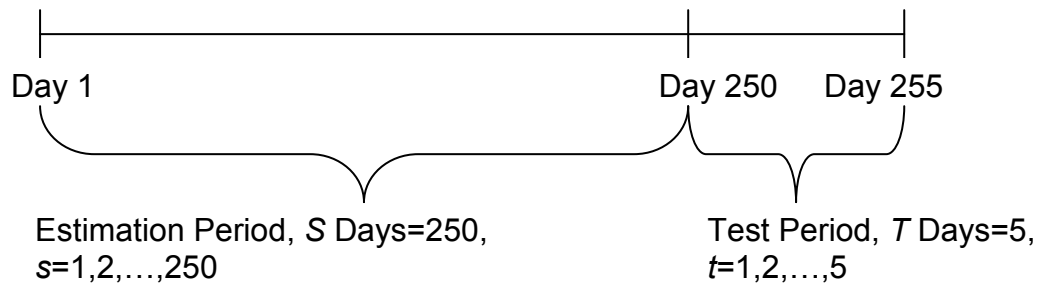
**Table 5:** Wealth Effects

| EVENT | DAY 1 WEALTH EFFECT (£ MILLIONS) | DAY 2 WEALTH EFFECT (£ MILLIONS) | DAY 3 WEALTH EFFECT (£ MILLIONS) | DAY 4 WEALTH EFFECT (£ MILLIONS) | DAY 5 WEALTH EFFECT (£ MILLIONS) | 5-DAY CUMULATIVE WEALTH EFFECT (£ MILLIONS) |
|---|---|---|---|---|---|---|
| 1 | -450.29 | -252.48 | 67.44 | -192.71 | -52.96 | -925.00 |
| 2 | 265.75 | 106.49 | 347.31 | -89.15 | -76.12 | 552.42 |
| 3 | -365.29 | -227.53 | -85.29 | 641.53 | -253.94 | -268.80 |
| 4 | 205.09 | -163.47 | -15.48 | 113.80 | 34.96 | 176.98 |
| 5 | -57.67 | -236.31 | -197.73 | 137.46 | -274.82 | -618.69 |
| 6 | 280.90 | -7.22 | 155.79 | -30.52 | -26.29 | 385.79 |
| 7 | -286.08 | -71.11 | 1.63 | -58.62 | -85.84 | -506.59 |
| 8 | 377.23 | 671.55 | 319.10 | 168.06 | -137.73 | 1302.77 |
| 9 | 216.62 | 396.59 | 96.95 | 116.99 | 28.48 | 816.49 |
| 10 | 214.29 | -215.24 | 163.86 | 61.96 | -12.76 | 257.03 |
| 11 | 7.29 | 107.99 | 4.41 | -60.67 | 95.19 | 158.42 |
| 12 | 47.43 | 287.30 | 8.76 | 38.29 | 31.65 | 416.16 |
| 13 | 67.29 | -439.72 | -96.66 | 32.93 | 156.39 | -275.73 |
| 14 | 158.39 | 294.32 | 408.00 | -305.64 | -199.66 | 353.66 |
| 15 | -106.50 | 11.41 | -162.09 | -75.93 | -99.06 | -405.73 |
| 16 | 97.52 | -191.73 | -422.86 | 243.05 | -2.42 | -291.82 |
| 17 | -111.50 | -282.85 | -31.53 | -19.22 | 42.43 | -397.62 |
| 18 | 110.93 | -463.25 | -305.01 | -100.89 | 207.08 | -742.33 |
| 19 | 307.64 | -90.98 | -245.94 | 189.32 | 316.60 | 517.21 |

**Figure 1:** Closing Share Price for the Railtrack Group from Flotation to Suspension (20/05/1996 to 05/10/2001)

**Figure 2:** Time Line for the Analysis of each Event



Day 1                                      Day 250    Day 255

Estimation Period, $S$ Days=250,              Test Period, $T$ Days=5,
$s$=1,2,…,250                                  $t$=1,2,…,5

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