Information Quality and Risk Around Mergers and Acquisition Announcements: Evidence From the London Stock Exchange

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Abstract: We consolidate our understanding of the link between risk and quality of news around information-intensive periods for a sample of 169 stocks from London Stock Exchange by using mergers and acquisitions announcements as a source of unscheduled news disclosure. We document that volatility of stock returns around mergers and acquisitions announcements is directly related to the quality of the news disclosed and inversely related to the amount of pre-announcement information. These results are consistent with the hypothesis that firms with a lot of prior information tend to experience relatively less price volatility around mergers and/or acquisitions announcements than firms with little pre-announcement information. The evidence also supports the assertion that firms that disclose precise information about their take-over activities should, on average, undergo relatively large price volatility than firms that announce imprecise information about their take-ôver intentions. This evidence provides a partial support for theoretical work of McNichols and Trueman (1994). Overall, the implication of Kim and Verrecchia's (1991a, 1997) propositions regarding volatility carry over to unscheduled news releases. The evidence also suggests that widening the event window give rise to results that are generally incompatible with the propositions of Kim and Verrecchia (1991a, 1997) and McNichols and Trueman (1994).

INTRODUCTION

In the hope of shedding more light on the association between assets' returns volatility (systematic risk) around information-intensive periods and the quality of information disclosed, this paper examines the impact of the quality of unscheduled news releases on risk around material information events. Kim and Verrecchia (herein after KV 1991, 1997) analysis implies that volatility of share price returns around such events is increasing in the precision of new information released and decreasing in the amount of information known by the market in the prior period. The analysis conducted in this paper use take-over announcement as a source of information. Take-over announcements are unscheduled and generally bring a lot of surprises to market participants. These kinds of announcements constitute a subset of a general information structure considered by McNichols and Trueman (hereafter MT, 1994). In the MT's economy, it is possible for a public news release to occur with probability less than unity.[1] According to MT (1994), the magnitude of announcement date price reaction will be positively related to the quality (precision) of the news disclosed by a public announcement as long as informed traders do not endogenously determine the precision of the pre-announcement private information.

Non-scheduled news announcements typically bring a lot of surprises to the market, and so it may take a relatively longer time for prices to converge to the new equilibrium.[2] This implicitly assumes that investors trade for several rounds before they eventually learn the full implication of the unscheduled news announcements. According to this point of view the announcement-day shocks originating from non-scheduled news releases should exert longer lasting effects (on average) into the price process. This explanation fits intuitively with KV's (1991b) observation that the market reaction to news disclosure differs for different types of news releases. This observation, in turn, prompts some additional empirical investigation on the relation

1 In MT's economy, traders are assumed to be risk-neutral

2 One example of such events is the "Russian Crisis" of the early 1990's involving a military confrotation between Yeltsin and the hardliners in the Russian Parliament. Another example is the announcement of a merger or acquisition.

between risk around unscheduled public newsreleases, the quality of pre-announcement information, and the precision of the public news disclosure.

Although an explicit analytical relationship between variance of price changes and the quality of news around unscheduled information disclosure is absent in KV's (1991a, 1997) analysis, the current investigation provides an empirical equivalent of such investigation. In other words, the analysis provides some insights into the robustness of the predictions of the propositions put forward by KV (1991a, 1997) under a variety of information structures. The current analysis can also be viewed as a barometer for assessing the validity of the argument put forward by MT (1994).

The paper is organised as follows: The next section describes the data, and section 3 introduces the methodology of the analysis. Section 4 presents the model that links announcement period volatility and the quality of information. In section 5, the hypotheses to be tested in the paper are introduced, and the discussion of our empirical findings is presented in section 6. Section 7 assesses the sensitivity of empirical results to the widening of announcement window, and the last section concludes the findings of the paper.

THE DATA

In this study, mergers and acquisitions (jointly known as take-overs) announcements are chosen to represent a subset of unscheduled news disclosures whose release dates are associated with significant movements in stock prices (see for example, Jensen and Ruback, 1983; Harris and Raviv, 1988; Rosett, 1990 and Brous and Kini, 1993). In addition, mergers and acquisitions announcements are assumed to be homogeneous classes of events. Mergers and acquisition news announcements dates for each sample firm are identified by using Financial Times Extel Company Research CD-ROMs.

Sample firms are drawn from the London Stock Exchange. The firms were originally drawn from FTSE 350 constituents and were required to be continuously listed over the full sample period. These firms have a history of share prices for a period covering 1st January 1990 to 31st December 1998. We choose these firms because they are actively traded, and closely watched stocks. Several investment services predict both the date and content of these firms' forthcoming announcements. We choose actively traded stocks because this property helps to mitigate the problem of autocorrelation biases originating from non-trading of stocks. The other criterion used to select a company in the final sample is data availability.

In the spirit of obtaining meaningful results, we require a firm to have at least 5 mergers or acquisition events during the period of analysis. The choice of 5 announcements is arbitrary, but this number is considered reasonable enough to allow reliable conclusions from the analysis. This criterion together with data availability condition generates a sample of 169 firms with a total of 2828 mergers or acquisition events, about 17 events per firm.

Consistent with Jones *et. al.* (1994) and Abhyankar *et. al.* (1997), the analysis conducted in this paper makes use of the adjusted closing middle daily market prices obtained from Datastream service to compute daily log returns.[3] The same procedure is applied in the computation of daily log returns implied by the FT All Share Index.

We follow Hsieh *et. al.* (1999) and Mohamed and Yadav (2002)[4] to construct surrogates for the quality (precision) of information releases, control variables and the other remaining variables. Further, the announcement prices for

3 Returns for holidays are removed. This procedure effectively reduces the sample size to 2277 daily return observations for each of the firms analysed in the sample.

4 Prof. Yadav, formerly from the University of Strathclyde is currently visiting Professor at the University of Carlifornia ,L.A. This paper was presented at the 29th meeting of the European Finance Association

$\hat{\varepsilon}_{jt}$ from (1) are employed to estimate volatility models used in this paper.

Measurement of Stock Returns Volatility

We define the unbiased estimate of conditional return standard deviation of firm j on day t as $\sigma_{jt} = |\hat{\varepsilon}_{jt}|\sqrt{\pi/2}$. Bessembinder and Seguin, (1992); Ederington and Lee, (1996) and Buckle *et al.*, (1998) are examples of research papers that have made use of this measure of "volatility."

We have chosen the absolute volatility measure for the following reasons. First, Schwert and Seguin (1990) show that if one assumes conditional (on observable variables) normality, $\hat{\varepsilon}_{jt}$ can be used to obtain unbiased estimate of the daily return standard deviation. Second, measures of volatility (standard deviation) based on squared returns or residuals are inherently more sensitive to outliers than is absolute deviations (see, Chambers and Penman, 1984; Rohrback and Chandra, 1989; Blazenko, 1997; and Granger and Sin, 1999). Granger and Sin (1999), for instance, argue that squared returns and conditional variance may be too sensitive to extreme values. A related point of view is documented by Schwert and Seguin (1990: 1147) who argue that absolute value measures of firm or portfolio variance are preferred to squared return measures. This appear to suggest that absolute value metrics of risk may command more power than the class of ARCH models in terms of both in-sample goodness of a fit and post-sample forecastability of volatility. Third, Davidian and Carroll (1987), Rohrback and Chandra (1989), Schwert and Seguin (1990), Granger and Ding (1995), and Bessembinder *et. al.*, (1996) demonstrate that the non-normality of returns in general, and the fat-tails of return distributions in particular, have a larger effect on a standard deviation measure than absolute value measure of volatility. Given the attractiveness and performance of the "absolute" value risk metric, we choose to estimate volatility using (2) overleaf:

the current analysis are those prices that fall in the mergers and acquisition announcement window. As a result, the pre-and post-announcement prices are all prices that fall outside the event window.

METHODOLOGY

Estimation of Unexpected Returns

The procedure used to generate residuals, $\hat{\varepsilon}_{jt}$, is similar in spirit to that found in Pagan and Schwert (1990); Bessembinder and Seguin (1992); Engle and Ng (1993); Jones *et al.* (1994) and Loudon *et. al.*, (2000). Equation (1) summarises the procedure followed to generate unexpected returns series:

$$R_{jt} = \alpha_{j0} + \sum_{k=1}^{4} \alpha_{jk} D_k + \sum_{i=1}^{5} \beta_{ji} R_{jt-i} + \varepsilon_{jt} \qquad (1)$$

where Rjt is the rate of return to a security j on day t, jk for k = 0, 1,..., 4 and jk for k = 1, 2,..., 5 are regression parameters, and D1 to D4 are (0,1) dummy variables for the days-of-the-week used to capture the differences in mean returns.[5] The days-of-the-week dummy variables are defined as follows: D1 equals 1 on Tuesdays and zero otherwise, D2 equals 1 on Wednesdays and zero otherwise, D3 equals 1 on Thursdays and zero otherwise, and D4 equals 1 on Fridays and zero otherwise. The lagged values of Rjt account for the documented evidence that returns on individual securities are correlated (see for example, Lo and MacKinlay, 1988 and De Jong *et al.*, 1992).[6] Since returns used in this study are computed using the middle closing prices, such correlation are likely to be caused by the problem of infrequent trading rather than measurement errors due to the bid-ask bounce. The residuals,

5 See, for example, French (1980), Keim and Stambaugh (1984), Bessembinder and Seguin (1992), Jones *et al.* (1994), and Loudon *et al.* (2000)

6 The Akaike Information Criteria (AIC) was used to determine the maximum number of lags to be used in model (1).

$$\sigma_{jt} = \delta_{j0} + \delta_{j1} D_A + \sum_{\tau=1}^{10} \rho_{j\tau} \sigma_{jt-\tau} + \theta_{j1} \hat{\varepsilon}_{jt-1} + v_{jt} \qquad (2)$$

where $\sigma_{jt} = |\hat{\varepsilon}_{jt}| \sqrt{\pi/2}$ is the unbiased estimate of conditional return standard deviation of firm j on day t, D_A is an announcement dummy which assumes the value of one on the mergers and acquisitions announcement date and on the preceding and post-announcement day and has the value of zero otherwise, δ_{j1} is the increase (decrease) in conditional return standard deviation in the mergers and acquisitions event window, $\rho_{j\tau}$ for $\tau = 1, 2, \ldots, 10$ are the measures of persistence in volatility of security j, while δ_{j0} and θ_{j1}, are the remaining regression parameters.[7]

The lagged values of standard deviation estimates that appear on the right-hand-side of (2) capture the tendency for large (small) changes in volatility to persist.[8] This is similar to the approach followed by Bessembinder and Seguin (1992), Jones *et al.*, (1994), and Daigler and Wiley (1999) and is a standard practice in the Autoregressive Conditional Heteroscedasticity (ARCH) literature (see Bollerslev *et al.*, 1992; Bera and Higgins, 1993; and Bollerslev *et. al.*, 1994). The lagged raw residual, $\hat{\varepsilon}_{jt}$-1, accounts for the tendency of changes in stock prices to be negatively correlated with stock volatility (see for example, Christie, 1982; Black, 1976; Nelson, 1991; Glosten *et al.*, 1993).[9]

7 Consistent with Dejong et.al., (1992) and Jones *et al.*, (1994), we ignore the day-of -the-week differences in mean standard deviations.

8 The Akaike Information Criteria (AIC) was used to determine the maximum number of lags to be used in model (2).

9 Model (2) assumes that higher lags (≥ 2) of the estimated residuals are less important in determining the leverage effect. This assumption makes model (2) very parsimonious so that only 13 parameters need to be estimated from the model.

EMPIRICAL MODEL FOR ANNOUNCEMENT VOLATILITY AND INFORMATION QUALITY

A formal test of the association between volatility of stock returns around mergers and acquisitions announcements, the amount of the pre-announcement information, and the realised precision of the take-over announcement is carried out using the model:[10]

$$L\left(\sigma_{j2}^2 / \sigma_{j1}^2\right) = \lambda_0 + \lambda_1 \mathrm{LSIZE}_j + \lambda_2 \mathrm{PAN1}_j + \lambda_3 \mathrm{MCEPS}_j + \lambda_4 L\left(\sigma_{m2}^2 / \sigma_{m1}^2\right) + \lambda_5 L(1 + D_j) + \xi_j \qquad (3)$$

where j represents firms. λ, $\lambda_1, \ldots, \lambda_5$ are regression parameters, σ_{j2}^2 (σ_{m2}^2) and are the announcement and the pre-announcement levels of volatility for a security (market) respectively. SIZEj is the total market value of outstanding shares of a firm for the period January 1990 to December 1998. This is used as a surrogate for the amount of pre-announcement information and it follows from Atiase, (1985); Bamber, (1987), Atiase and Bamber, (1994); Kim *et al.*, (1997), and Utama and Cready (1997). PAN1 is a surrogate for precision of an announcement as defined in Mohamed and Yadav (2002),[11] while MCEPS is the magnitude of the average change in earnings per share for firm j and follows Hsieh *et al.*, (1999). The variable D_j is a proxy for the net change in the degree of leverage for the period January 1990 to December 1998. This proxy is estimated using [DFL(t+1)DOL(t+1) DFLtDOLt], where the subscript (t+1) denotes the period January 1990 to December 1998 and t denotes the period January 1988 to December 1989. The degree of financial leverage, DFLj = TADFj/TADFj + Ej and the degree of financial

10 See Mohamed and Yadav (2002).

11 For clarity we write the expression for the proxy for an average precision as PRNI = STD(P_1/P_2)/STD(V//P_2), where PRN1 denotes our first measure of precision, and STD(.) is a standard deviation operator, P1 (P2) denote the pre-announcement (announcement) price, and V = u is the fundamental ("intrinsic") value of a firm. The "intrinsic" value, V, for a firm is approximated using an earnings-based valuation model (residual income valuation model) similar to that adopted by D'Mello and Shroff (2000).

leverage, $DOL_j = NFA_j/TA_j$. In this definition, the variable $TADF_j$ denotes the sum of preference capital, borrowings due within one year, and long-term borrowing, amount of long-term debt, Ej denotes equity capital and reserves, NFAj is the net fixed assets, and TAj is the total assets in firm j. The use of the said proxies is motivated by data availability. Implicit in our computations is that DOL and DFL are good instrumental (proxy) variables for the "true" degrees of operating and financial leverages as defined by Mandelker and Rhee (1984). The operator $L(\theta)$ stands for the natural logarithm of θ, ξ_j, is the error term for firm j, and all the other independent variables are as defined in Table 1. We assume that the random error, ξ_j, captures additional factors that affect volatility of stock returns around mergers and acquisitions announcements periods but not introduced in model (3).

HYPOTHESES TO BE TESTED

Since the main focus is this paper is to assess the association between volatility of asset returns, the quality of pre-announcement information, and the precision of take-over announcements, then only two main hypotheses are constructed. These hypotheses are based on the predictions of KV (1991a, 1997) and MT (1994).

The first hypothesis, H_{01}, focuses on the link between volatility of stock returns around mergers and acquisitions announcements and our surrogate for the amount of pre-announcement information. Formally, this hypothesis is stated as follows:

Hypothesis 1: There is an inverse relationship between volatility around mergers and acquisitions announcements and the proxy for the amount of pre-announcement information.

$H_{01}: \lambda_1 \geq 0$

$H_{A1}: \lambda_1 < 0$

The null of hypothesis 1 asserts that firms with a lot (small amount) of prior information are expected to undergo relatively large (small) shifts in volatility at the time of mergers and acquisitions announcements. While the alternative states that there is a negative association between risk shift and the amount of prior information around mergers and acquisitions announcements. At a chosen level of significance, the rejection of H01 would imply that the anticipation or non-anticipation of a public announcement does not affect the (inverse) relationship between announcement period volatility and the quality of prior information. That is, firms with a lot of pre-announcement information will generally experience less returns' volatility during public announcement regardless of whether the announcement was anticipated or not.

Following KV (1991a, 1997) and MT (1994) we would expect that volatility shift around mergers and acquisitions announcements to be directly related to our proxy for the precision of the announced news. This insight leads to our second hypothesis:

Hypothesis 2: The shift in volatility around the time of mergers and acquisitions announcements is positively related to the precision of the announcement.

$H_{02}: \lambda_2 \leq 0$

$H_{A2}: \lambda_2 > 0$

The null hypothesis H_{02} advocates that mergers and acquisitions announcements with high (low) precision are associated with low (high) shifts in volatility, while the alternative H_{A2} proclaims that there is a positive association between shifts in volatility and the precision of information released around the time of mergers and acquisitions announcements.

EMPIRICAL RESULTS

Preliminary Analysis

Before we turn to the results of the main hypotheses being tested, we take a quick look at the descriptive statistics that appear under table 1 and 2. Table 1 presents Pearson correlation matrix for the variables of interest, while Table 2 presents parameter estimates for the "volatility" equation.

Correlation Analysis for Firm-specific Variables

Table 5.1 gives a summary of correlation matrix (Pearson) for changes in volatility around dividends and earnings announcements, the surrogate for the amount of pre-announcement (precision of) information, and other control variables used in model (3). The natural logarithm of relative volatility for security j, $L\left(\sigma_{j2}^2/\sigma_{j1}^2\right)$, is constructed using estimates of model (2), while $L\left(\sigma_{m2}^2/\sigma_{m1}^2\right)$ is constructed using estimates from the standard GJR-GARCH (1,1) model. All the other variables are as defined under Table 1.

It is evident that both, the measure of the amount of pre-announcement information and the surrogate for the precision of mergers and acquisition announcements are correlated with $L\left(\sigma_{j2}^2/\sigma_{j1}^2\right)$, and their respective correlation coefficients have the predicted signs. The sample correlation between the surrogate for the amount of pre-announcement information and $L\left(\sigma_{j2}^2/\sigma_{j1}^2\right)$ is -0.278 and is highly significant [p-value = 0.000]. The correlation coefficient between $L\left(\sigma_{j2}^2/\sigma_{j1}^2\right)$ and the surrogate for precision, PRN1, is 0.190 and significant at levels of significant more than 1.3 percent. Thus, *ceteris paribus*, the surrogate for the amount of pre-announcement information appears to have more power in explaining shifts in volatility around earnings and dividend news release dates than the proxy for the quality of news released during mergers and acquisitions announcements. This preliminary evidence suggests that the extent of price volatility around mergers and acquisitions announcements dates largely depend on the amount of information (about the take-over) available (leaked) before an official public announcement, and the quality of the news (about take-over) disclosed. Thus, all else being equal, price volatility around mergers and acquisitions announcements should be greater for firms with relatively little amount of pre-announcement information than for firms with a lot of prior information. On the other hand, the evidence suggests that, ceteris paribus, firms that announce precise (imprecise) information about their mergers and acquisitions intentions should experience larger (small) price volatility.

The remaining pairs of variables have insignificant correlation coefficients, the exception being the sample correlation for LSIZE and $L\left(\sigma_{m2}^2/\sigma_{m1}^2\right)$, and PRN1 and $L\left(\sigma_{m2}^2/\sigma_{m1}^2\right)$. The correlation coefficient between the surrogate for the amount of pre-announcement information and $L\left(\sigma_{m2}^2/\sigma_{m1}^2\right)$ -0.136 (p-value = 0.078), whereas the surrogate for the precision of a merger or acquisition announcement and $L\left(\sigma_{m2}^2/\sigma_{m1}^2\right)$ have a correlation of 0.189 with a p-value of 0.014.

Inference drawn from Table 1 supports the predictions of Kim and Verrecchia (1991a, 1997) and MT (1994). Specifically, the evidence suggests that stock return volatility around mergers and acquisitions announcements is inversely related to the amount of pre-announcement information but is directly related to the precision of the take-over news released. Thus, the preliminary evidence collected so far seem to suggest that returns' volatility at the time of a public news release is positively (negatively) related to the precision of the news released (the amount of pre-announcement information) regardless of whether the announcement was anticipated or not. However, inferences drawn from a multivariate setting are likely to be more appealing than the pair-wise correlations reported in table 1 because by construction, a multivariate specification controls for the interaction between variables of interest.

Ordinary Least Squares Estimates for Model (1)

We turn next to the ordinary least squares (OLS) regressions for exploration of the announcement day volatility increases as well as the degree of volatility persistence implied by volatility specification in (2). The use of OLS estimation procedure to estimate parameters of volatility model 2 follows a practice similar to that adopted by Bessembinder and Seguin (1992).[12] Table 2 documents the estimation results.

The first, the 14th and the last row of Table 2 show estimates of parameter δ_{jo}, O_{j1}, and the adjusted R^2 respectively. Their cross-sectional mean (median) values are 0.613 (0.592), -0.008 (-0.004), and 9.1 percent (8.3 percent) respectively.[13] Their respective standard deviations are 0.190, 0.035, and 4.2 percent. As seen, the estimates of δ_{jo} are all positive and significant. This guarantees a positive estimate for the unconditional volatility of a typical stock in the sample. On the other hand, the last two columns of Table 2 show that about 58 percent of firms demonstrate that bad news are associated with higher volatility than good news. However, less than 50 percent of these cases demonstrate significant asymmetric impact of news on volatility.

Consistent with the evidence documented in, among others, Jensen and Ruback (1983), Harris and Raviv (1988), Rosett (1990), and Brous and Kini (1993), it seems that mergers and acquisition announcements are associated with significant movements in stock prices. On mergers and acquisitions announcement days, volatility of a typical stock is generally higher than average for about 59.0 percent of sample stocks, while the remaining 41.0 percent of sample firms experienced decreases in volatility. The cross-sectional average (median) increase of the conditional return standard deviation is 0.125 (0.056) with a standard deviation of 0.363. Although only 32 (and about 4) percent of the volatility increase (decrease) cases are significant, the overall evidence is generally supportive of the notion that news releases cause a shift in fundamental asset values.

The small increase in risk around mergers and acquisition announcements could be interpreted in at least two ways. First, because the sample firms are relatively large and largely followed by analysts, it is possible that news about mergers and acquisition leak to the market well before the information is made public. If this happens, the market will anticipate most of the information content of the forthcoming take-over announcement, and so the announcement will bring little surprises and hence weak price reaction at the time of an announcement. An alternative explanation is based on investors ability to process unanticipated news announcements. If, as expected, mergers and acquisition news announcements typically bring a lot of surprises to the market, market participants may trade for several rounds before they eventually learn the full implication of the announcement. Under this scenario, it may take a relatively longer time for prices to converge to the new equilibrium. According to this point of view, a relatively wider window may be needed to "fully" capture the announcement effect. This possibility is explored later in this paper.

Table 2 shows that cross-sectional average estimates for the measures of persistence in volatility, $\rho_j\tau$ for $\tau = 1, 2, \ldots, 10$ are individually statistically different from zero at all conventional levels. This picture is a fair reflection of the characteristics of individual securities displayed in the last two columns of Table 2. Thus, the evidence is consistent with the ARCH literature that old news contains useful information about future volatility. The cross-sectional mean (median) value of volatility persistence, *p*, for a typical stock considered in the analysis is 0.529 (0.535) with a standard deviation of 0.096. This is indicative of the persistent nature of the

12 As a robustness check, the SUR estimation procedure was also tried for a sub-sample of stocks, but parameter estimates remained practically similar to OLS estimates.

13 The mean adjusted R^2 indicates that past values of volatility are important determinants of current return variability.

information contained in mergers and acquisition announcements.

The Association Between Return Volatility and Information Proxies

The results from estimating our test model are provided in Table 3. For all the panels, the dependent variable $L(\sigma_{j2}^2/\sigma_{j1}^2)$ is denoted by LRRV. As mentioned earlier, the LRRV is constructed using estimates from "volatility" model 2. The detailed procedure of constructing LRRV is explained in the table. The maximum lag length used to estimate Newey-West standard errors is 4. The figures in parentheses are p-values corresponding to the null hypothesis H_0: PES = 0 against the alternative H_A: PES $\neq$ 0, for all parameters, except for λ_1 and λ_2, for which one-tailed p-values are reported in line with the structure of hypothesis 1 and hypothesis 2.

Since we are primarily interested in hypotheses H_{01} and H_{02}, for brevity, we do not conduct detailed formal hypothesis testing regarding the control variables. This is a standard practice in empirical studies of this nature. The discussion below assumes the use of White (1980b) standard errors in the computations of test statistics unless otherwise stated. Although this choice is arbitrary, the conclusions that follow are invariant to the use of Newey-West (1987a) standard errors.

In order to validate the results of the preliminary analysis of subsection 6.1.1, we assess the magnitude and significance of the estimate of coefficient λ_1 and λ_2. Panel A of table 3 shows that the surrogate for the amount of pre-announcement information, LSIZE, is negatively related (coefficient -0.103) to volatility of asset returns around mergers and acquisitions announcements. Moreover, the p-value corresponding to the estimate for λ_1 is equal to 0.000, indicating that $\hat{\lambda}_1$ is significant at all conventional levels. On the basis of these findings, we reject the null hypotheses H01 at all levels.

Panel A also suggests that the proxy, PRN1, for the precision of the information content of the announced mergers and acquisitions is positively related to volatility of asset returns around these announcements. The mean estimate of λ_2 is 0.733 and is statistically significant at all conventional levels. Again, it is obvious that the evidence presented in Table 3 categorically rejects the null hypothesis H_{02} at conventional levels of significance.

Two important conclusions emerge from the above discussion. First, the evidence reported above is generally consistent with the preliminary conclusions drawn from the simple pair-wise correlation analysis of subsection 6.1.1. That is, on average, the evidence suggests that returns' volatility at the time of mergers and acquisitions is positively (negatively) related to the precision of the news released (the amount of pre-announcement information). Consistent with MT's (1994) proposition, it seems that informed traders do not endogenously determine the precision of the pre-announcement private information. Otherwise, the magnitude of announcement date price reaction to mergers and acquisition announcements would not be positively related to the quality (precision) of the news disclosed by take-over announcements.

Secondly, to the extent that the empirical surrogate for the quality of pre-announcement and event-period information are reasonable proxies for the two unobservable qualities of information, the accumulated evidence so far is in line with the predictions of the analytical work of KV (1991a, 1997). Specifically, KV predict that, at the time of anticipated public news release, there is a positive (negative) association between stock returns' volatility and the precision of the news released (the quality of the pre-announcement information). Since similar conclusions have been documented using scheduled news announcements,[14] we find it reasonable to conclude that the predictions the analytical work of KV (1991a,

14 See for example, Hsieh *et al.* (1999) and Mohamed and Yadav (2002).

1997) carry over to unscheduled news announcements.

SENSITIVITY OF EMPIRICAL RESULTS TO THE WIDENING OF ANNOUNCEMENT WINDOW

In previous sections it was argued that non-scheduled news announcement like mergers and acquisitions may typically bring a lot of surprises to traders and so a wider window may be required to capture the announcement effect. This argument implicitly assumes that traders take a relatively longer time to learn the full implications of merger and acquisition announcements.

In the hope of enriching our understanding of risk dynamics around unanticipated irregular news announcements, this sub-section re-examines the association between risk, the quality of pre-announcement information and the precision of take-over announcements by using a relatively wider announcement window. While it is not easy to establish the optimum announcement window capable of capturing the impact of mergers and acquisition announcements, the analysis presented in this subsection assumes that a 12-day event window is a reasonable compromise.[15]

Table 4 reports on parameter estimates for our test models when a 12-day mergers and acquisitions announcement window is used. The results reported use volatility risk metric derived from model (2). The surrogate for precision of a disclosure PRN1 retains its initial definition.

The estimate of λ_1 reported under table 4 is 0.011. The sign of this estimate is not consistent with the predictions of KV (1991a, 1997). However, this does not pose any serious problem since the estimate is statistically insignificant at conventional levels. This finding is obviously not consistent with the predictions of hypothesis H_{A1}.

The OLS procedure provides positive estimates for λ_2. The sign of this estimate is consistent with the predictions of KV (1991a, 1997) and MT (1994). That is, the evidence suggests that the announcement date price reaction is positively related to the surrogate of precision employed. The lack of meaningful association between volatility around take-over announcements and the chosen proxies for the amount of pre-announcement information and the quality of news disclosed is also echoed by a generally poor explanatory power of the test model as shown in the table. Overall, the evidence provides no support for KV (1991a, 1997) predictions.

The evidence presented in table 4 appears to suggest that the widening of mergers and acquisitions announcement window generates results that are not supportive of either KV (1991a, 1997) or MT (1994). Given that there is a very large probability for a wider event-window to capture effects unrelated to a take-over announcement, the likelihood of arriving at bogus inferences is enormous. In its entirety, increasing announcement window appears to potentially distort the link between risk, the amount of pre-announcement information, and the quality of mergers and acquisition announcements.[16]

CONCLUSION

This paper has examined the association between risk (volatility), the quality of pre-announcement information and the precision of the news released for the case of mergers and acquisitions

15 A 12-day announcement window used is defined as (-1, 0, +1, ..., +10). That is, the window includes a day before announcement, the day of a take-over announcement, and 2-trading weeks after the announcement.

16 So far the analysis of the association between the metrics of risk and the quality of information has used the levels of the surrogate of precision of news disclosure. As part of the analysis, we repeated the tests using the ranked values of the quality of the news disclosed. The ranked precision, PRNRj, employed is defined as PRNRj =[Rank (PRNj) - 1]/ [N-1], where N is the total number of observations in the (cross-sectional) sample, Rank (O) is an operator that is order preserving and ranks values in such a way that the largest value has a rank of N and the smallest value has a rank of 1. The results of the tests (not reported here) give rise to qualitatively similar conclusions.

announcements. The analysis has been applied to 169 sample stocks from the London Stock Exchange that had mergers and acquisitions announcements for the period 1st January 1990 to 31st December 1998. The main objective of the analysis has been to consolidate our understanding of the link between risk and quality of news around information-intensive periods. We started with a proposition that conclusions based on scheduled news announcements might not necessarily apply to unanticipated irregular news announcements because of the propensity for the two categories of news to bring different price adjustment processes. Using mergers and acquisitions announcements as a representative of unscheduled irregular news disclosures, the current investigation has helped to refine some issues that were not addressed in the theoretical work of KV (1991a, 1997) and the empirical work of Hsieh et al. (1999) and Mohamed and Yadav (2002).

We present the findings of the paper as follows. First, when a [-1, 0, +1] days announcement window is used, our results show that returns' volatility at the time of mergers and acquisitions is generally positively (negatively) related to the surrogate for precision of the news released (the amount of pre-announcement information). These results are consistent with the hypothesis that firms with a lot of prior information before a public disclosure of mergers and/or acquisitions announcements tend to experience relatively less price volatility than firms with little pre-announcement information. The evidence also supports the assertion that firms that disclose precise information about their mergers and/or acquisitions activities announce-ments should, on average, undergo relatively large price volatility than firms that announce imprecise information about their take-over intentions. This evidence provides a partial support for theoretical work of MT's (1994). Overall, the finding exhibit a mirror image of the behaviour of volatility of stock returns around scheduled news events. That is, the evidence reported here appear to suggest that the implication of KV's (1991a, 1997) propositions regarding volatility carry over to unanticipated news releases.

Second, a re-examination of the association between risk, the quality of pre-mergers and acquisitions information, and the precision of these announcements by using a [-1, 0, +1, ..., +10] days event window reveals the following. Increasing announcement window causes the significant association between volatility and the empirical surrogates for the precision to disappear. This most likely reflects an increase in noise in the event window stemming from other pieces of news unrelated to mergers and/or acquisition announcements.

Table 1: *Correlation (Pearson) Matrix for Regression Variables*

This table shows the degree of association between volatility around mergers and acquisitions announcements, the surrogate for the amount of pre-announcement information, the precision of the disclosed news, and the other control variables used in the analysis for a sample of 169 firms from London Stock Exchange. The figures in parentheses are p-values corresponding to a null hypothesis H_0: $\rho_{ij} = 0$; where ρ_{ij} is the coefficient of correlation. For a reasonably large sample the null is rejected when p-value< the chosen level of significance.

The variables σ^2_{j2} (σ^2_{j1}), σ^2_{m2} (σ^2_{m1}), SIZE, MCEPS, and D denote the announcement (the pre-announcement) levels of volatility for a security j, the announcement (the pre-announcement) levels of volatility for the market portfolio, the mean market value of security j (in millions of pounds), the magnitude of the average change in net earnings per share adjusted for rights and scrip issues, and the proxy for the net change in degree of leverage. The variable D is formed by using the instrumental variable of the degree of operating leverage and the proxy for the degree of financial leverage for the period January 1990 to December 1998 respectively. The operator L(θ) stands for the natural logarithm of θ. Volatility estimates for a given security j are estimated using the absolute value risk metric specified in (2). For the market portfolio, estimates of volatility are obtained by using the standard GJR-GARCH (1,1) without a dummy variable for security's mergers and acquisitions release days. The variable PRN1 is the surrogate for the precision of mergers and acquisitions announcements and is defined under section 4.

	$L\left(\sigma^2_{j2}/\sigma^2_{j1}\right)$	LSIZE	PRN1	MCEPS	D
LSIZE	-0.278 (0.000)*				
PRN1	0.190 (0.013)**	0.088 (0.253)			
MCEPS	0.011 (0.890)	-0.095 (0.220)	-0.100 (0.194)		
D	0.047 (0.549)	0.039 (0.615)	0.033 (0.671)	0.006 (0.939)	
$L\left(\sigma^2_{m2}/\sigma^2_{m1}\right)$	-0.005 (0.950)	-0.136 (0.078)***	0.189 (0.014)**	-0.096 (0.216)	0.019 (0.806)

Notes:

* Indicates the rejection of the null hypothesis at all conventional levels, ** and *** indicate statistically significant correlation at the 5, and 10 percent levels of significance.

Table 2: *Standard Deviation Parameter Estimates Based on Model (2)*

This table presents summary statistics (cross-sectional) for volatility parameter estimates for a sample of 169 firms over the period January 1, 1990 to December 31, 1998 with a total of 2277 observations. Volatility inputs are estimated under the assumption of [-1, 0, +1] days announcement window. Formally, we estimate the following volatility equation for each security analysed in the empirical work:

$$\sigma_{jt} = \delta_{j0} + \delta_{j1} D_A + \sum_{\tau=1}^{10} \rho_{j\tau}\sigma_{t-\tau} + \theta_{j1}\varepsilon_{jt-1} + v_{jt}$$

, where $\sigma_{jt} = \left|\hat{\varepsilon}_{jt}\right|\sqrt{\pi/2}$ is the unbiased estimate of conditional return standard deviation of firm j on day t, D_A is an announcement dummy which assumes the value of one on the merger and/or acquisition announcement date and on the preceding and post-announcement day and has the value of zero otherwise, δ_{j1} is the increase (decrease) in conditional return standard deviation on the day of a merger and/or acquisition announcement, $\rho_{j\tau}$ for $\tau = 1, 2, \ldots, 10$ are the measures of persistence in volatility of security j and $\rho = \sum_{\tau=1}^{10} \rho_{j\tau}$, while δ_{j0} and θ_{j1}, are the remaining regression parameters. Consistent with Bessembinder and Seguin (1992), results reported are based on OLS estimation. The residuals $\hat{\varepsilon}_{jt}$ used to estimate the standard deviation model are generated by model (1).

The symbol PEST, MN, MD, STD, SGP, IGP, SGN, and IGN denote parameter estimate, arithmetic mean, median, standard deviation, significantly positive, insignificant but positive, significantly negative, and insignificant but negative at 5 percent significant level respectively. The column labelled p-value shows the alternative hypothesis (in parentheses) and the corresponding probability (attained α of the test) of obtaining a value as large in magnitude (extreme or more extreme) as the t-statistic corresponding to null hypotheses H_0: $\delta_{j0} = 0$, H_0: $\delta_{j1} \leq 0$, H_0: $\rho_{j1} = 0$, H_0: $\rho_{j2} = 0$, H_0: $\rho_{j3} = 0$, H_0: $\rho_{j4} = 0$, H_0: $\rho_{j5} = 0$, and H_0: $\rho_{j6} = 0$, H_0: $\rho_{j7} = 0$, H_0: $\rho_{j8} = 0$, H_0: $\rho_{j9} = 0$, H_0: $\rho_{j10} = 0$, and H_0: $\theta_{j1} \geq 0$ respectively. For a reasonably large sample the null is rejected when p-value< the chosen level of significance.

PEST	MN	P-value	MD	STD	SGP (IGP)	SGN (IGN)
δ_{j0}	0.613	0.000($\neq$ 0)	0.592	0.190	169(0)	0(0)
δ_{j1}	0.125	0.000(>0)	0.056	0.363	24(75)	3(67)
ρ_{j1}	0.174	0.000($\neq$ 0)	0.168	0.057	169(0)	0(0)
ρ_{j2}	0.067	0.000($\neq$ 0)	0.068	0.034	141(22)	0(6)
ρ_{j3}	0.053	0.000($\neq$ 0)	0.052	0.031	120(44)	0(5)
ρ_{j4}	0.037	0.000($\neq$ 0)	0.035	0.029	83(70)	1(15)
ρ_{j5}	0.034	0.000($\neq$ 0)	0.034	0.029	80(68)	0(21)
ρ_{j6}	0.032	0.000($\neq$ 0)	0.033	0.029	76(70)	2(21)
ρ_{j7}	0.032	0.000($\neq$ 0)	0.029	0.030	70(78)	1(20)
ρ_{j8}	0.034	0.000($\neq$ 0)	0.035	0.031	82(59)	1(27)
ρ_{j9}	0.029	0.000($\neq$ 0)	0.028	0.029	72(70)	1(26)
ρ_{j10}	0.036	0.000($\neq$ 0)	0.036	0.027	87(63)	0(19)
ρ	0.529	0.000($\neq$ 0)	0.535	0.096	-	-
θ_{j1}	-0.008	0.001(<0)	-0.004	0.035	19(52)	45(53)
Adjusted R^2	0.091	-	0.083	0.042	-	-

Notes: An alternative, and perhaps more plausible, test for ρ_{ji} would be a joint F-test for the hypothesis that the lagged values of standard deviation have no role to play in explaining standard deviation at time t. But since a test of joint volatility persistence (for up to ten lags) is not the primary focus of this work, we choose to ignore the F-test.

Table 3: *Parameter Estimates Based on the Regressions of Relative Volatility Around Mergers and/or Acquisitions Announcements on Firm Specific Variables*

This table reports regression results for the test model used to conduct hypothesis tests of the empirical relationship between relative volatility for a firm, relative changes in volatility for the market portfolio, and other firm-specific characteristics for a sample of 169 firms from London Stock Exchange. Volatility inputs are estimated under the assumption of [-1, 0, +1] days announcement window. The test model is specified as:

$$L\left(\sigma_{j2}^{2}/\sigma_{j1}^{2}\right) = \lambda_0 + \lambda_1 LSIZE_j + \lambda_2 PRN_j + \lambda_3 MCEPS_j + \lambda_4 L\left(\sigma_{m2}^{2}/\sigma_{m1}^{2}\right) + \lambda_5 L(1 + D_j) + \xi_j$$

, where j represents firms, λ_0, λ_1,..., λ_5 are regression parameters, σ_{j2}^{2} (σ_{m2}^{2}) and σ_{j1}^{2} (σ_{m1}^{2}) are the announcement and the pre-announcement levels of volatility for a security (market) respectively. The operator L(θ) denotes the natural logarithm of θ, ξ_j is the error term for firm j. We assume that the random error, ξ_j, captures additional factors that affect volatility of stock returns around earnings and dividends announcement dates but not introduced in the above model. The variable PRN1 denotes the surrogate of precision. All the other independent variables that appear in the model above are defined in table 1. Volatility estimates for a given security j are estimated using the absolute value metric specified in (2). For the market portfolio, estimates of volatility are obtained by using the standard GJR-GARCH (1,1) model. The natural logarithm of volatility ratios $L\left(\sigma_{j2}^{2}/\sigma_{j1}^{2}\right)$ is referred to as LRRV.

The symbol PR, PS, PES, W-se, and NW-se denote parameter of interest, predicted sign of the parameter, parameter estimate, White (1980b) standard error, and Newey-West (1987a) standard error respectively. The maximum lag used in the computations of Newey-West standard errors is 4. The symbol UN, NG, and PO are used to denote unknown, negative, and positive signs respectively.

The figures in parentheses are p-values corresponding to a null hypothesis H_0: PES = 0 against the alternative H_0: PES ≠ 0, for all parameters, except for λ_1 and λ_2, for which one-tailed p-values are reported in line with the structure of hypothesis 2 and hypothesis 3. For a reasonably large sample the null is rejected when p-value< the chosen level of significance.

PR	λ_0	λ_1	λ_2	λ_3	λ_4	λ_5	Adj.R^2 (%)
PS	UN	NG	NG	PO	UN	PO	-

Dependent Variable is the LRRV Implied by Model 2 and Precision Surrogate is PRN1

PES	0.982	-0.103	0.733	0.000	-0.301	0.015	10.70
W-se	0.324 (0.003)	0.028 (0.000)	0.239 (0.002)	0.008 (0.957)	0.234 (0.201)	0.097 (0.881)	
NW-se	0.327 (0.003)	0.029 (0.000)	0.204 (0.000)	0.007 (0.956)	0.237 (0.207)	0.093 (0.876)	

Table 4: *Parameter Estimates Based on the Regressions of Changes in Risk Around Firms' Mergers and/or Acquisitions Announcements on Firm Specific Variables for a Wider Event Window*

This table reports regression results for the test model used to conduct hypothesis tests of the empirical relationship between the level of risk around mergers and acquisition announcements and other firm-specific characteristics for a sample of 169 firms from the London Stock Exchange. Volatility inputs are estimated under the assumption of [-1, 0, +1, ..., +10] days announcement window. The model estimated is:

$$L\left(\sigma_{j2}^2/\sigma_{j1}^2\right) = \lambda_0 + \lambda_1 \mathrm{LSIZE}_j + \lambda_2 \mathrm{PRN}_j + \lambda_3 \mathrm{MCEPS}_j + \lambda_4 L\left(\sigma_{m2}^2/\sigma_{m1}^2\right) + \lambda_5 L(1+D_j) + \xi_j$$

Where j represents firms, $\lambda_0, \lambda_1, \ldots, \lambda_5$ are regression parameters, σ_{j2}^2 (σ_{m2}^2) and σ_{j1}^2 (σ_{m1}^2) are the announcement and the pre-announcement levels of volatility for a security (market) respectively. The operator $L(\theta)$ denotes the natural logarithm of θ, ξ_j is the error term for firm j. We assume that the random error, ξ_j, captures additional factors that affect volatility of stock returns around mergers and acquisition announcement dates but not introduced in the above model. Volatility estimates for a given security j are estimated using the absolute value metric specified in (2). For the market portfolio, estimates of volatility are obtained by using the standard GJR-GARCH (1,1) model. The natural logarithm of volatility ratios $L\left(\sigma_{j2}^2/\sigma_{j1}^2\right)$ is referred to as LRRV. All the other variables are as defined in table 3.

The symbol PR, PS, PES, W-se, and NW-se denote parameter of interest, predicted sign of the parameter, parameter estimate, White (1980b) standard error, and Newey-West (1987a) standard error respectively. The maximum lag used in the computations of Newey-West standard errors is 4. The symbol UN, NG, and PO are used to denote unknown, negative, and positive signs respectively.

The figures in parentheses are p-values corresponding to a null hypothesis H_0: PES = 0 against the alternative H_0: PES $\neq$ 0, for all parameters, except for λ_1 and λ_2, for which one-tailed p-values are reported in line with the structure of hypothesis 2 and hypothesis 3. For a reasonably large sample the null is rejected when p-value< the chosen level of significance.

PR	λ_0	λ_1	λ_2	λ_3	λ_4	λ_5	Adj.R^2 (%)
PS	UN	NG	NG	PO	UN	PO	-
Dependent Variable is the LRRV Implied by Model 2 and Precision Surrogate is PRN1							
PES	-0.419	0.011	0.027	-0.003	0.228	-0.057	0.00
W-se	0.274	0.025	0.221	0.006	0.204	0.098	
	(0.127)	(0.322)	(0.451)	(0.552)	(0.266)	(0.562)	
NW-se	0.233	0.022	0.213	0.006	0.192	0.085	
	(0.074)	(0.298)	(0.449)	(0.563)	(0.238)	(0.506)	

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