JOURNAL
OF EUROPEAN ECONOMY
Vol. 11. Special issue – 2012
Publication of Ternopil National Economic University

Maoguo WU

SIGNALLING IN THE STOCK MARKETS: EVIDENCE FROM JUVENTUS FC

Abstract

In the paper, we examine the key drivers of the stock prices of a publicly traded football club, Juventus Football Club, one of the leading football clubs in the Italian Serie A. The underlying financial theory that we apply and test is the news model, which states that changes in the stock prices are the results of the emergence of the unexpected new public information. When applying it to sport industries, it can be understood that unexpected match results affect stock price of the club. In addition, by bringing the reversed news model into the paper, we test whether major corporate governance related events have any explanatory effect on stock prices.

JEL: G19.

Introduction

Based on the news model and the reversed news model, we examine the two kinds of drivers of stock prices. The news model is tested by using the signals which can be identified as the new public information. The fundamental assumption of the news model is that financial markets are efficient in a semi-strong form, so that all publicly available information is incorporated into the stock prices when the information is released. Past studies of similar purpose

Wu Maoguo, University of Aberdeen.

tend to set financial earning statistic as signal. They often use earning announcements, dividend payouts etc. However, it is usually difficult in practice to collect these data for small investors. These data are irregularly published by public companies, often have intervals of a quarter or six months. Another problem is that data can be easily manipulated, we need to take a prudent attitude towards them. By choosing a publicly traded football club, in this case Juventus Football Club and using the football match results as signals, the problem associated above can be solved. The first advantage for this approach is that signals become frequent and regular. Football matches take place regularly in the competitive season (normally take place once a week), so these signals frequently feed to financial markets. The second advantage is the openness of the signals. Match results are access free and they normally cannot be fixed. Last but not the least, football matches usually take place when markets are closed. This gives sufficient time for investors to absorb new information. According to the news model, only expectation errors, which are the differences between actual and expected results, have impacts on stock prices. Therefore, we mark this expectation error as signal here and in turn is the explanatory variable. Signals can be abstracted from the actual results. We assume that investors form some expectations over the outcome prior to the match. This will be estimated using the betting odds for the game. This method is commonly used in existing literatures (Lehmann, Weigand (1998), Dobson, Goddard (2001)). When coming to the reversed news model, the approach is opposite to that in the news model. It is introduced in the paper to have some robustness checks, and so to avoid pitfalls in similar traditional studies.

Before going straight into the subject, we need to first check if sport performance does matter for sports clubs. We conduct the paper in such a way that we assume there is a link between the performances of the football team and the revenues of the club. We find that various past research paper support this idea. Angel Barajas, Carlos Fernández-Jardón and Liz Crolley (2005) found that «a better sports performance is a source of higher revenues for Spanish clubs»1. Szymanski and Kuypers (1999), Deloitte and Touche (1999, 2000b) both argued that good performance on the pitch leads to a high revenue income. The basic reason behind is club's reputation. Football clubs make majority of their revenues in three ways: selling broadcasting rights, selling tickets and merchandises and through commercial advertising and sponsoring. When football team performs well long enough, the club gets more reputable and it can gain recognitions in the public. Tickets and team related merchandise sales will go up. Because of all the publicity, clubs will attract more advertising opportunities or more sponsorship. When teams do well, they tend to stay longer in the competition. Thus more can be gained for selling broadcasting rights. In football industry, higher revenues mean higher profits. When teams perform well, inves-

[1] Angel Barajas, Carlos Fernández-Jardón and Liz Crolley (2005): Does sports performance influence revenues and economic results in Spanish football, pp. 11. They conclude that there exists a non-linear relationship between the match performances and the expected incomes.

tors' expectation of dividends goes up, so the stock price rises as well. As a result, we form the following hypotheses:

H_1: a surprised won match can influence stock prices positively.

H_2: a surprised lost match can influence stock prices negatively.

It is also reasonable to think that European games should have a greater effect on the stock prices than national level games. The reason is that European competitions typically are more appealing. Club can generate greater both financial and sports benefits in European games.

The structure of this paper will be as follows: In Section 2, we focus on data processing, preparing stock price and index, interpreting the betting odds for matches and obtaining the expectation errors. In Section 3 we run regressions of the stock prices on expectation errors on match days and in full sample range. We test to see if empirical evidence does support the theory. In Section 4, the reversed news model is used to test for robustness. This approach investigates any «forgotten» variables that been missed out in the regressions. Finally, we conclude this paper and point out any shortcomings of the approach that we adopt.

Data Processing

The main idea of the paper is that «only the difference between the realized fundamentals and the expected fundamentals has to be regarded as the news component»[2], quoted from Georg Stadtmann (2006). In other words, only expectation errors can affect stock prices. The sample data that we use in the paper consists of all Italian Serie A and Champion League games played by Juventus from 20th Dec 2001 to 31st May 2006. We also use the share prices of Juventus and index of Milan exchange in the same time span. The share and index data are obtained from uk.finance.yahoo.com. It gives detailed historical data for the two participants in the website. We only use the closing prices for each in our analysis. Also, instead of the actual price, we use the logarithms of both time series. Since football games usually happen in the afternoon or in the evening at weekends, we therefore attach every match related variable to the following working day when financial market is open, e.g. if Juventus plays on Saturday, the game outcome corresponds to the following Monday's share price. We define match day as the working day followed by the one there is a match takes place. There are 163 Serie A games and 52 Champion League games played in the time span, share prices and index can be categorized into two types: match day data and non-match day data. We mainly use match day data in the model.

[2] Georg Stadtmann (2006): Frequent News and Pure Signals: The Case of a Publicly Traded Football Club, pp. 7.

Table 1

Number of games played and the categories

	Juventus Italian Serie A	Juventus Champion League	Inter Milan Italian Serie A
No. games played	163	52	163

Betting odds are used as proxies for investor's ex-ante belief of the game outcomes. Such proxy is broadly used in existing research paper (e. g. Brown, Hartzell (2001) and Palonino, Renneboog and Zhang (2005)). They give objective measures of forecast using the expertise of the betting company; in turn reflect investor's expectation. The betting odds are obtained from www.betexplorer.com. The website provides odds for home wins, draws and home loses for both Champion League and Serie A matches. We calculate the mark-up for each game then subsequently yield the probability of winning, drawing and losing.

$$\Pr ob_{win}(or \Pr ob_{draw} or \Pr ob_{lose}) = \frac{1/Odd_{win}(or 1/Odd_{draw} or 1/Odd_{lose})}{1/Odd_{win} + 1/Odd_{draw} + 1/Odd_{lose}}$$

Table 2

Betting odds and Probabilities for the match outcome

Date	Teams	Result	Betting odds			Mark-up	Probability		
			1	X	2				
25/2/03	Juventus-Manchester United	0:3	2.04	3.1	3.55	1.094	0.4479	0.2947	0.2574
4/12/05	Fiorentina-Juventus	1:2	3.09	2.99	2.26	1.101	0.2941	0.3039	0.4021
5/4/06	Juventus-Arsenal	0:0	1.84	3.32	3.89	1.102	0.4933	0.2734	0.2333

Teams	Actual points	Expected points	Unexpected points
Juventus-Manchester United	0	1.6384	-1.6384
Fiorentina-Juventus	3	1.5100	1.4900
Juventus-Arsenal	1	1.7532	0.7532

For example, on 25th Feb 2003, Juventus played against Manchester United at home. The odds were 2.04, 3.1 and 3.55 for a home win, a draw and a home loss respectively. It means a bettor can put $1 on a Juventus lose; he will receive $3.55 if Juventus turns out to lose. From the odds, we see that Juventus was the slight favour. We get the mark-up of 1.094 for the game by 1/2.04+1/3.1+1/3.55. Thus the probability of a home win is 44.79% (1/(2.04 * 1.094)), a draw of 29.47% and a loss of 25.74%. In a football match, a team receives 3, 1 or 0 points respectively when it wins draws or loses. As the result, the expected point of Juventus in this game is 1.6384 (3*44.97+1*29.47%). It turned out that Juventus lost the game and consequently received 0 point. The expectation error resulted is therefore –1.6384 (0–1.6384). Hence there was a downwards pressure on the stock price.

Using the findings from Georg Stadtmann (2006), other factors such as a player renewing his contract, players exchanging, hiring new players do not appear to significantly influence the share price of a football club. We therefore do not include any of these variables in the regressions.

Regression results

Before running any regressions, the two time-series (share price of Juventus and index of the Milan exchange) need to be tested for stationarity. In general, financial time-series such as equity price and index are typically non-stationary. We use standard ADF test for unit roots. It appears that neither of the logged series is stationary. However, the first differences of both logged series turn out to be stationary. Therefore, we use the percentage change of both variables (1st difference of the logged series) for regressions.

Regress stock price on index first.

$$DLJUV = \beta_0 + \beta_1 DLINDEX \quad (1)$$

[3]

where *DLJUV* is the percentage change of the share prices and DLINDEX is the percentage change of the market index. We find that from since the club went IPO in Dec 2001, on average share price deviates 0.3% for every 1% change in the index. The coefficient β_1 appears to be much larger if we use the match day sample. The share price increases 0.7% for every 1% increase in the index. Nevertheless we can separate the effects of common market conditions from the variables we want to examine by working on Regression 1b. Thus we regard it as our benchmark regression.

[3] The t-statistics are based on heteroskedastic standard errors in all the regressions followed.

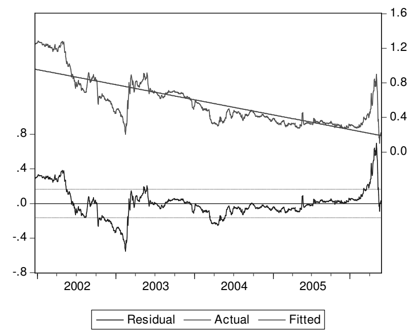
Table 3

Let Juventus' share price, Milan exchange index and their first differences be dependent variables. We run regressions of them on time trend. Part A presents four residual graphs from regressions. By looking at the graphs, log series of stock price and index are clearly not stationary and the lagged log series seem to be white noise processes. Thus we run further tests on the lagged series to see if they truly are stationary. In order to use the ADF tests, we need to determine the optimal lag length. We test down from high orders and examine the t-values on coefficients until we can reject the null hypothesis of the coefficient equals to zero. Part B gives one example of such process. Part C presents an example of ADF tests.

Part A

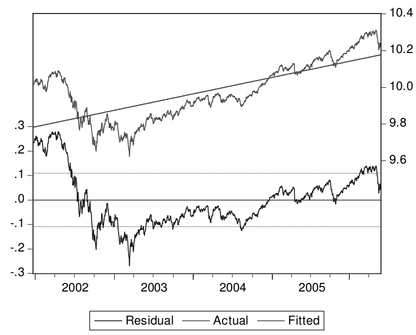
(See Appendix pp. 2–5 for detail)

LJUV



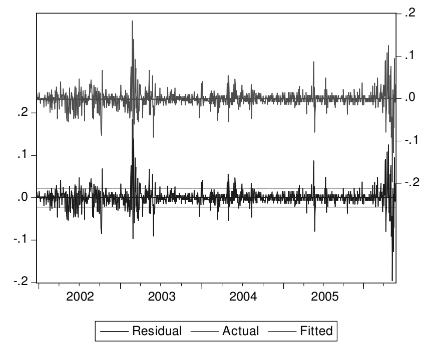
LJUV is the logarithm series of the index.

LINDEX



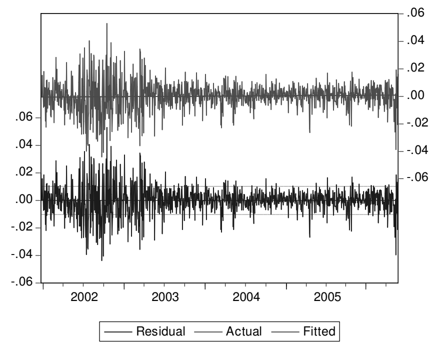
LINDEX is the logarithm series of Juventus' share price.

DLJUV



DLJUV is the 1st difference series of Juventus' share price.

DLINDE



DLINDEX is the 1st difference series of the index.

Part B

for choosing the best lag length

DLJUV AS THE DEPENDENT VAR		LAG 4	LAG 3	LAG 2
δ_0	Constant	0.011800 (2.883726)	0.011172 (2.740183)	0.010971 (2.703642)
δ_1	Time trend	-8.00E-06 (-2.398541)	-7.57E-06 (-2.274777)	-7.44E-06 (-2.242816)
δ_2	LJUV(-1)	-0.013684 (-3.388023)	-0.013078 (-3.251646)	-0.012874 (-3.217628)
δ_3	DLJUV(-1)	0.129830 (4.405609)	0.130038 (4.410717)	0.131255 (4.469803)
δ_4	DLJUV(-2)	0.084310 (2.836648)	0.088262 (2.977259)	0.090205 (3.067962)
δ_5	DLJUV(-3)	0.009117# (0.306146)	0.015370 (0.519689)	N/A
δ_6	DLJUV(-4)	0.051014# (1.725279)	N/A	N/A

Note 1:1st row in each cell represents the coefficient, the corresponding t-value is in parenthesis. # denotes null hypothesis cannot be rejected at 10% significance level.
Lag 4 and lag 3 can be deleted. The best lag length is 2 for DLJUV, as the null hypothesis of the coefficients of lag 2 and lag 1 equal to zero are rejected at 10% significance level. (See Appendix pp. 6–9)

Part C

ADF test for DLJUV

Null hypothesis can be rejected at 1%, 5%, and 10% significance levels as t-statistic is lower than critical values. Thus series LJUV has not got a unit root, it is stationary.

Null Hypothesis: DLJUV has a unit root				
Exogenous: Constant				
Lag Length: 2 (Automatic based on SIC, MAXLAG=2)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-17.33147	0.0000
Test critical values:	1% level		-3.435831	
	5% level		-2.863848	
	10% level		-2.568050	

(See Appendix pp. 10–11)

Table 4

Regression Results I

		Reg 1a	Reg 1b	Reg 2	Reg 3
β_0	Constant	-0.00096 (1.45919)	-0.00423 (1.28233)	-0.009737 (-1.62354)	0.005937 (0.394985)
β_1	DLINDEX	0.306895*** (4.25978)	0.783111*** (3.013277)	0.778522*** (2.941878)	0.766285*** (2.867217)
β_2	JCACT			0.004466 (1.523886)	0.008836* (1.678855)
β_3	JCEXP				-0.014968 (-1.333336)
β_6	JIACT			0.00221 (0.805299)	0.002191 (0.597925)
β_7	JIEXP				-0.007713 (-0.84345)
	Obs.	1151	213	212 ^	212 ^
	R^2	0.019238	0.158706	0.164617	0.170815
	Adj R^2	0.018384	0.154719	0.152568	0.150689
	Prob. F-test	0.000002	0.000000	0.000000	0.000000

Note 2: 1st row in each cell represents the coefficient, the corresponding t-value is in parenthesis. * (**, ***) denotes significance at 10 (5, 1)% level. ^ denotes loss of the first observation in the sample data. (See Appendix pp. 12–14)

In line with the method used by Georg Stadtmann (2006), we add variables to the benchmark model in the match day data. First the actual results are added.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_2 JCACT + \beta_6 JIACT \quad (2)$$

where *JCACT* is the actual points gained by Juventus in Champion League, and *JIACT* is the actual points gained by Juventus in Serie A. Using t-statistics, the null hypothesis of coefficient of the actual variable β_2/β_6 equals to zero cannot be rejected at 10% significance level in both cases. The findings coincide with the theory that actual results do not affect share price directly. Also with respect to the goodness-of-fit of the regressions, when comparing Regression 1b and Regression 2, we find the adjusted R^2 drops from 0.1547 to 0.1526 when adding the actual match results.

We then include expected results in the regression.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_2 JCACT + \beta_3 JCEXP + \beta_6 JIACT + \beta_7 JIEXP \quad (3)$$

where *JCEXP* represents the expected points gained by Juventus in Champion League, and *JIEXP* represents the expected points gained by Juventus in Serie A. The coefficient of *JCEXP* or *JIEXP* β_3/β_7 does not significantly differ to zero, so these variables do not have an influence on share prices either. We go on to conduct a hypothesis test that: Ho: $\beta_2 = -\beta_3, \beta_6 = -\beta_7$. Wald test concludes that Ho can not be rejected on a 1% confidence level.

Figure 1

Wald Test Ho: $\beta_2 = -\beta_4, \beta_3 = -\beta_5$

Wald Test: Null Hypothesis: $\beta_2 = -\beta_4, \beta_3 = -\beta_5$			
Test Statistic	Value	D.F	Probability
F-statistic	0.270093	(2, 206)	0.7636
Chi-square	0.540187	2	0.7633

H_0 cannot be rejected at 10% significance level, as probability is much bigger than 10%. (See Appendix pp. 14)

As the result, it is reasonable to combine the actual match points and the expected match points into a sole variable, i. e. the unexpected match points, to replace the two variables in the regression.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_8 JIUNEXP \quad (4)$$

where *JCUNEXP* represents the unexpected points gained by Juventus in Champion League, and *JIUNEXP* represents the unexpected points gained by Juventus in Serie A. We reject that the hypothesis that β_4 is zero at 10% significance level. We safely say there is a correlation relationship between the Champion League unexpected points and the stock price. The Coefficient for Serie A is otherwise statistically zero. Therefore the findings support that European matches have a role in affecting the share price. Furthermore, from the sign of β_4 we confirm the former hypothesis that: A surprised won match should influence stock prices positively, and a surprised lost match should influence stock prices negatively. The finding that unexpected game points from Italian national league do not have an impact on the stock price does coincide with the claim that European games matter more.

Table 5

Regression Results II

		Reg 4	Reg 5
β_0	Constant	-0.00466 (-1.44809)	-0.00449 (-1.38457)
β_1	DLINDEX	0.771345*** (2.876016)	0.769767*** (2.887572)
β_4	JCUNEXP	0.008341* (1.670473)	0.008341* (1.66713)
β_8	JIUNEXP	0.002009 (0.557663)	0.001888 (0.531522)
β_{10}	IIUNEXP		-0.00292 (-1.00494)
	Obs.	212	212
	R^2	0.168966	0.17212
	Adj R^2	0.15698	0.156123
	Prob. F-test	0.000000	0.000000

See Note 2. (See Appendix pp. 15–16)

As a major competitor to Juventus in Serie A, we argue that the performances of Inter Milan can have some effects on Juventus' stock price. If there exists some inter team relationship, the unexpected successes in Inter's games can potentially have some knock-on effects. Here we add one more variable: unexpected points gained for Inter Milan (IIUNEXP) in Serie A.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_8 JIUNEXP + \beta_{10} IIUNEXP \quad (5)$$

We get similar regression results for *JCUNEXP* and *JIUNEXP* as in Regression (4). They both take positive values as we expected. Furthermore, the t-statistic of β_8 is very small, so β_8 is not significantly different from zero. The coefficient of IIUNEXP β_{10} takes a negative sign. It implies that an unexpected success of Inter has a negative impact on the share prices of Juventus, although this indirect effect is negligible in statistical term. The adjusted R-square is 0.156123, in other words there is an explanation degree of 15.6%, which is quite high for a financial regression.

So far, we run the regressions based on match day data set only (212 observations after adjustments). These regressions exam the effect of unexpected game results on the trading day immediately following the match. Another interesting question would be whether these results have some lasting impact on the stock price, i. e. do they influence the stock prices for more than one trading day. To address it, we decide to include the lagged independent variables of the *JCUNEXP*, *JIUNEXP* and *IIUNEXP* in our regression as additional variables and we use all trading days stock prices regardless whether there is a match or not. In first step, we perform Regression (5) with the full range data (1151 observations after adjustments), set all non-match day unexpected points to be 0.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_8 JIUNEXP + \beta_{10} IIUNEXP \quad (5.b)$$

Table 6

Regression Results III

		Reg 1a	Reg 5b	Reg 6
β_0	Constant	-0.000964 (-1.459188)	-0.001252 (-1.932677)	-0.001311 (-2.021555)
β_1	DLINDEX	0.306895*** (-4.25978)	0.293408*** (-4.056152)	0.296815*** (-4.109671)
β_4	JCUNEXP		0.008561** (-2.524984)	0.008555** (-2.520994)
β_5	JCUNEXP(-1)			-0.004066 (-1.209691)
β_8	JIUNEXP		0.007054*** (-3.463394)	0.007065*** (-3.464145)
β_9	JIUNEXP(-1)			0.001208 (-0.732044)
β_{10}	IIUNEXP		-0.001783 (-1.007301)	-0.001785 (-1.00701)
β_{11}	IIUNEXP(-1)			0.001792 (-1.159581)
	Obs.	1151	1151	1151
	R^2	0.019238	0.045148	0.048765
	Adj R^2	0.018384	0.041816	0.042939
	Prob. F-test	0.000000	0.000000	0.000000

See Note 2. (See Appendix pp. 17–18)

The results are pretty much inline with the Regression (5), except that t-statistic for JIUNEXP appears to be much higher, consequently the variable seems to have an impact on share price.

Because of its characteristics, equity market react to new information extremely fast, any opportunity is quickly arbitrated away. We therefore believe the surprise factor can last beyond 3, 4 days. We only test whether any signals do carry over to the subsequent trading day. The regression is represented below.

$$DLJUV(+1) = \beta_0 + \beta_1 DLINDEX(+1) + \beta_4 JCUNEXP(+1) + \beta_5 JCUNEXP + \\ + \beta_8 JIUNEXP(+1) + \beta_9 JIUNEXP + \beta_{10} IIUNEXP(+1) + \beta_{11} IIUNEXP$$

In days following match days, *JCUNEXP*(+1), *JIUNEXP*(+1) and *IIUNEXP*(+1) are set to be zero, the only variables other than index could influence *DLJUV*(+1) are previous days match results. If coefficients of those are not zero, we could say there are some lasting effects. Otherwise we conclude there is none. In match days, the regression converts to Regression (5). In all other days, all variables except index are zero. Thus it is assumed only the index affects stock price at these times. We include all the sample dates (1151 observations after adjustments). We transform the regression equation a little to get

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_5 JCUNEXP(-1) + \\ + \beta_8 JIUNEXP + \beta_9 JIUNEXP(-1) + \beta_{10} IIUNEXP + \beta_{11} IIUNEXP(-1) \quad (6)$$

Table shows that all the coefficients of the lagged variables *JCUNEXP* (-1), *JIUNEXP*(-1) and *IIUNEXP*(-1) are not significantly different from zero, which means that all the impacts are short-lived; none of them last for more than one day. We are able to conclude that there is no persistency in the match related variables. It does make sense since in general any financial arbitrary is quickly corrected by hedge funds. If we only look at the signs of lagged coefficients, Champion League has an opposite sign to its normal coefficient. It suggests that it may have an overshooting behavioral, whereas Serie A data does oppositely. However these behavioral are so small that we can ignore them.

The Reversed News Model

In this section, we use an alternative approach called the reversed news model (see Ellison, Mullin 2001). It is normal practice in the financial literature to identify the explanatory variables first and then to check if they indeed work empirically. It is mentioned in the Georg Stadtmann (2006), after the straight forward approach, an opposite one should be taken to check for original model's robustness. As expressed in the name, this approach first identify any outliner cannot be explained by the market conditions, then search for any major event which can be linked to these abnormal changes. Georg Stadtmann (2006) used it to investigate the drivers of stock price of a publicly trading German football club. They found «one advantage of the reversed news model is that this method is an appropriate way to identify «forgotten» news categories ... an omitted variable bias can be circumvented»4

We bring back the benchmark regression in the news model with the full time span (20/12/2001–31/5/2006).

---

[4] Georg Stadtmann (2006): Frequent News and Pure Signals: The Case of a Publicly Traded Football Club, pp.19, Paragraph 3.

$$DLJUV = \beta_0 + \beta_1 DLINDEX \qquad (1.a)$$

We collect the residual series, and sort them by their absolute values. We pick out the largest 20 residuals and try to identify events which could possibly link with these dates. We highlight two events below.

Table 7

20 largest residuals and their linked events

No.	Date	Price reaction*	Event	Category
1	16/05/2006	-0.194557	Phone-tap scandal	CG
2	24/02/2003	0.184784	Juventus move to the top of Serie A	MO
3	03/03/2003	0.142817	N/A	
4	15/05/2006	-0.138845	Phone-tap scandal	CG
5	19/05/2006	-0.126749	Phone-tap scandal	CG
6	26/04/2006	0.124147	Juventus set to clinch their second successive Serie A title	MO
7	27/02/2003	0.110167	N/A	
8	20/04/2006	0.107119	Juventus set to clinch their second successive Serie A title	MO
9	24/05/2006	0.098010	N/A	
10	07/03/2003	0.098005	N/A	
11	11/04/2006	0.096942	Juventus set to clinch their second successive Serie A title	MO
12	26/02/2003	-0.096785	N/A	
13	29/05/2003	-0.092097	Juventus lose out in champion league final to AC Milan on penalty	MO
14	11/05/2006	-0.089382	Phone-tap scandal	CG
15	10/04/2006	0.084807	Juventus set to clinch their second successive Serie A title	MO
16	18/05/2005	0.083347	Bid rumour for the club	CG
17	18/05/2006	-0.083032	Phone-tap scandal	CG
18	09/10/2002	-0.082379	N/A	
19	12/04/2006	-0.078621	N/A	
20	23/05/2005	-0.077935	N/A	

Note 3: CG: Corporate Governance related news. MO: Match Outcome related news. *Price reaction of Juventus stocks, not explained by overall market reaction. N/A.: no news identified. (See Appendix pp. 18)

Juventus move to the top of Serie A (24 February, 2003)

Juventus and Inter Milan have long been regarded as two major players in the Italian Serie A. From 1998 to 2001, Juventus has been championed once and been second place twice, whereas Inter Milan has been second place 2 times and always stayed at top five. Before 21st round match of season 02–03, Juventus trial Inter Milan three points in the overall table. On the night of 16 Feb 2003, Juventus beat Parma 2–1 to gain the three points, whereas in the previous day Inter lost to Chievo Verona. Juventus subsequently moved level with Inter at the top of Serie A, and was looking as favorite to win the league. In Round 22, Juventus beat opponents for the full points. They sat comfortably in the top. This injected a boost to the investor's confidence. So when new hit the market, share price was pushed up by 18.48%.

Phone-tap scandal (May, 2006)

Another piece of news which resulted in a series of extreme reactions of share price was the phone-tap scandal. On 4th May 2006, Italian press leaked a telephone conversation between Juventus' general manager Luciano Moggi and one of Italian football officials. It brought up allegations of collusion in appointing referees for Juventus games. In the next few days, the price of Juventus went to rock bottom. On 11th May, the whole board of the club resigned just days after club's president and vice- president quit over the allegation. Press claimed that Juventus was in crisis as the club went into investigation. In the wake of this biggest scandal since the 1980s, Italian football official forced to investigate its internal affairs and brought the scope of this affair cover almost entire Italian football industry. The continue knock-on effect was reflected in Juventus' share price. Over the next 19 trading days since 4th May, Juventus' share price has dropped by more than 57%. On 16th May alone, almost 20% of its value's been scrapped.

Conclusion

Using the news model, we conclude that the unexpected match outcomes play important roles in driving the stock prices of a publicly traded football club. Champion League games have a stronger effect on the share price than national league games. European matches generate much high revenues (bigger sponsorships, high broadcasting fees etc), so these games weight more typically. In the mean time, these effects are not sustained. Although the evidence suggests that national league has negligible impact in our case, others did find a link there (Georg Stadtmann (2006)). This approach is very straight forward and it is easy to follow. But it is also easy to miss some important variables that way. Therefore we then applied reversed news model. The data tell us besides the match related variables, corporate governance related event can interfere with the stock price. With both types of variables incorporated into the stock price, there still exist big errors that can not be explained by models. To improve on this, one can separate the effects on unexpected win and loss (Alex Edmans, Diego García and Øyvind Norli (2006)); on the other hand, we can use betting exchange prices (e. g. prices from www.betfair.com) instead of betting odds. Gennaro Bernile and Evgeny Lyandres (2008) suggested that because most investors of publicly traded football clubs are their fans, their ex-ante belief about the match outcomes tend to be biased. They tend to be over optimistic before the games and end up being more disappointed if they lose. This biasness in ex-ante belief cannot be reflected by betting odds. We argue that the betting exchange price is a better proxy for investor's belief. It is able to capture investor's mood more precisely. We did find some betting prices went back to 2004, but with limited data, it became too difficult for us to use them instead.

Bibliography

1. Alex Edmans, Diego García and Øyvind Norli (2006): Sport Sentiment and Stock Returns. May 2006. Working Paper Series: JEL Classifications: A12, G14.
2. Angel Barajas, Carlos Fernández-Jardón and Liz Crolley (2005): Does Sports Performance Influence Revenues and Economic Results in Spanish Football? September 2005. Working Paper Series: JEL Classifications: L83, L21, M21.
3. Brown, Gregory W. and Hartzell, Jay C. (2001): Market reaction to public information: The atypical case of the Boston Celtics, in: Journal of Financial Economics, Vol. 60, pp. 333–370.
4. Deloitte and Touche (1999). Informe Anual 1996/97 sobre Las Finanzas en la Primera División del Fútbol en España. Deloitte & Touche.
5. Deloitte and Touche (2000 b). Informe Anual 1997/98 y 1998/99. Las Finanzas en la Primera División del Fútbol en España. Deloitte & Touche.
6. Dobson, Stephen and Goddard, John (2001): The Economics of Football, Cambridge University Press.
7. Ellison, Sara Fisher, Mullin, Wallace P. (2001): Gradual Incorporation of Information: Pharmaceutical Stocks and the Evolution of President Clinton's Health Care Reform; in: Journal of Law and Economics, Vol. 44(1), pp. 89–129.

8. Georg Stadtmann (2006): Frequent News and Pure Signals: The Case of a Publicly Traded Football Club. June 2006.
9. Gennaro Bernile and Evgeny Lyandres (2008): Understanding Investor Sentiment: The Case of Soccer. January 2008. Working Paper Series: JEL Classifications: G12, G14.
10. Lehmann, Erik and Weigand, Jürgen (1998): Wieviel Phantasie braucht die Fußballaktie? In: Zeitschrift für Betriebswirtschaft, Ergänzungsheft 2/1998, pp. 101–120.
11. Palomino, Frederic, Luc Renneboog, Chendi Zhang (2005): Stock Price Reactions to Short-Lived Public Information: The Case of Betting Odds, European Corporate Governance Institute (ecgi) Finance Working Paper No 81/2005.
12. Szymanski, S., Kuypers, T. (1999): Winners and Losers: The Business Strategy of Football. Penguin, Harmondsworth.

Appendix

Donations in the E-View

JUV=stock price of Juventus

INDEX=index of Milan Exchange

JCACT=actual points gained by Juventus in Champion League

JCEXP=expected points gained by Juventus in Champion League

JCUNEXP=unexpected points gained by Juventus in Champion League

JIACT=actual points gained by Juventus in Italian Serie A

JIEXP=expected points gained by Juventus in Italian Serie A

JIUNEXP=unexpected points gained by Juventus in Italian Serie A

IIUNEXP= unexpected points gained by Inter Milan in Italian Serie A

LINDEX=Log (INDEX)

LJUV=Log (JUV)

DLINDEX=LINDEX-LINDEX(-1)

DLJUV=LJUV-LJUV(-1)

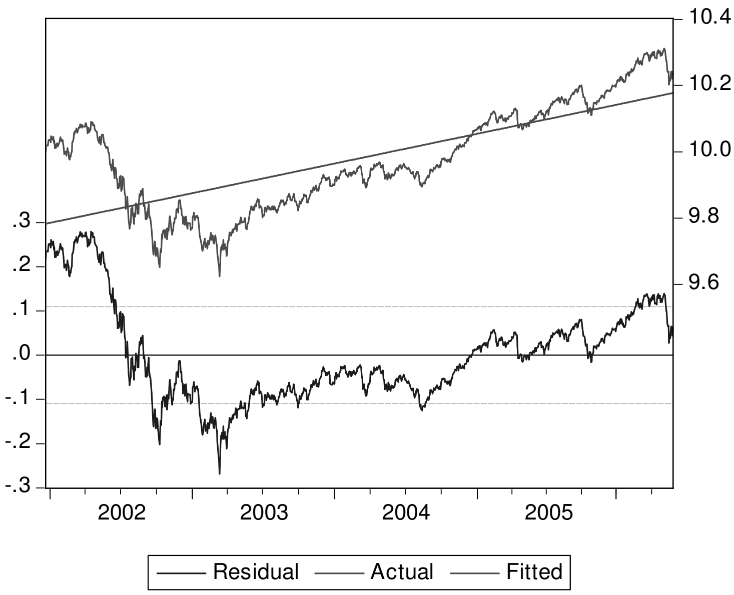
Test for stantionarity: (on full sample size)

Detrend the series:

Dependent Variable: LINDEX
Method: Least Squares
Date: 02/29/08 Time: 17:00
Sample: 12/20/2001 5/31/2006
Included observations: 1152

	Coefficient	Std. Error	t-Statistic	Prob.
C	9.782669	0.006447	1517.374	0.0000
T	0.000343	9.69E-06	35.37420	0.0000

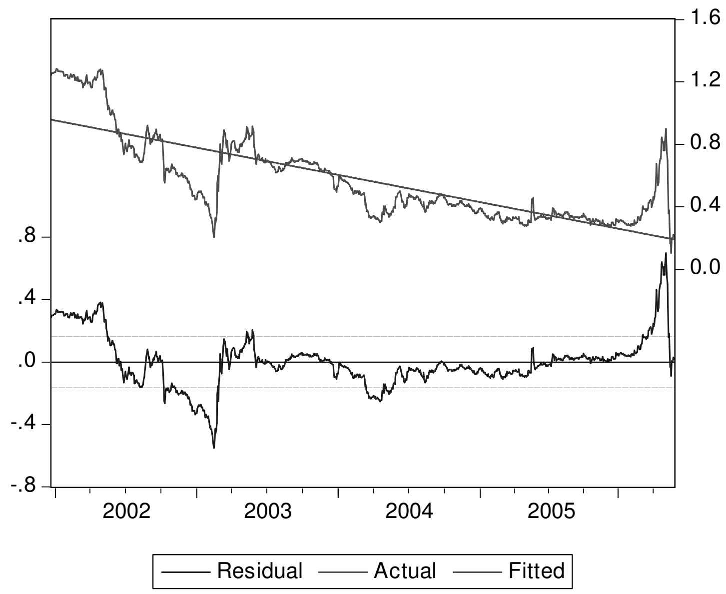
R-squared	0.521100	Mean dependent var	9.980219
Adjusted R-squared	0.520683	S.D. dependent var	0.157931
S.E. of regression	0.109340	Akaike info criterion	-1.586978
Sum squared resid	13.74847	Schwarz criterion	-1.578212
Log likelihood	916.0995	Hannan-Quinn criter.	-1.583670
F-statistic	1251.334	Durbin-Watson stat	0.008694
Prob(F-statistic)	0.000000		



Dependent Variable: LJUV
Method: Least Squares
Date: 02/29/08 Time: 17:05
Sample: 12/20/2001 5/31/2006
Included observations: 1152

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.958994	0.009720	98.66294	0.0000
T	-0.000667	1.46E-05	-45.66699	0.0000

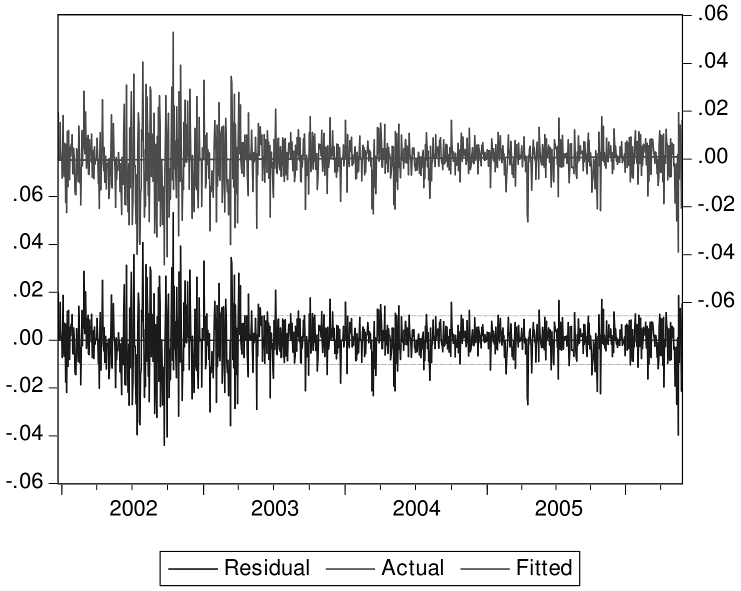
R-squared	0.644565	Mean dependent var	0.574500
Adjusted R-squared	0.644256	S.D. dependent var	0.276380
S.E. of regression	0.164845	Akaike info criterion	-0.765891
Sum squared resid	31.24986	Schwarz criterion	-0.757124
Log likelihood	443.1529	Hannan-Quinn criter.	-0.762582
F-statistic	2085.474	Durbin-Watson stat	0.018725
Prob(F-statistic)	0.000000		



Dependent Variable: DLINDEX
Method: Least Squares
Date: 02/29/08 Time: 17:06
Sample (adjusted): 12/21/2001 5/31/2006
Included observations: 1151 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000516	0.000602	-0.857809	0.3912
T	1.25E-06	9.04E-07	1.385702	0.1661

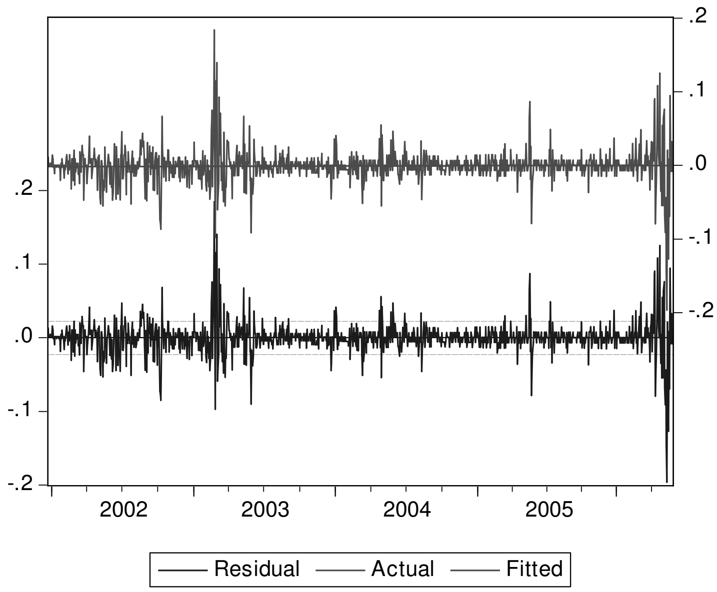
R-squared	0.001668	Mean dependent var	0.000206
Adjusted R-squared	0.000800	S.D. dependent var	0.010194
S.E. of regression	0.010190	Akaike info criterion	-6.333097
Sum squared resid	0.119306	Schwarz criterion	-6.324324
Log likelihood	3646.697	Hannan-Quinn criter.	-6.329785
F-statistic	1.920169	Durbin-Watson stat	2.018958
Prob(F-statistic)	0.166107		



Dependent Variable: DLJUV
Method: Least Squares
Date: 02/29/08 Time: 17:07
Sample (adjusted): 12/21/2001 5/31/2006
Included observations: 1151 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001691	0.001333	-1.269249	0.2046
T	1.37E-06	2.00E-06	0.684370	0.4939

R-squared	0.000407	Mean dependent var	-0.000901
Adjusted R-squared	-0.000463	S.D. dependent var	0.022556
S.E. of regression	0.022561	Akaike info criterion	-4.743453
Sum squared resid	0.584839	Schwarz criterion	-4.734681
Log likelihood	2731.857	Hannan-Quinn criter.	-4.740142
F-statistic	0.468362	Durbin-Watson stat	1.723098
Prob(F-statistic)	0.493880		



Test for best lag length

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/01/08 Time: 13:37
Sample (adjusted): 12/27/2001 5/31/2006
Included observations: 1147 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.011800	0.004092	2.883726	0.0040
T	-8.00E-06	3.34E-06	-2.398541	0.0166
LJUV(-1)	-0.013684	0.004039	-3.388023	0.0007
DLJUV(-1)	0.129830	0.029469	4.405609	0.0000
DLJUV(-2)	0.084310	0.029722	2.836648	0.0046
DLJUV(-3)	0.009117	0.029779	0.306146	0.7595
DLJUV(-4)	0.051014	0.029569	1.725279	0.0847

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/07/08 Time: 16:00
Sample (adjusted): 12/26/2001 5/31/2006
Included observations: 1148 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.011172	0.004077	2.740183	0.0062
T	-7.57E-06	3.33E-06	-2.274777	0.0231
LJUV(-1)	-0.013078	0.004022	-3.251646	0.0012
DLJUV(-1)	0.130038	0.029482	4.410717	0.0000
DLJUV(-2)	0.088262	0.029645	2.977259	0.0030
DLJUV(-3)	0.015370	0.029575	0.519689	0.6034

R-squared	0.035380	Mean dependent var	-0.000913
Adjusted R-squared	0.031157	S.D. dependent var	0.022582
S.E. of regression	0.022228	Akaike info criterion	-4.769744
Sum squared resid	0.564228	Schwarz criterion	-4.743372
Log likelihood	2743.833	Hannan-Quinn criter.	-4.759788
F-statistic	8.377179	Durbin-Watson stat	2.001441
Prob(F-statistic)	0.000000		

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/01/08 Time: 13:41
Sample (adjusted): 12/25/2001 5/31/2006
Included observations: 1149 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010971	0.004058	2.703642	0.0070
T	-7.44E-06	3.32E-06	-2.242816	0.0251
LJUV(-1)	-0.012874	0.004001	-3.217628	0.0013
DLJUV(-1)	0.131255	0.029365	4.469803	0.0000
DLJUV(-2)	0.090205	0.029402	3.067962	0.0022

R-squared	0.035123	Mean dependent var	-0.000913
Adjusted R-squared	0.031749	S.D. dependent var	0.022572
S.E. of regression	0.022211	Akaike info criterion	-4.772096
Sum squared resid	0.564379	Schwarz criterion	-4.750135
Log likelihood	2746.569	Hannan-Quinn criter.	-4.763806
F-statistic	10.41085	Durbin-Watson stat	2.002631
Prob(F-statistic)	0.000000		

The Max lag length for DLJUV is 2

Dependent Variable: DLINDEX
Method: Least Squares
Date: 03/07/08 Time: 16:03
Sample (adjusted): 12/27/2001 5/31/2006
Included observations: 1147 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.032106	0.019064	-1.684095	0.0924
LINDEX	0.003236	0.001910	1.694315	0.0905
DLINDEX(-1)	-0.009780	0.029631	-0.330064	0.7414
DLINDEX(-2)	0.033483	0.029652	1.129215	0.2590
DLINDEX(-3)	-0.052492	0.029644	-1.770743	0.0769
DLINDEX(-4)	0.015193	0.029668	0.512102	0.6087

R-squared	0.006786	Mean dependent var	0.000190
Adjusted R-squared	0.002434	S.D. dependent var	0.010196
S.E. of regression	0.010184	Akaike info criterion	-6.330840
Sum squared resid	0.118330	Schwarz criterion	-6.304450
Log likelihood	3636.737	Hannan-Quinn criter.	-6.320877
F-statistic	1.559195	Durbin-Watson stat	1.988601
Prob(F-statistic)	0.168804		

Dependent Variable: DLINDEX
Method: Least Squares
Date: 03/01/08 Time: 13:51
Sample (adjusted): 12/26/2001 5/31/2006
Included observations: 1148 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.032592	0.019026	-1.712965	0.0870
LINDEX	0.003285	0.001906	1.723430	0.0851
DLINDEX(-1)	-0.010610	0.029565	-0.358868	0.7198
DLINDEX(-2)	0.034036	0.029609	1.149508	0.2506
DLINDEX(-3)	-0.052500	0.029576	-1.775101	0.0761

R-squared	0.006554	Mean dependent var	0.000190
Adjusted R-squared	0.003078	S.D. dependent var	0.010192
S.E. of regression	0.010176	Akaike info criterion	-6.333229
Sum squared resid	0.118358	Schwarz criterion	-6.311253
Log likelihood	3640.274	Hannan-Quinn criter.	-6.324933
F-statistic	1.885220	Durbin-Watson stat	1.989759
Prob(F-statistic)	0.110713		

The max lag length for DLINDEX is 3

ADF Test

Null Hypothesis: DLJUV has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic based on SIC, MAXLAG=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.33147	0.0000
Test critical values:	1% level	-3.435831	
	5% level	-2.863848	
	10% level	-2.568050	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLJUV)
Method: Least Squares
Date: 03/07/08 Time: 16:06
Sample (adjusted): 12/26/2001 5/31/2006
Included observations: 1148 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
DLJUV(-1)	-0.782792	0.045166	-17.33147	0.0000
D(DLJUV(-1))	-0.090845	0.039180	-2.318665	0.0206
D(DLJUV(-2))	-0.008050	0.029595	-0.271998	0.7857
C	-0.000717	0.000660	-1.086663	0.2774

R-squared	0.434687	Mean dependent var	-7.05E-06
Adjusted R-squared	0.433204	S.D. dependent var	0.029639
S.E. of regression	0.022314	Akaike info criterion	-4.763732
Sum squared resid	0.569611	Schwarz criterion	-4.746151
Log likelihood	2738.382	Hannan-Quinn criter.	-4.757095
F-statistic	293.2187	Durbin-Watson stat	2.000552
Prob(F-statistic)	0.000000		

DLJUV hasn't got a unit root. It is stationary.

Null Hypothesis: DLINDEX has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic based on SIC, MAXLAG=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-16.95824	0.0000
Test critical values:	1% level	-3.435836	
	5% level	-2.863850	
	10% level	-2.568051	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLINDEX)
Method: Least Squares
Date: 03/07/08 Time: 16:08
Sample (adjusted): 12/27/2001 5/31/2006
Included observations: 1147 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
DLINDEX(-1)	-1.003712	0.059187	-16.95824	0.0000
D(DLINDEX(-1))	-0.003651	0.050885	-0.071751	0.9428
D(DLINDEX(-2))	0.032400	0.042038	0.770713	0.4410
D(DLINDEX(-3))	-0.017682	0.029655	-0.596249	0.5511
C	0.000191	0.000301	0.633601	0.5265

R-squared	0.506743	Mean dependent var	1.41E-05
Adjusted R-squared	0.505015	S.D. dependent var	0.014487
S.E. of regression	0.010192	Akaike info criterion	-6.330071
Sum squared resid	0.118628	Schwarz criterion	-6.308080
Log likelihood	3635.296	Hannan-Quinn criter.	-6.321769
F-statistic	293.3060	Durbin-Watson stat	1.994728
Prob(F-statistic)	0.000000		

DLINDEX hasn’t got a unit root. It is stationary.
Regression models:

$$DLJUV = \beta_0 + \beta_1 DLINDEX \quad (1)$$

With full data span. Reg (1.a)

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/01/08 Time: 12:59
Sample (adjusted): 12/21/2001 5/31/2006
Included observations: 1151 after adjustments
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000964	0.000661	-1.459188	0.1448
DLINDEX	0.306895	0.072045	4.259780	0.0000

R-squared	0.019238	Mean dependent var	-0.000901
Adjusted R-squared	0.018384	S.D. dependent var	0.022556
S.E. of regression	0.022347	Akaike info criterion	-4.762471
Sum squared resid	0.573821	Schwarz criterion	-4.753699
Log likelihood	2742.802	Hannan-Quinn criter.	-4.759160
F-statistic	22.53774	Durbin-Watson stat	1.758893
Prob(F-statistic)	0.000002		

With match days data, Reg (1.b)

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/05/08 Time: 19:06
Sample (adjusted): 1/07/2002 5/15/2006
Included observations: 213 after adjustments
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.004231	0.003299	-1.282328	0.2011
DLINDEX	0.783111	0.259887	3.013277	0.0029

R-squared	0.158706	Mean dependent var	-0.003295
Adjusted R-squared	0.154719	S.D. dependent var	0.051931
S.E. of regression	0.047745	Akaike info criterion	-3.236559
Sum squared resid	0.480983	Schwarz criterion	-3.204997
Log likelihood	346.6935	Hannan-Quinn criter.	-3.223804
F-statistic	39.80411	Durbin-Watson stat	1.707722
Prob(F-statistic)	0.000000		

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_2 JCACT + \beta_6 JIACT \quad (2)$$

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/05/08 Time: 19:08
Sample (adjusted): 1/07/2002 5/15/2006
Included observations: 212 after adjustments
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.009737	0.005997	-1.623540	0.1060
DLINDEX	0.778522	0.264634	2.941878	0.0036
JCACT	0.004466	0.002931	1.523886	0.1291
JIACT	0.002210	0.002745	0.805299	0.4216

R-squared	0.164617	Mean dependent var	-0.003279
Adjusted R-squared	0.152568	S.D. dependent var	0.052053
S.E. of regression	0.047918	Akaike info criterion	-3.219967
Sum squared resid	0.477595	Schwarz criterion	-3.156635
Log likelihood	345.3165	Hannan-Quinn criter.	-3.194369
F-statistic	13.66250	Durbin-Watson stat	1.703816
Prob(F-statistic)	0.000000		

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_2 JCACT + \beta_3 JCEXP + \beta_6 JIACT + \beta_7 JIEXP \quad (3)$$

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/05/08 Time: 19:09
Sample (adjusted): 1/07/2002 5/15/2006
Included observations: 212 after adjustments
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005937	0.015031	0.394985	0.6933
DLINDEX	0.766285	0.267257	2.867217	0.0046
JCACT	0.008836	0.005263	1.678855	0.0947
JCEXP	-0.014968	0.011226	-1.333336	0.1839
JIACT	0.002191	0.003665	0.597925	0.5505
JIEXP	-0.007713	0.009144	-0.843450	0.4000

R-squared	0.170815	Mean dependent var	-0.003279
Adjusted R-squared	0.150689	S.D. dependent var	0.052053
S.E. of regression	0.047971	Akaike info criterion	-3.208546
Sum squared resid	0.474051	Schwarz criterion	-3.113548
Log likelihood	346.1059	Hannan-Quinn criter.	-3.170150
F-statistic	8.487337	Durbin-Watson stat	1.698617
Prob(F-statistic)	0.000000		

Wald Test for Ho: $\beta_2 = -\beta_3, \beta_6 = -\beta_7$

Wald Test:
Equation: EQ02

Test Statistic	Value	df	Probability
F-statistic	0.270093	(2, 206)	0.7636
Chi-square	0.540187	2	0.7633

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(3) + C(4)	-0.006132	0.008603
C(5) + C(6)	-0.005522	0.007618

Restrictions are linear in coefficients.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_8 JIUNEXP \qquad (4)$$

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/05/08 Time: 19:13
Sample (adjusted): 1/07/2002 5/15/2006
Included observations: 212 after adjustments
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.004660	0.003218	-1.448085	0.1491
DLINDEX	0.771345	0.268199	2.876016	0.0044
JCUNEXP	0.008341	0.004993	1.670473	0.0963
JIUNEXP	0.002009	0.003602	0.557663	0.5777

R-squared	0.168966	Mean dependent var	-0.003279
Adjusted R-squared	0.156980	S.D. dependent var	0.052053
S.E. of regression	0.047793	Akaike info criterion	-3.225187
Sum squared resid	0.475108	Schwarz criterion	-3.161855
Log likelihood	345.8698	Hannan-Quinn criter.	-3.199590
F-statistic	14.09691	Durbin-Watson stat	1.688079
Prob(F-statistic)	0.000000		

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_8 JIUNEXP + \beta_{10} IIUNEXP \qquad (5)$$

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/05/08 Time: 19:15
Sample (adjusted): 1/07/2002 5/15/2006
Included observations: 212 after adjustments
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.004493	0.003245	-1.384572	0.1677
DLINDEX	0.769767	0.266579	2.887572	0.0043
JCUNEXP	0.008341	0.005003	1.667130	0.0970
JIUNEXP	0.001888	0.003553	0.531522	0.5956
IIUNEXP	-0.002923	0.002908	-1.004937	0.3161

R-squared	0.172120	Mean dependent var	-0.003279
Adjusted R-squared	0.156123	S.D. dependent var	0.052053
S.E. of regression	0.047817	Akaike info criterion	-3.219555
Sum squared resid	0.473305	Schwarz criterion	-3.140391
Log likelihood	346.2729	Hannan-Quinn criter.	-3.187559
F-statistic	10.75909	Durbin-Watson stat	1.682181
Prob(F-statistic)	0.000000		

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_8 JIUNEXP + \beta_{10} IIUNEXP \quad (5.b)$$

Dependent Variable: DJUV
Method: Least Squares
Date: 03/01/08 Time: 13:13
Sample (adjusted): 12/21/2001 5/31/2006
Included observations: 1151 after adjustments
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001252	0.000648	-1.932677	0.0535
DINDEX	0.293408	0.072337	4.056152	0.0001
JCUNEXP	0.008561	0.003391	2.524984	0.0117
JIUNEXP	0.007054	0.002037	3.463394	0.0006
IIUNEXP	-0.001783	0.001770	-1.007301	0.3140

R-squared	0.045148	Mean dependent var	-0.000901
Adjusted R-squared	0.041816	S.D. dependent var	0.022556
S.E. of regression	0.022079	Akaike info criterion	-4.784032
Sum squared resid	0.558662	Schwarz criterion	-4.762102
Log likelihood	2758.211	Hannan-Quinn criter.	-4.775754
F-statistic	13.54663	Durbin-Watson stat	1.744960

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_5 JCUNEXP(-1) + \beta_8 JIUNEXP + \beta_9 JIUNEXP(-1) + \beta_{10} IIUNEXP + \beta_{11} IIUNEXP(-1) \quad (6)$$

Dependent Variable: DLJUV
Method: Least Squares
Date: 03/01/08 Time: 13:07
Sample (adjusted): 12/21/2001 5/31/2006
Included observations: 1151 after adjustments
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001311	0.000648	-2.021555	0.0435
DLINDEX	0.296815	0.072223	4.109671	0.0000
JCUNEXP	0.008555	0.003394	2.520994	0.0118
JCUNEXP(-1)	-0.004066	0.003362	-1.209691	0.2266
JIUNEXP	0.007065	0.002040	3.464145	0.0006
JIUNEXP(-1)	0.001208	0.001650	0.732044	0.4643
IIUNEXP	-0.001785	0.001773	-1.007013	0.3141
IIUNEXP(-1)	0.001792	0.001545	1.159581	0.2465

R-squared	0.048765	Mean dependent var	-0.000901
Adjusted R-squared	0.042939	S.D. dependent var	0.022556
S.E. of regression	0.022066	Akaike info criterion	-4.782614
Sum squared resid	0.556546	Schwarz criterion	-4.747525
Log likelihood	2760.394	Hannan-Quinn criter.	-4.769369
F-statistic	8.370788	Durbin-Watson stat	1.749032
Prob(F-statistic)	0.000000		

Make residual series of regression (1a), named as resid01 in full range data workfile.
Sorting in the descending order.

Date	Price reaction
16/05/2006	-0.194557
24/02/2003	0.184784
03/03/2003	0.142817
15/05/2006	-0.138845
19/05/2006	-0.126749
26/04/2006	0.124147
27/02/2003	0.110167
20/04/2006	0.107119
24/05/2006	0.098010
07/03/2003	0.098005
11/04/2006	0.096942
26/02/2003	-0.096785
29/05/2003	-0.092097
11/05/2006	-0.089382
10/04/2006	0.084807
18/05/2005	0.083347
18/05/2006	-0.083032
09/10/2002	-0.082379
12/04/2006	-0.078621
23/05/2005	-0.077935