STOCK MARKET REACTION TO NEWS: EVIDENCE FROM JUVENTUS REVISITED

Tanyue Sun, PhD
Maoguo Wu, PhD
SHU-UTS SILC Business School, Shanghai University, China

Abstract

This paper examines a major influence on the stock prices of a publicly traded football club, Juventus Football Club S.p.A., a professional Italian association football club. The underlying financial theory applied and tested in this paper is the news model. The news model considers changes in stock prices the consequence of unexpected new public information. Applying the news model to the sport industry, it can be considered that unexpected match results affect the stock price of the club. In addition, following the reversed news model, whether major corporate governance related events have any influence on stock prices is tested. This paper contributes to the literature on the impact of unexpected public information on stock prices.

Keywords: Signaling, News Model, Reversed News Model

Introduction

Based on the news model and the reversed news model, two determinants of stock prices are tested. The news model is tested by using signals identified as new public information. The fundamental assumption of the news model is that financial markets are efficient in a semi-strong form. Therefore, all publicly available information is incorporated into stock prices when the information is released. Previous studies on similar subjects tend to set financial earnings (earning announcements, dividend payouts *etc*.) as signals. However, it is usually difficult to collect these data in practice. These data are sporadically published with intervals spanning from a quarter to six months by public companies. Another issue is that data can be easily manipulated, *i.e.*, some data are biased. This paper sets the match results of a publicly traded football club, Juventus Football Club S.p.A., as signals. An obvious advantage of this approach is that regular and frequent signals can be obtained. Football matches take place regularly in the competition season (normally once a week), when these signals frequently feed to the financial

market. Another advantage is the openness of signals, given that football matches are aired live and match results are observed spontaneously (cannot be manipulated). Moreover, football matches usually take place when the stock market is closed. The lag between match days and trading days gives investors sufficient time to analyze new information. According to the news model, only expectation errors, which are the differences between actual results and expected results, have impacts on stock prices. Therefore, this expectation error is marked as the signal and in turn an explanatory variable in this paper. Signals can be abstracted from the actual results. It is assumed that investors form some expectations for the outcome prior to the match. Following the example of Lehmann and Weigand (1998), the expectation is estimated using the betting odds for the game. Similar estimation is found in Dobson and Goddard (2001). Estimation of the reversed news model provides different results. Robustness checks are conducted to avoid pitfalls in the econometric specification.

The remaining sections of this paper are organized as follows. Section 2 reviews related literature. Section 3 describes how data are processed and how stock price and stock index are calculated. It also interprets the betting odds for matches and the expectation errors. Section 4 illustrates regressions of the stock prices on expectation errors on match days and in full sample range. Empirical evidence provides support for the theory. The reversed news model is discussed in Section 5. The reversed news model investigates any possible explanatory variables that have been omitted in the regressions. Section 6 concludes the paper. Appendix are found in Section 7.

Related Literature

A great deal of research reveals that match results influence the stock prices of sport clubs. In general, there is a link between the performance of a football team and the revenue of the club. A partial selection of papers that support this idea are briefly mentioned here. Barajas, Fernández-Jardón and Crolley (2005) finds that there exists a non-linear relation between the match performance and the expected incomes, *i.e.*, a better performance is a source of higher revenue for Spanish football clubs. Szymanski and Kuypers (1999) and Deloitte and Touche (1999, 2000b) both argue that good performance on the pitch leads to a high revenue income. The basic reason behind is the club's reputation. Football clubs make most of their revenue in three ways: selling broadcasting rights, selling tickets and merchandises, and receiving endorsements through commercial advertising and sponsoring. When football team performs well long enough, the club becomes more reputable and it can gain recognition in the public. Sales of tickets and team related merchandise will increase. 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 the football industry, higher revenues mean higher profits. When teams perform well, investors' expectation of dividends goes up, so the stock price rises as well. As a result, the following two hypotheses are proposed:

H1: an unexpected won match influences stock prices positively.

H2: an unexpected lost match influences stock prices negatively.

It is also reasonable to assume that European games have a greater effect on stock prices than national games. The reason is that competitions among all football clubs across Europe are more appealing. Football clubs can obtain more financial benefits and sport benefits in European games.

Data Processing

Stadtmann (2006) indicates that only the difference between the realized fundamentals and the expected fundamentals can be regarded as the news component. In other words, only expectation errors affect stock prices. The sample data set consists of all Italian Serie A and Champion League games played by Juventus Football Club from December 20th 2001 to May 31st 2006. The share prices of Juventus and the index of Milan exchange in the same time span are also used. The share and index data provide detailed historical data for the two participants in the website. Only the closing prices for each are used in the analysis. Besides, instead of using the actual price, the logarithms of both time series are used. Since football games usually take place in the afternoon or in the evening at weekends, every match related variable is attached 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. It is innocuous to define a match day as a working day followed by a day when there is a match. Table 1 summarizes number of games played and categories.

Table 1 Number of Games Played & Categories

	Juventus Italian Serie A	Juventus Champion League	Inter Milan Italian Serie A
Number of Games Played	163	52	163

It can be seen that 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. Match day data are mainly used in all analysis of this paper.

Betting odds are used as proxies for investor's ex-ante belief of the game outcomes. Such proxy is broadly used in previous research (*e.g.*, Brown and 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. Table 2 summarizes the data we use for the analysis.

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	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

We calculate the mark-up for each game and then subsequently yield the probability of winning, drawing and losing. Table 3 provides an example.

$$\text{Probability of Win} = \frac{\frac{1}{Odd_{win}}}{\frac{1}{Odd_{win}} + \frac{1}{Odd_{draw}} + \frac{1}{Odd_{lose}}} \quad (1)$$

$$\text{Probability of Draw} = \frac{\frac{1}{Odd_{draw}}}{\frac{1}{Odd_{win}} + \frac{1}{Odd_{draw}} + \frac{1}{Odd_{lose}}} \quad (2)$$

$$\text{Probability of Lose} = \frac{\frac{1}{Odd_{lose}}}{\frac{1}{Odd_{win}} + \frac{1}{Odd_{draw}} + \frac{1}{Odd_{lose}}} \quad (3)$$

Table 3 Points Calculation: An Example

Teams	Actual Points	Expected Points	Unexpected Points
Juventus-Manchester	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 favor. 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.

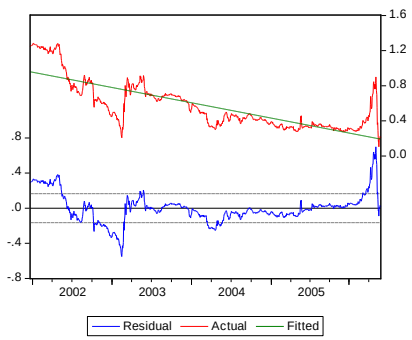
Stadtmann (2006) finds that other factors such as a player renewing his contract, players exchanging, hiring new players do not appear to significantly influence the share price of a football club. These variables are not included in the regressions in this paper.

Regression Results

Stationary of the two time-series (share price of Juventus and index of the Milan exchange) are tested first. In general, financial time-series such as equity price and index are typically non-stationary. Standard ADF test is conducted to 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, the percentage change of both variables (1st difference of the logged series) is used for regressions.

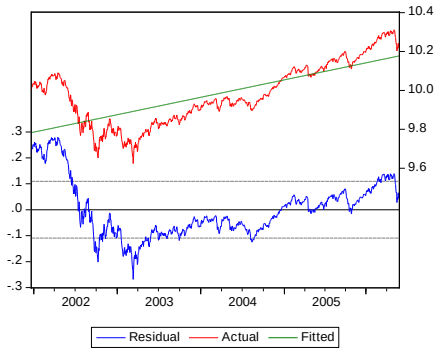
Let Juventus share price, Milan exchange index and their first differences be dependent variables. We run regressions of them on time trend. Part A presents four residual graphs from regressions. By looking at the graphs, log series of stock price and index are clearly not stationary and the lagged log 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. The plot of four variables against time are presented below.

LJUV



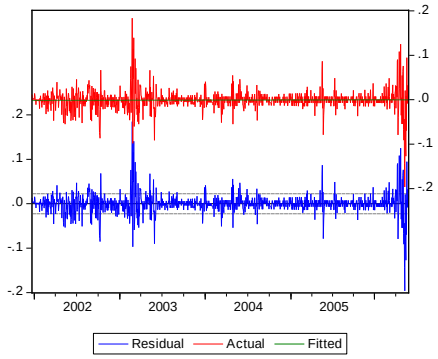
LJUV is the logarithm series of the index

LINDEX



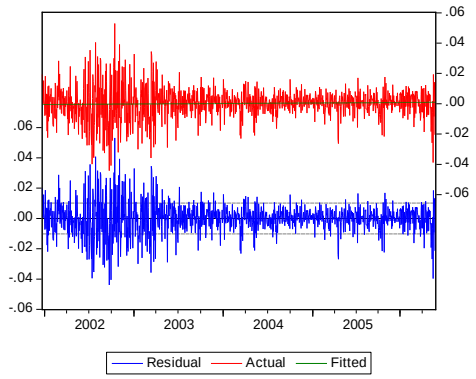
LINDEX is the logarithm series of Juventus' share price

DLJUV



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

DLINDEX



DLINDEX is the 1st difference series of the index.

Table 4 illustrates how to choose the best lag length. The first row in each cell represents the coefficient. The corresponding t-value is in parenthesis. The sign # denotes that null hypothesis cannot be rejected at the 10% significance level.

Table 4: 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

It is clear that 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.

Table 5 illustrates 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.

Table 5 ADF Test for DLJUV

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	

Regress stock price on index first.

$$DLJUV = \beta_0 + \beta_1 DLINDEX_3, \quad (4)$$

where DLJUV is the percentage change of the share prices and DLINDEX is the percentage change of the market index.

Table 6 shows the first set of regression results. The first row in each cell represents the coefficient; the corresponding t-value is in parenthesis. *,

, * denotes significance at 10, 5, 1 % level.The sign ˆ denotes loss of the first observation in the sample data.

Table 6: 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 ˆ	212 ˆ
	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

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 4b. Thus we regard it as our benchmark regression.

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.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_2 JCACT + \beta_6 JIACT , \quad (5)$$

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 4b with Regression 5, we find that 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, *i.e.*,

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_2 JCACT + \beta_3 JCEXP + \beta_6 JIACT + \beta_7 JIEXP \quad (6)$$

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: $\beta_2 = -\beta_3, \beta_6 = -\beta_7$. Table 7 shows the result of Wald Test.

Table 7: 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%. Wald test concludes that Ho can not be rejected on a 1% confidence level.

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.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_8 JIUNEXP \quad (7)$$

where JCUNEXP represents the unexpected points gained by Juventus in Champion League, and JIUNEXP represents the unexpected points gained by Juventus in Serie A.

Table 8 presents the second set of regression results. Denotation is the same as that in Table 6.

Table 8: 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

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 coefficients for Serie A

are 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.

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.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_8 JIUNEXP + \beta_{10} IIUNEXP \qquad (8)$$

We get similar regression results for JCUNEXP and JIUNEXP as in Regression (7). 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 (9) with the full range data (1151 observations after adjustments), set all non-match day unexpected points to be 0.

$$DLJUV = \beta_0 + \beta_1 DLINDEX + \beta_4 JCUNEXP + \beta_8 JIUNEXP + \beta_{10} IIUNEXP \qquad (9b)$$

Table 9: Regression Results III

		Reg 4a	Reg 9b	Reg 10
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

The results are pretty much inline with the Regression (9), 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 (9). 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

$$DLJUV=\beta_0+\beta_1 DLINDEX+\beta_4 JCUNEXP +\beta_5 JCUNEXP(-1)+\beta_8 JIUNEXP +\beta_9 JIUNEXP(-1)+\beta_{10} IIUNEXP+\beta_{11} IIUNEXP(-1) \quad (9)$$

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.

Section 5. 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".2

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

$$DLJUV = \beta_0 + \beta_1 DLINDEX \tag{4a}$$

We collect the residual series, and sort them by their absolute values. (Insert Table 7 here) We pick out the largest 20 residuals and try to identify events which could possibly link with these dates. We highlight two events below.

Juventus Moved 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%.

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

Phone-Tapping 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.

Section 6. Conclusion

Using the news model, we conclude that the unexpected match outcomes play an important role 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 indicates that national league has negligible impact in our case, others did find a link there (Georg Stadtmann (2006)). This approach is very straight forward, but it is 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.

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Section 7. Appendix

Table 10: 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	

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.

Abbreviations

JUV = stock price of Juventus
INDEX = index of Juventus on Milan Stock Exchange
JCACT = actual points of Juventus in Champion League
JCEXP = expected points of Juventus in Champion League
JCUNEXP = unexpected points of Juventus in Champion League
JIACT = actual points of Juventus in Italian Serie A
JIEXP = expected points of Juventus in Italian Serie A
JIUNEXP = unexpected points of Juventus in Italian Serie A
IIUNEXP = unexpected points of Inter Milan in Italian Serie A
LINDEX = log(INDEX)
LJUV = log(JUV)
DLINDEX = LINDEX - LINDEX(-1)
DLJUV = LJUV - LJUV(-1)