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*The Analysis of Relationships Between Sport Results and Rates  
of Returns of Companies Involved in Sport Sponsoring*

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Analiza zależności między wynikami sportowymi a stopami zwrotu przedsiębiorstw  
zaangażowanych w sponsoring sportowy

**Keywords:** sports finance; ARCH models; football

**Słowa kluczowe:** finanse sportowe; modele ARCH; piłka nożna

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### **Introduction**

Present-day commercial sport is strictly tied to money, which allows it to exist. Professional sport could not function without sponsors' money. Taking into account the fact that football is the most popular sport discipline in Poland as well as in the whole world, it is more than possible to discover strong relationships between financial markets and sport. Additionally, many authors pay attention on emotional relationships between football fans and clubs. Naturally, it is not so easy to confirm that the character of these relationships has an impact on fluctuations of stock prices, but the direction of research seems to be proper.

The main goal of this article is to prove the existence of relationships between rates of return of companies involved in sport sponsoring and sport results of sponsored clubs and that they are statistically significant. Therefore, the authors hypothe-

size that wins and losses in matches of Polish Ekstraklasa have a significant impact on the rates of return of companies on the Warsaw Stock Exchange (WSE) that finance sport. The data of the research were quotations of stocks from the Warsaw Stock Exchange from 1.07.2010 to 30.06.2017 and information about football matches' results for chosen clubs of Ekstraklasa from the 2010/2011 to 2016/2017 seasons. The verification of the hypothesis was based on the (G)ARCH-type models.

### **1. The sport industry – business or altruism?**

The commercialization of sport, manifested in creating professional sport and abandoning the ideas of Baron Coubertin's Olympism, created a scientific gap. This gap, called sport economics, started to be filled by economists dynamically from the early fifties in the United States and the seventies in Europe [Sznajder, 2007]. Four main factors influence this evolution: creation of the sportsman occupation, commercialization of sport disciplines, growth of economic education in sport and development of specific sport markets.

Sloane in 1971 wrote about football as an industry [Sloane, 1971], but Rottenberg was the real precursor of sport economic ideas [Rottenberg, 1956]. He described the main characteristic features of professional sport teams in the American Baseball League. Then Fort collected them and described them as eleven anchors of sport economics [Fort, 2005]. They include:

- monopsonistic labour market,
- monopolistic product market,
- the difference between rich and poor clubs is based on attendances as opposed to population,
- attendances are a function of some key variables,
- an equal distribution of talent does not exist in sport,
- the prospect of very high salaries attracts an over-abundance of players, causing wide salary dispersion,
- the uncertain of the result could be guaranteed only in a case of small differences between competitors (accordance to market efficiency).

Sznajder [2007] lists the following features of football clubs as an enterprise:

- profit maximization (despite the fact that it need not be the priority of an enterprise),
- formalizing the legal regulations to guarantee safety of functioning in the industry;
- creating the sport event, which, thanks to spectators, could be successful,
- sport success is set as a priority of an enterprise.

The inevitable transformation of amateur sport into professional does not concern all sport disciplines. Team sports like basketball, volleyball, hockey or handball, but in particular football, change a lot very quickly. These changes equal not only

structural transfigurations but also changes in a group of consumers. The widespread commercialization of sport makes the difference between sport enterprises and other firms very clear. Some features play important roles for stock exchange companies involved in sport. They include:

- strong sensitivity to media relations, overreaction to market information,
- double-duality of the market (firms act on the sport market and on the sponsoring-advertising market, selling goods on both primary and secondary markets using media, and all at the same time),
- characteristic consumers (indicating loyalty to the club, but trying to have an impact on strategic decisions and transfer policy),
- strict market regulations relating to rules of functioning of professional sport leagues.

Every year, the football market is reported in Deloitte's Report using the TOP 20 most valuable football clubs. Market growth was up by 6.5% in the season 2016/2017 from 7.4 to 7.9 billion €, and if such a rate is sustained, the expected value in the season 2017/2018 will be higher than 8 billion € [Deloitte, 2018]. This is in huge part caused by the exceptional position of English Premier League clubs – ten English clubs hold a top ranking. As always, such a situation has both good and bad aspects. The positive aspect is that the market is still growing, but the negative is that the difference between the rich English league and others is expanding. Taking into account the ratings of the next 10 clubs – 14 of 30 of the most valuable clubs are from the UK, with revenue of 4.4 billion € per year – confirms that thesis. Such a situation encourages international brands to sponsor clubs – for example, Emirates Airlines financially supports three clubs from the TOP 20.

The presentation of the Polish Ekstraklasa (PE) against this background is not impressive. Revenues of Legia Warsaw, the richest Polish club, equal 281 million PLN and were almost four times higher than revenues of the second club, Lech Poznań (75.1 million PLN). The total revenues of all 16 clubs equal 706.7 million PLN (170 million €), which is less than the revenues of the twentieth team in TOP 20. Despite the fact that the character of football enterprises is similar in Poland and England, the scale of activity determines their local or global ranges. Taking into account that the Polish league is not widely known and is significantly undercapitalized, the lack of interest of big international companies in it does not seem strange. The level of financial involvement of PE's sponsors is fitted to the local market, and the policy is based on local expectations and goals.

## **2. Sponsorship in economy and sport**

Sponsorship has existed since ancient times, when the Roman aristocrat Gaius Cilnius Maecenas shaped public opinion through financial support of selected artists [Stecki, 2000]. However, contemporary patronage was a selfless support directed

at social interest, while current sponsorship acts also in the interest of the company engaged in sponsorship [Sznajder, 1996].

Nowadays, client acquisition is becoming more difficult because of the spreading of different types of information and commercials. In this case, companies are trying to find alternatives and more friendly ways of communicating with clients. One way is sponsorship, which is connected with commercials, but they are less annoying when people see them during an emotional sport event.

Sponsorship has a social and an economic nature. The first focuses on the social interests and concerns supporting such fields as health, sport, culture and art. The second is connected with funding events that could not be organized without the sponsors' support or transferring money to companies that are unable to collect sufficient revenues from their business to finance it. Because of such investments, sponsorship has contributed to the development of numerous areas of social life. Statistics show that the sponsorship market is growing year by year, and in 2017, it reached 23.1 billion USD [*Global sponsorship spending by region...*]. The biggest recipient of the sponsorship market is the sport sector, accounting for around 85% [*ESA Sponsorship Fact Sheet...*]. These tendencies occur because sport evokes positive connotations, which is exactly the way that the companies engaged in sponsorship aim to operate. On the other hand, some entities in the sport market are often unable to collect sufficient revenues from their primary business activity to finance it [Sznajder, 2015], which causes the sport segment to become the ideal market for sponsors.

The companies may get involved in sponsorship in many ways, which is why we distinguish numerous types of sponsorship that can be divided into different categories. Firstly, sponsorship can be divided according to the particular objective that the sponsoring entity aims to fulfil. On the one hand, notoriety is what the company wants to earn by choosing an entity for sponsorship that will ensure the wide appeal of the brand and enhance the level of its recognition. On the other hand, the image of both the enterprise and the manufactured products is enhanced by transferring the positive connotations from the sponsored entity [Sznajder, 2015]. Another division refers to the number of involved sponsors. We distinguish here between exclusive sponsorship, in which only one sponsoring entity is concerned, a co-sponsorship, which includes several different sponsors, and a dominative sponsorship, in which there are several sponsoring entities, but one of them receives higher compensatory payments because its contribution is more significant than that of the other sponsors. In co-sponsorship, each enterprise demonstrates a specific degree of involvement, which may be concluded from the name associated with them (main sponsor, technical sponsor, partner) in a so-called "sponsorship pyramid" presenting the hierarchy of entities according to the value of the means involved [Sznajder, 2015]. Secondly, sponsorship can be divided according to the nature of the benefits a sponsor provides. In this category, we distinguish between a financial sponsorship related to transferring funds, an in-kind sponsorship focused on providing, for instance, sport equipment, a service sponsorship, in which the sponsored entity receives services such as provi-

sion of transportation, or license sponsorship, which grants the use of the sponsor's trademark, logo or name [Sznajder, 2015]. The next division is based on the way the sponsor's name is revealed. This case involves an emblem sponsorship, in which the sponsor gains the right to use the sponsored entity's logo or has obtained permission to display its logo or name on materials used for promoting a particular event, and name (titular) sponsorship, in which the sponsor's name appears in the title of the event. The last criterion is the duration of the sponsoring contact, by which we can distinguish a one-time sponsoring, if the contract concerns a particular event, from a long-term sponsorship, in which the contract is signed for a longer period of time.

### 3. The autoregressive econometric models

The research on relationships between sport results and rates of return of stock exchange companies connected to football has been on-going for 20 years. Authors did not focus on one kind of model but used many different econometric and statistic tools such as linear and nonlinear models, GARCH-type models and statistical tests, for example, for cointegration or causality. Table 1 presents a short review of studies.

Table 1. Review of selected research conducted in the field of the relationship between sport information and share prices using (G)ARCH model

Author	Research focus	Used variables	Method	Conclusion
Douque, Ferreira (2005)	FC Porto, Sporting Lisbon	Index PS20, games results, daily trading volume, risk-free rate	ARCH-GARCH	At the end of the season, the relationship becomes significant
Berument, Ceylan, Gözpinar (2006)	Beşiktaş, Fenerbahçe, Galatasaray	Index ISE100, international games results	GARCH	The relationship was confirmed only for Beşiktaş
Edmans, Garcia, Norli (2007)	50 national teams	International games results	GARCH	The relationship was only confirmed for developed countries
Benkraiem, Le Roy, Louhichi (2010)	11 British clubs	Games results, date of the match, match referee	EGARCH	Sports results have a significant impact on stock prices
Berument, Ceylan (2012)	Chile, Turkey, England, Spain	Stock exchange indexes, games results	EGRACH	Sports results have an impact on stock prices and on the relationship rate of return-volatility
Saraç, Zeren (2013)	Beşiktaş, Fenerbahçe, Galatasaray	Index ISE100, games results, betting odds, goal difference, type of games, match place, derby	Regression	Goal difference has a positive impact on rates of return of all three clubs. There is also a negative relationship with international games
Majewski (2014)	BVB	Games results, transfers, match day	Statistic tests, GARCH	Games results have an impact on changes in rates of return of BVB stock
Majewski (2017)	Juventus FC, FC Liverpool, Bayern Munich, BVB	Games results, sponsors' rates of return	GARCH	There was no relationship between Bayern games results and Deutsche Telekom stocks or between Juventus rates and Fiat-Chrysler stocks. Instead, there were relationships between two other clubs and its sponsors' shares

Source: [Majewski, 2014, 2015; Majewski, Majewska, 2017].

The majority of the articles presented in Table 1 show significant relationships between rates of returns of sponsors' stocks and sponsored club results. In many cases, the best approximations were for GARCH-type models.

The base for the GARCH is the linear model:

$$y_t = \gamma_0 + \sum_{k=1}^n \gamma_k X_{kt} + \varepsilon_t \quad (1)$$

where:

$y_t$  – rate of return of a sponsor's stocks in period  $t$

$X_{kt}$  – a value of independent variable

$\varepsilon_t$  – the random component – in OLS is normally distributed  $N(0, 1)$

Because of problems with normality of random components, the best fit is usually possible thanks to ARCH-type models. Significant results are obtained for the first two types: ARCH( $q$ ) and GARCH( $p, q$ ), as Table 1 shows.

The basic ARCH( $q$ ) model is expressed by Engle [1982]:

$$h_t = \alpha_0 + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 \quad (2)$$

where:

$h_t$  – conditional variance

$\varepsilon_t | I_{t-1} \sim N(0, h_t)$

$I_t$  – the information set available at time  $t$

$\alpha_0 > 0, \alpha_i \geq 0, i=1, \dots, q$  and  $\sum_{i=1}^q \alpha_i < 1$ .

The ARCH process is a special case of a more general model called GARCH, which stands for generalized ARCH. It adds to equation (2) lags in values of variance. The GARCH ( $p, q$ ) was expressed by Bollerslev [1986]:

$$h_t = \alpha_0 + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^p \beta_j h_{t-j} \quad (3)$$

where:

$\alpha_0 > 0, \alpha_i \geq 0, \beta_j \geq 0, i=1, \dots, q, j=1, \dots, p$ , which guarantees the non-negativity of the conditional variance

The third analysed model is the EGARCH model, which stands for generalized exponential autoregressive heteroscedasticity. It can be expressed by the equation [Xiuhongshi, Kobayashi, 2009, pp. 2797–2808; see also: Nelson, 1991, pp. 347–370]:

$$y_t = \sqrt{h_t} e_t$$

$$\log(h_t) = \alpha_0 + \beta \log(h_{t-1}) + \gamma \left| \frac{y_{t-1}}{h_{t-1}} \right| + \left| \frac{\theta y_{t-1}}{h_{t-1}} \right|$$

where:  $-1 < \beta < 1$

The best fit of rates of return movement will allow ascertaining that the possibility of the successful use of non-economic factors in econometric modelling exists. The estimation procedure was maximum likelihood ( $L$ ), the log of  $L$  being given by:

$$\ln L = -\frac{N}{2} \ln 2\pi - \frac{1}{2} \sum_{t=1}^N \ln h_t(\theta) - \frac{1}{2} \sum_{t=1}^N \frac{R_t^2}{h_t(\theta)} \quad (4)$$

where:

$N$  – a length of the series

$h_t(\theta)$  – the variance function expressed by the equation:  $h_t(\theta) = e^{\alpha_1 + \alpha_2 \cdot \ln \varepsilon_t}$

$R_t$  – residuals from the regression

Estimation was done using the GRET program.

#### 4. Empirical results – Ekstraklasa case study

Econometric models' estimation goal is to verify occurrence and analyse the relationship between sport results and rates of return of companies involved in sponsorship. The analysis focuses on five sponsors of football teams from Ekstraklasa and one football company listed on the Warsaw Stock Exchange, which are presented in Table 2.

Table 2. Companies – sponsors from Ekstraklasa

Company	Characteristics of cooperation
Comarch S.A., a Polish software house and systems integrator	Comarch is a sponsor of Cracovia. The company ringfenced sport as an activity that relates to running the club. The main goal of investing in a sport club is the promotion of the Comarch brand
KGHM Polska Miedź S.A., a Polish company, one of the world's leaders in copper and silver production	KGHM is the owner of Zagłębie Lubin, which is responsible for organizing professional sports competitions and running the Football Academy. The main goal of these activities is to realize the long-term social responsibility strategy implemented by KGHM
Lubelski Węgiel Bogdanka S.A., a Polish coal mining company	Bogdanka realizes a part of its marketing activities by supporting Górnik Łęczna. Club activities support the team playing in Ekstraklasa and promote sports among young people and other residents of the region. These activities aim to achieve social benefits and marketing goals such as creating a company's image
Polnord S.A., a Polish company, one of the largest developers in Poland	Polnord was the main sponsor of Arka Gdynia until 2016. Since 2017, the company is a partner of Arka Gdynia
Ruch Chorzów S.A., a Polish football company, listed on the Warsaw Stock Exchange	Ruch Chorzów is a Polish football team listed on WSE (NewConnect). Sport is the company's core business activity and involves getting licence to Ekstraklasa, team development and increasing the stadium attendance
Zakłady Chemiczne Police S.A., a Polish company that specializes in the chemical synthesis industry	The company is the main sponsor of Pogoń Szczecin

Source: own research.

The research was conducted in the following steps:

- data collection,
- models estimation,
- best models selection.

The study was carried out using share quotations of identified companies from 1 July 2010 to 30 June 2017 and Ekstraklasa game results from seasons 2010/2011 to 2016/2017.

Variables used in the research are:

1.  $R_t$  – logarithmic rate of return of sponsor.
2.  $W$  – game won.
3.  $R$  – game drawn.
4.  $P$  – game lost.

Furthermore, the research used lagged independent variables ( $W$ ,  $R$ ,  $P$ ) and lagged dependent variables ( $R_t$ ).

The dependent variable was calculated as a logarithmic rate of return using the formula:

$$R_t = \ln \frac{P_t}{P_{t-1}}$$

where:

$P_t$  – closing price at time  $t$

$P_{t-1}$  – closing price at time  $t-1$

Independent variables due to their qualitative character were changed to dummy variables:

1. Game won:  $W=1$ ,  $R=0$ ,  $P=0$ .
2. Game drawn:  $W=0$ ,  $R=1$ ,  $P=0$ .
3. Game lost:  $W=0$ ,  $R=0$ ,  $P=1$ .

Afterwards, rates of return were collated with a game results database and were used in econometric modelling in GRETL programme.

After estimation of almost 600 models, the best models were chosen (one for each sponsor) based on maximizing the log-likelihood function and minimizing the Akaike's information criterion presented in Table 3.

On the basis of econometric analysis, we verified that (excluding one case, KGHM Zagłębie Lubin) relationships exist between rates of return of companies financing football clubs and sport results. The dynamic models assuming the existence of heteroscedasticity of random components are the best approximations. The most important determinants of rates of return were lagged (1 or 2 days) losses of such clubs as Cracovia, Górnik Łęczna, Arka Gdynia, Ruch Chorzów and Pogoń Szczecin. Wins are significant regressors only in two cases: Ruch Chorzów and Pogoń Szczecin. Unfortunately, the parameters were negative (for Ruch and Pogoń), suggesting that these results are accidental. It could be supposed that in the case of

Table 3. Results of estimation for companies involved in sponsorship of clubs from Ekstraklasa

Club	Sponsor	Model			Ln(L)	AIC
		variable	value	p-value		
Cracovia	Comarch	const	0.00087	0.0597	4430.1140	-8846.229
		$P_{t-2}$	-0.00338	0.0939		
		$R_{t-3}$	-0.05430	0.0311		
		alpha (0)	0.000176	0.0002		
		alpha (1)	0.12687	<0.0001		
		beta (1)	0.41022	0.0032		
Zagłębie Lubin	KGHM	const	0.00035	0.4933	4135.6670	-8259.334
		$R_{t-1}$	0.08618	0.0008		
		alpha (0)	1.06254e <sup>-05</sup>	0.0009		
		alpha (1)	0.06268	<0.0001		
		beta (1)	0.92172	<0.0001		
Górnik Łęczna	Bogdanka	const	-0.00068	0.1041	4330.5380	-8649.077
		$P_{t-1}$	0.00675	0.0005		
		alpha (0)	2.06233e <sup>-05</sup>	<0.0001		
		alpha (1)	0.20189	<0.0001		
		beta (1)	0.79767	<0.0001		
Arka Gdynia	Polnord	const	0.00052	0.4022	3894.7910	-7775.581
		$P_t$	-0.00669	0.0206		
		$P_{t-1}$	-0.00829	0.0031		
		alpha (0)	3.50635e <sup>-05</sup>	0.0084		
		alpha (1)	0.13029	<0.0001		
		beta (1)	0.83843	<0.0001		
Ruch Chorzów	Listed on WSE	const	-0.00271	0.0035	1981.74123	-3939.482
		W	0.01222	0.1457		
		P	-0.02766	1.68e <sup>-05</sup>		
		$P_{t-1}$	-0.04639	4.39e <sup>-07</sup>		
		$P_{t-2}$	-0.02973	0.0009		
		$P_{t-3}$	0.01911	0.0000		
		$P_{t-4}$	0.02184	0.0245		
		$P_{t-5}$	-0.03156	0.0000		
		omega	-0.98837	3.12e <sup>-015</sup>		
		alpha	0.77685	1.27e <sup>-020</sup>		
		gamma	-0.19768	0.0158		
		beta	0.89610	0.0000		
		Pogoń Szczecin	Police	const		
$W_{t-1}$	-0.00369			0.0931		
$W_{t-2}$	-0.00407			0.0699		
$R_t$	-0.00515			0.0259		
$R_{t-2}$	-0.00460			0.0503		
$P_{t-2}$	-0.00430			0.0349		
$R_{t-1}$	0.04561			0.0993		
alpha (0)	2.00547e <sup>-05</sup>			0.0014		
alpha (1)	0.09803			<0.0001		
beta (1)	0.86666			<0.0001		

Source: own research.

Pogoń, the event is more important than the results. We found such a conclusion in the work of Majewski [2015]. The financial and sport situation of Ruch Chorzów could cause some problems in estimation models for rates of return.

Every loss of Arka Gdynia causes a decrease of rates of return of Polnord: -0.6% for losses and -0.8% for 1-day-lagged losses, respectively. Rates of return of Bogdanka reacted positively to losses of Górnik Łęczna, and there is no any logical interpretation of such a situation. Rates of return of Comarch indicate appropriate reactions for losses of Cracovia – every loss causes a -0.3% decrease in rates of return.

## Conclusions

It was possible to positively verify that in the analysed period, relationships exist between rates of return and sport results of PE's clubs. The results obtained for Cracovia and Arka have a particular meaning – strong negative reactions of sponsors' stocks on losses of team. The results obtained for Górnik Łęczna and Bogdanka are not clear, and they have no logical interpretation.

The most complicated results are obtained for Ruch Chorzów and Pogoń Szczecin. There were contradictions between logic interpretation and signs of model parameters standing by losses in the case of Ruch. We suppose that the very weak financial situation of Ruch Chorzów could affect rates of return on the Warsaw Stock Exchange. The rates of ZCh Police reacted negatively to losses and wins at the same time (for 2-day lags). This result suggests that we should enter another variable to the model – matchday, as in the work of Majewski, in which this variable is connected to rates of return.

Further research should take into account also bookmakers' odds, which allow for the verification of the emotional character of relationships.

## References

- Bollerslev T., *Generalized autoregressive conditional heteroscedasticity*, "Journal of Econometrics" 1986, Vol. 31(3), DOI: [https://doi.org/10.1016/0304-4076\(86\)90063-1](https://doi.org/10.1016/0304-4076(86)90063-1).
- Deloitte, *Raising Stars. Football Money League*, Sport Business Group, January 2018.
- Engle R., *Autoregressive conditional heteroskedasticity with estimates of the variance of UK inflation*, "Econometrica" 1982, Vol. 50(4), DOI: <https://doi.org/10.2307/1912773>.
- ESA Sponsorship Fact Sheet – 2014, <http://sponsorship.org/wp-content/uploads/2014/07/ESA-Sponsorship-Fact-Sheet-2014.pdf> [access: 10.04.2018].
- Fort R., *The Golden Anniversary of the Baseball Players' Labor Market*, "Journal of Sports Economics" 2005, Vol. 6(4), DOI: <https://doi.org/10.1177/1527002505281226>.
- Global sponsorship spending by region from 2009 to 2018 (in billion U.S. dollars)*, [www.statista.com/statistics/196898/global-sponsorship-spending-by-region-since-2009](http://www.statista.com/statistics/196898/global-sponsorship-spending-by-region-since-2009) [access: 10.04.2018].
- Majewski S., *Koincydencja zdarzeń czy wpływ oczekiwań rynku bukmacherskiego na realizację stóp zwrotu z akcji przedsiębiorstw piłkarskich – przypadek Borussia Dortmund*, „Decyzje” 2014, nr 22.
- Majewski S., *Sponsoring sportowy jako czynnik wpływający na stopy zwrotu spółki giełdowej – przypadek spółki ZCh Police i klubu piłkarskiego Pogoń Szczecin*, [in:] *Problemy gospodarki międzynarodowej, krajowe i regionalne*, Wydawnictwo Adam Marszałek, Toruń 2015.

- Majewski S., Majewska A., *Econometric modelling of market prices of football clubs 'sponsors' stocks*, "AESTIMATIO, The IEB International Journal of Finance" 2018, No. 17.
- Nelson D.B., *Conditional Heteroscedasticity in Asset Returns: A New Approach*, "Econometrica" 1991, No. 59.
- Rottenberg S., *The Baseball Player's Labor Market*, "Journal of Political Economy" 1956, Vol. 64(3),  
**DOI: <https://doi.org/10.1086/257790>**.
- Stecki L., *Sponsoring*, Towarzystwo Naukowe Organizacji i Kierownictwa „Dom Organizatora”, Toruń 2000.
- Sloane P.J., *The economics of professional football: The football club as a utility maximizer*, "Scottish Journal of Political Economy" 1971, Vol. 18(2),  
**DOI: <https://doi.org/10.1111/j.1467-9485.1971.tb00979.x>**.
- Sznajder J., *Charakterystyka rynku sportu profesjonalnego*, „Gospodarka Narodowa” 2007, nr 10.
- Sznajder A., *Marketing sportu*, PWE, Warszawa 2015.
- Sznajder A., *Sponsoring, czyli jak promować firmę, wspierając innych*, Business Press, Warszawa 1996.
- Xiuhongshi S., Kobayashi M., *Testing for jumps in the EGARCH process*, "Mathematics and Computers in Simulation" 2009, Vol. 79.

#### **Analiza zależności między wynikami sportowymi a stopami zwrotu przedsiębiorstw zaangażowanych w sponsoring sportowy**

Artykuł jest krótkim studium o znaczeniu czynników nieekonomicznych w kształtowaniu się stóp zwrotu z akcji spółek sponsorskich na Giełdzie Papierów Wartościowych w Warszawie. W pracy skupiono się na związkach między wynikami sportowymi klubów piłkarskich a stopami zwrotu spółek giełdowych. Wykorzystano tu dynamiczne modele ekonometryczne zakładające heteroskedastyczność składnika losowego.

#### **The Analysis of Relationships Between Sport Results and Rates of Returns of Companies Involved in Sport Sponsoring**

The article is a short study of the importance of non-economic factors in the fluctuation of rates of return of sponsors' stocks quoted on the Warsaw Stock Exchange. The authors focus on the correlations between sport results of Polish football clubs and rates of return of stocks of stock exchange companies. Dynamic econometric models assuming heteroscedasticity of a random coefficient are used.