

## Цифровая экономика

# INFORMATION EFFICIENCY IN ONLINE BETTING MARKET: THE CASE FROM RUSSIAN PREMIER LEAGUE FOOTBALL MATCHES

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**Pang, Yu**

*HSE University, St. Petersburg School of Economics and Management, PhD student  
St. Petersburg, Russian Federation  
yupang@hse.ru*

## Abstract

*This research embarks on an uncharted exploration into the efficiency of the Russian football online betting market, offering a fresh perspective on a relatively unexplored area. This study analyzes the average market odds and odds from four specific local Russian bookmakers: 1xstavka, Fonbet, Betcity, and Marathon, spanning the seasons from 2019/2020 to 2022/2023. The findings reveal a discernible decline in average bookmakers' margins over the seasons, with significant fluctuations and potential correlations with the absence of an audience. The efficiency tests of the online betting markets for the average market price and the four Russian local bookmakers yield notable insights. The results indicate a consistent trend of negative returns, with certain seasons and bookmakers showing less negative or even positive returns. The research uncovers fluctuating efficiency in different outcomes over the seasons, highlighting potential market inefficiencies, particularly in the assessment of away team victories during specific periods. Despite its comprehensive analysis, the study acknowledges limitations, including its focus on four Russian bookmakers and the exclusion of various external factors, underscoring the need for further research in this domain.*

## Keywords

*information efficiency; online betting market; Russian Premier League football; Bookmaker Margins*

## Introduction

The Efficient Market Hypothesis (EMH), introduced by Eugene Fama in 1970, posits that financial markets are “informationally efficient”, meaning that asset prices fully reflect all available information [1]. Since its introduction, numerous studies have sought to verify the EMH from various perspectives, examining different markets and time periods to ascertain the extent of their informational efficiency [2–4]. A unique market that has garnered attention in this context is the betting market. Characterized by its own set of dynamics and parameters, the betting market offers a distinctive platform for examining information efficiency. The betting market, unlike traditional financial markets, is driven by probabilities of events rather than tangible assets, presenting a different angle for assessing market efficiency [5,6].

Research on the efficiency of betting markets across different sports has yielded diverse conclusions. Various studies have explored the informational efficiency in the betting markets of different sports, each presenting its own set of characteristics and challenges. These studies have revealed a spectrum of findings, highlighting the complexity and variability of betting market efficiency across different sports contexts, like in American football [7,8]; horse racing [9,10]. In the realm of football, the debate continues.

The efficiency of the betting market in football matches has been a topic of extensive research and discussion. Some studies affirm the market's efficiency, arguing that football betting markets accurately reflect all relevant information and adjustments are made as new information emerges. A comprehensive study [5] delves into the efficiency of online betting markets. The research, which spans 11 years and encompasses odds from 41 bookmakers across 11 major European leagues, reveals a spectrum of efficiency levels within these markets. The meticulous methodology employed in the study facilitates the

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identification of odds thresholds, instrumental for formulating both retrospective and prospective profitable betting strategies. Despite the discovery of inefficiencies in three markets, the research predominantly underscores the efficiency of eight markets. This finding aligns with the Efficient Market Hypothesis, as it indicates that the best odds across bookmakers reflect all available information, leaving no room for consistent profit opportunities. Similarly, a study [6] conducted on the English football betting market lends further support to the EMH. The research demonstrates that odds are generally unbiased when juxtaposed with actual match outcomes, signifying market efficiency in the weak form. This efficiency is attributed to the rapid adjustment of odds in response to new information, effectively eliminating arbitrage opportunities and reinforcing the principles of the EMH.

Conversely, other research posits that the football betting market is not fully informationally efficient. In the exploration of the efficiency of the fixed odds betting market for football in England, [11] embarks on a detailed investigation focusing on the utilization of available information by market participants. The study unveils a compelling model wherein the bookmaker, in the pursuit of maximizing expected profits, may inadvertently set odds that defy the principles of market efficiency. Through rigorous empirical tests employing the ordered probit model and extensive data on odds and public information, Kuypers uncovers palpable evidence of market inefficiencies. These findings illuminate the existence of potential profitable betting opportunities for bettors, thereby challenging the notion of market efficiency. Further casting doubt on the efficiency of the betting market, [12] present an exhaustive assessment of the international efficiency of the European football betting market. Their research, marked by a comprehensive analysis of betting across different bookmakers, reveals the emergence of profitable arbitrage opportunities. This phenomenon, which allows bettors to secure guaranteed profits by exploiting price differences among bookmakers, stands in stark contrast to the weak-form market efficiency, further underscoring the presence of inefficiencies in the market. Complementing these findings, [13] conducts an extensive investigation into the efficiency of the European Football online betting market. Analyzing odds from 12 bookmakers across 21 European championships over an 11-year span, the study discerns that systematically selecting odds inferior to a certain threshold yields a positive rate of return, particularly when supporting overwhelming favorites. This observation, indicative of the potential for consistent profits, further attests to the inefficiencies permeating the European Football online betting market.

In the unique context of the COVID-19 pandemic, [14] explore the semi-strong form efficiency of sports betting markets during the period of "ghost" games in top European football leagues. Despite the absence of spectators and a consequent diminished home advantage, the study finds that betting markets failed to promptly and accurately integrate this new public information into betting prices. The persistent overvaluation of the home team's winning chances, especially notable in the German Bundesliga, signals a temporary deviation from semi-strong form efficiency, highlighting market inefficiency during this period. Corroborating these findings, [15] further underscore the market's inefficiency, noting the inadequate adjustment of betting odds to the altered home advantage in "ghost" games. The research reveals a slow or even non-existent adaptation process in the betting markets, further emphasizing the deficiency in semi-strong efficiency during the pandemic.

While extensive research has been conducted on various global betting markets, this study stands as a pioneering exploration into the efficiency of the online betting market in Russian football. Despite the extensive studies on betting market efficiencies, a significant gap exists in the exploration of the Russian online betting market, a niche this study aims to fill. Utilizing a robust analysis of odds data and return results from various bookmakers, this study offers a comprehensive insight into the efficiency of the Russian online betting market.

This paper extends the research on information efficiency in the online betting market by focusing on the Russian Premier League football matches. I aim to explore the efficiency of the Russian online betting market, comparing the odds from local Russian bookmakers to the global average. This study will provide a comprehensive understanding of the market dynamics and efficiency in the context of Russian football matches. By focusing on the Russian Premier League football matches, this research not only contributes to the understanding of market dynamics in a relatively unexplored context but also offers practical insights for bettors and market participants. While this research provides novel insights into the Russian betting market, it acknowledges the limitation of focusing exclusively on the Russian Premier League, offering a pathway for future research to explore other leagues and sports within Russia.

## 1 Method

Consider  $y_i$  as a binary variable, representing the occurrence of a specific game outcome (home win, draw, or away win), taking the value of one if the outcome occurs, and zero otherwise, across different matches  $i = 1, \dots, I$ . The decimal odds offered for each possible outcome  $i$  is denoted as  $o_i$ . The reciprocal of these odds,  $z_i = 1/o_i$ , is the bookmaker's implied probability forecast for the corresponding outcome. Summing  $z_i$  across all possible outcomes generally results in a value exceeding one ( $\sum z_i > 1$ ), representing the bookmaker's expected commission or profit margin, symbolized as  $c_i$ . Mathematically,  $c_i$  is expressed as  $c_i = \sum z_i - 1$ , a value also referred to as the "overround" or "vig".

The true, objective probability of each outcome  $I$  is symbolized as  $p_i$ , leading to the expression of the implied odds-based probability forecast as  $z_i = p_i + c_i$ . The forecast error,  $\varepsilon_{ij}$ , is defined as the difference between the actual game outcome  $y_i$  and the bookmaker's implied probability  $z_{ij}$ , offered by various bookmakers  $j = 1, \dots, J$ , i.e.,  $\varepsilon_{ij} = y_{ij} - z_{ij}$ . In an efficient market, prices already incorporate all available information, precluding the use of additional information for generating abnormal returns. Under this premise, the expected value of the forecast error aligns with the negative of the bookmaker's commission,  $E(\varepsilon_i) = -c_i$ .

To evaluate the market efficiency of different bookmakers, the following model is proposed:

$$\varepsilon_{ij} = \beta_j z_{ij} + \alpha_{1j} + \sum_{t=2}^T \alpha_{tj} d_t + \mu_{ij} \quad E(\mu_{ij} | \beta_j, \alpha_{1j}, \alpha_{tj}) = 0 \quad (1)$$

In this model: (i)  $\alpha_{1j}$  captures the  $j^{\text{th}}$  bookmaker's commission in the first season. (ii)  $\alpha_{tj}$  represents the change in the  $j^{\text{th}}$  bookmaker's commission over time, from season 2 to season  $T$ . (iii)  $d_t$  is a season-specific dummy variable, equal to 1 for season  $t$  and 0 otherwise. In  $\varepsilon_{ij} = \beta_j z_{ij} + \alpha_{1j} + \sum_{t=2}^T \alpha_{tj} d_t + \mu_{ij}$

$E(\mu_{ij} | \beta_j, \alpha_{1j}, \alpha_{tj}) = 0$  (1),  $\alpha_{1j}$  is anticipated to be negative, indicating a subtraction of a certain level of bookmaker commission from the forecasted probabilities in the first season. This negative value arises as bookmakers set odds ensuring their profit, reflected in the commission, making  $\alpha_{1j}$  negative. The coefficients  $\alpha_{tj}$  denote the change in this commission over time. A positive value of these coefficients indicates a reduction in the commission (or overround) compared to the first season, as the initial negative commission is offset by these positive values, resulting in a diminished overall negative commission.

In addition to evaluating forecast errors, this study ambitiously aims to analyze the efficiency of the Russian online betting market in comparison to global standards. The methodology is expanded to include fixed effects for individual bookmakers, denoted as  $\delta_j$ , to enhance the model's robustness. This inclusion allows for a more nuanced examination of market efficiency and potential biases, specifically addressing the favorite-longshot bias and under-prediction of draw outcomes.

The model is augmented by introducing  $h_{ij}$  and  $a_{ij}$ , representing the forecasted probabilities of home and away wins based on bookmaker odds. The enhanced model is expressed as:

$$\varepsilon_{ij} = \beta_j z_{ij} + \beta_h h_{ij} + \beta_a a_{ij} + \delta_j + \alpha_{1j} + \sum_{t=2}^T \alpha_{tj} d_t + \mu_{ij} \quad E(\mu_{ij} | \beta_j, \beta_h, \beta_a, \delta_j, \alpha_{1j}, \alpha_{tj}) = 0 \quad (2)$$

The coefficient  $\beta_j$  is pivotal for assessing market efficiency. Aligning with the framework [16], market efficiency is upheld if the conditional expectation is zero. A non-zero  $\beta_j$  would signify a systematic deviation of the bookmaker  $j$ 's odds from true probabilities, highlighting market inefficiencies. The coefficients  $\beta_h$  and  $\beta_a$  gauge the influence of bookmakers' implied probabilities for home and away wins on forecast errors. A significant  $\beta_h$  or  $\beta_a$  would denote systematic miscalculations in estimating the likelihood of home or away wins, revealing a consistent under-prediction of draws.

Weighted Least Squares (WLS) is employed to estimate the model parameters, enhancing efficiency and addressing heteroskedasticity in forecast errors. The weighting matrix's diagonal elements are approximated by  $z_{ij}^*(1-z_{ij})$  [5].

It is crucial to note the robust estimation of standard errors, accounting for potential clustering at the match level. This step is essential as  $\varepsilon_{ij}$  is likely to exhibit substantial correlation across bookmakers and outcomes for a given match. Overlooking this clustering or using an inappropriate dimension, such as the bookmaker level, could lead to inaccurately precise estimates, potentially resulting in the unwarranted rejection of the null hypothesis. By employing this comprehensive and robust methodology, the study ensures a meticulous examination of the Russian online betting market's efficiency, offering valuable insights and contributing significantly to the existing body of knowledge.

## 2 Data

This study utilizes a comprehensive dataset sourced from Football Data (<https://www.football-data.co.uk/>) and Odds Portal (<https://www.oddsportal.com/>), offering updated match results, average market odds, and diverse odds from approximately 60 global bookmakers. To focus on the efficiency of the Russian online betting market, this study exclusively utilizes data from four local Russian bookmakers: 1xstavka, Fonbet, Betcity, and Marathon. The data is sourced from the website line4bet.ru, ensuring a comprehensive and relevant dataset for the analysis. The data for 1xstavka begins from October 2017, while information from the other bookmakers is available from the 2019/2020 season. To maintain consistency and ensure a comprehensive analysis, the study restricts the dataset to seasons from 2019/2020 to 2022/2023, encompassing 960 matches across four seasons. Each match in the dataset is equipped with average and pre-match odds from the four selected Russian bookmakers. The 2019/2020 season data is bifurcated into two segments to analyze the potential impact of matches held without spectators post-March 1, 2020, due to the COVID-19 pandemic, referred to as "ghost" games. Attendance data is cross-verified through the Championat website (<https://www.championat.com/>).

Table 1 meticulously outlines the distribution of match outcomes, including home wins, draws, and away wins, across the four scrutinized seasons. Despite no significant disparity in the victory distribution between the two segments of the 2019/2020 season, a detailed comparative analysis with the other three seasons unveils a decreased home winning rate in 2019, recorded at less than 40%. In contrast, an elevated away winning rate, surpassing 35%, is observed. While some studies [17], suggest a correlation between the absence of spectators and a reduced home field advantage, it remains inconclusive to directly attribute the observed trends to this factor. The assertion that the absence of spectators substantially impacts the distribution of home and away wins lack robust empirical evidence, rendering it not definitively substantiated.

Table 1. Distribution of football match outcome across seasons

Season	Home Win (%)	Draw (%)	Away Ain (%)	Total Matches
2019/2020(a)	35.26%	28.20%	36.54%	156
2019/2020(b)	38.10%	25.00%	36.90%	84
2020/2021	48.33%	20.83%	30.83%	240
2021/2022	43.33%	24.58%	32.08%	240
2022/2023	47.08%	22.92%	30.00%	240

Notes: "2019/2020(a)" refers to matches from the 2019/2020 season that occurred before March 1, 2020.

Table 2 provides a detailed overview of the bookmakers' margins across different seasons, highlighting a general decline in average bookmakers' margins from 6.66% in the first part of the 2019/2020 season to 5.16% in the 2022/2023 season. This trend underscores a consistent reduction in bookmakers' margins over time. Among the individual bookmakers, Marathon displays significant fluctuations, with a notable drop to 1.44% in the 2020/2021 season and a subsequent increase to 3.65% in the 2022/2023 season. This inconsistency contrasts with the relative stability observed in the margins of other bookmakers like 1xstavka and Betcity. The division of the 2019/2020 season offers insights into the impact of "ghost" games, where matches were held without spectators. A critical observation is the sharp decline in Marathon's margins to 2.30% in the latter part of the 2019/2020 season, nearly halving from the earlier segment. This significant reduction during the period of "ghost" games highlights a potential correlation between the absence of an audience and reduced bookmaker margins, suggesting that audience presence may influence betting outcomes and bookmaker profitability.

Table 2. Bookmakers' margins across seasons

	2019/2020(a)	2019/2020(b)	2020/2021	2021/2022	2022/2023
On Average	6.66%	6.52%	6.32%	5.60%	5.16%
1xstavka	3.46%	2.78%	2.74%	2.58%	2.57%
Fonbet	4.62%	4.48%	4.32%	4.43%	4.13%
Betcity	3.67%	2.96%	3.31%	3.29%	3.23%
Marathon	4.95%	2.30%	1.44%	1.90%	3.65%

### 3 The analysis of model

This section evaluates the efficiency of online betting markets, focusing on the average market price and four Russian local bookmakers as outlined previously. The efficiency test is grounded on the expectation that the conditional forecast errors should equate to the negative of the bookmaker commissions. It is anticipated that the estimation of 
$$\varepsilon_{ij} = \beta_j z_{ij} + \alpha_{1j} + \sum_{t=2}^T \alpha_{tj} d_t + \mu_{ij} \quad E(\mu_{ij} | \beta_j, \alpha_{1j}, \alpha_{tj}) = 0$$
 (1), for each bookmaker would yield a significantly negative estimate for  $\alpha_{1j}$ , reflecting the bookmaker margin, and the null hypothesis  $H_0: \beta_j = 0$  would not be rejected. The results, detailed in Table 3, align with these expectations, showcasing all negative estimates for  $\alpha_1$ , affirming the anticipated bookmaker margin.

Table 3. Estimated Parameters and Efficiency Tests for Online Betting Markets Across Bookmakers

Variable	Average	1xstavka	Fonbet	Marathon	Betcity
$\hat{\alpha}_1$	-0.0204 (0.207)	-0.0104 (0.336)	-0.0094 (0.352)	-0.0179 (0.235)	-0.0154 (0.266)
$\hat{\alpha}_2$	0.0038 (0.216)	0.0049 (0.196)	0.0046 (0.191)	0.0160** (0.010)	-0.0020 (0.752)
$\hat{\alpha}_3$	0.0050 (0.113)	0.0072* (0.069)	0.0061* (0.093)	0.0160*** (0.000)	-0.0015 (0.776)
$\hat{\alpha}_4$	0.057* (0.087)	0.0064* (0.095)	0.0033 (0.240)	0.0132*** (0.002)	-0.0037 (0.489)
$\hat{\alpha}_5$	0.0145*** (0.000)	0.0140*** (0.001)	0.0120*** (0.004)	0.0144*** (0.001)	0.0049 (0.176)
F-test	15.0374*** (0.005)	9.6832** (0.046)	8.6991* (0.069)	14.4139*** (0.006)	5.0155 (0.286)
$\hat{\beta}$	-0.0166 (0.812)	-0.0178 (0.801)	-0.0309 (0.658)	-0.0091 (0.897)	0.0141 (0.842)
$N_j$	958	937	946	922	899

Notes: p-values are reported in brackets. F-test denotes Wald tests for the restriction  $H_0: \hat{\alpha}_2 = \hat{\alpha}_3 = \hat{\alpha}_4 = \hat{\alpha}_5 = 0$  (p-values are reported). The t-test for  $\hat{\alpha}_1$  is one-tailed ( $H_1: \hat{\alpha}_1 < 0$ ). The t-test for  $\hat{\alpha}_t$ , where  $t = 2, \dots, 5$  is also one-tailed ( $H_1: \hat{\alpha}_t > 0$ ). The last row reports the number of matches which has record in  $N_j$  bookmaker.

\*\*\* denote significance at the level 1%.

\*\* denote significance at the level 5%.

\* denote significance at the level 10%.

Table 3 presents the model estimates and tests of online betting market efficiency. The results for  $\alpha_{tj}$  for  $t = 2, \dots, 5$  in the 2022/2023 season are all significant at least at the 5% level and are positive, indicating a substantial shift in bookmaker commissions, particularly for Marathon. This bookmaker shows a consistent and significant decrease in commission, as evidenced by the positive and significant estimates for all three seasons following 2019(a). The F-test results further reinforce these observations, leading to the rejection of the null hypothesis  $H_0: \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0$  highlighting the dynamic nature of bookmaker commissions over time.

This significant temporal change underscores potential market inefficiencies and a lag in the incorporation of the latest information into the pricing models. The model results suggest a systematic reduction in bookmaker commissions over time, particularly for Marathon, possibly reflecting a delayed market response to new information. For instance, the reduced home advantage in "ghost" games, a phenomenon observed in the dataset, might be slowly integrating into the betting odds, contributing to the observed trends in bookmaker commissions. This gradual adjustment highlights the market's resilience and adaptability to new information and trends. Despite a noticeable time lag, it underscores the importance of continuous monitoring and analysis to ensure optimal betting odds and market efficiency.

Table 4 reveals notable patterns in the estimated coefficients  $\hat{\beta}_h$  and  $\hat{\beta}_a$  for home and away wins, respectively. The signs of these coefficients imply a tendency among bookmakers to under-predict the probability of both home and away wins compared to draws. Despite these patterns, the coefficients do

not attain statistical significance at conventional levels, echoing the findings of Kuypers (2000) and suggesting a potential absence of bias in the fixed odds. In Column II of Table 4, which considers only the favorite-longshot bias, the sign of  $\hat{\beta}_z$  hints at an unconventional manifestation of bias. Bookmakers appear to underestimate 'longshot' outcomes while overestimating more likely events, contrary to typical expectations of overestimating longshots. Columns II and III offer significant insights into the efficiency of Russian local bookmakers relative to the global average. All coefficients in these columns are statistically significant at the 5% level, with some even at the 1% level. The positive signs of these coefficients indicate a relative inefficiency in the Russian betting market compared to the global average, signaling potential implications for market participants and underscoring the need for further exploration.

In Table 4, the consistent statistical significance of coefficients related to individual bookmakers (1xstavka, Fonbet, Marathon, Betcity) further highlights the distinct patterns and potential inefficiencies within the Russian betting market. The observed inefficiencies and the unconventional bias patterns underscore the complexity of the betting market, emphasizing the importance of a nuanced and multifaceted approach to understanding and analyzing market dynamics and efficiency.

Table 4. Estimated Coefficients and Tests for Market Efficiency and Bias

Variable	(I)	(II)	(III)
$\hat{\beta}_z$	-0.0127 (0.854)	-0.0124 (0.858)	-0.0122 (0.859)
$\hat{\beta}_h$	0.0009 (0.760)		0.0009 (0.760)
$\hat{\beta}_a$	0.0028 (0.341)		0.0028 (0.334)
1xstavka		0.0102*** (0.000)	0.0102*** (0.000)
Fonbet		0.0049*** (0.000)	0.0049*** (0.000)
Marathon		0.0107*** (0.000)	0.0107*** (0.000)
Betcity		0.0089*** (0.000)	0.0089*** (0.000)
$\hat{\alpha}_2$	0.0055 (0.157)	0.0057 (0.150)	0.0056 (0.153)
$\hat{\alpha}_3$	0.0070* (0.063)	0.0070* (0.063)	0.0069* (0.067)
$\hat{\alpha}_4$	0.0055 (0.119)	0.0055 (0.118)	0.0053 (0.125)
$\hat{\alpha}_5$	0.0126*** (0.002)	0.0125*** (0.003)	0.0125*** (0.003)
F-test $\hat{\beta}_h = \hat{\beta}_a = \hat{\beta}_z = 0$	0.792		0.791
F-test $\hat{\beta}_d = -(\hat{\beta}_h + \hat{\beta}_a) = 0$	0.472		0.468

Notes: The t-test for  $\hat{\alpha}_t$ , where  $t = 2, \dots, 5$  is one-tailed ( $H_1: \hat{\alpha}_t > 0$ ).

\*\*\* denote significance at the level 1%.

\*\* denote significance at the level 5%.

\* denote significance at the level 10%.

#### 4 Odds efficiency analysis

This section delves into the efficiency of odds by employing a straightforward betting strategy for validation. The strategy involves placing a one-ruble bet on each possible outcome using historical odds data. This approach facilitates the examination of return results, offering a window into the performance and reliability of various bookmakers' odds. Figure 1, which illustrates the average return from different bookmakers during the observed period, reveals a consistent trend of negative returns, highlighting the inherent risk in betting activities. The consistently lowest average return underscores the higher efficiency of the global market compared to Russian local bookmakers. This pattern further confirms the relative inefficiency of the Russian betting market, as evidenced by the model's conclusions and the consistently negative returns from the global market average across all seasons.

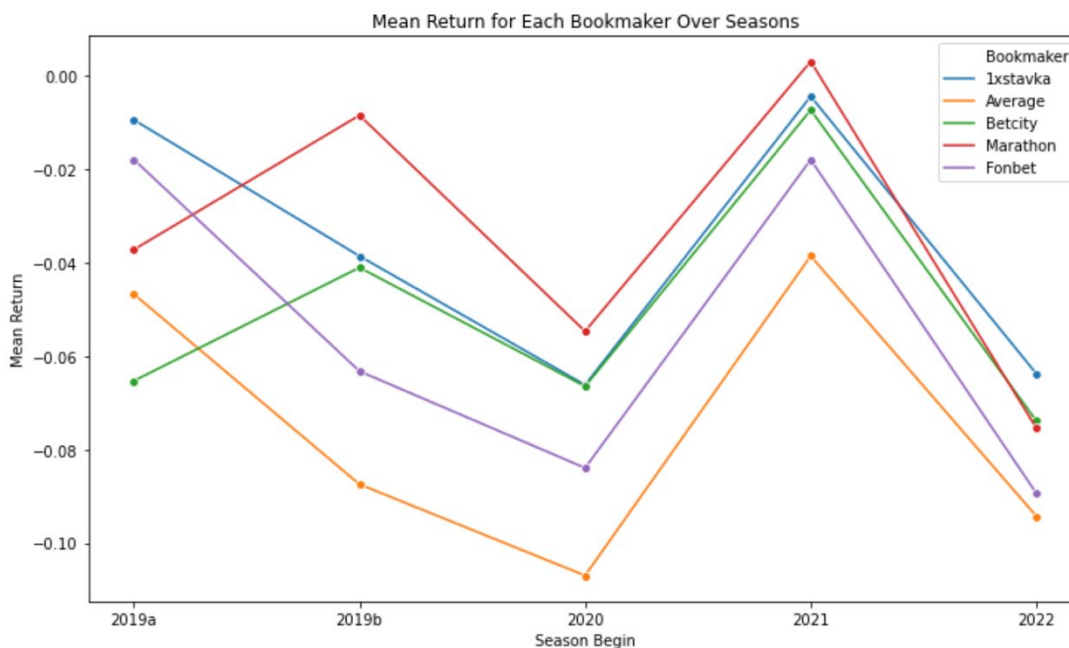


Figure 1. Mean return for each bookmaker over seasons

The 2021 season emerges as an anomaly, with some bookmakers showing less negative or even positive returns. This shift could indicate a change in betting dynamics or odds setting during this period, aligning with the previously presented model results. The model's statistically significant coefficients and their positive signs hinted at a less efficient Russian betting market compared to the global average. This inefficiency is further underscored by the consistently more negative returns from the global market average across all seasons, as illustrated in Figure 1.

In the exploration of average returns for different outcomes across various seasons as depicted in Figure 2, a clear pattern of fluctuating efficiency emerges. The 2020 season is notable for yielding a positive return when betting on the home team winning, a stark contrast to the negative returns for away team wins and draws. This trend reverses in the 2019a season, where bets on away team wins result in positive returns, while home team wins and draws fall into the negative. The 2021 season presents a mixed scenario with positive returns for away team wins, while the other outcomes remain negative. However, the 2022 season shows a return to negative values for all outcomes, with the least negative return observed for home team wins. The consistent positive returns for away team wins in the seasons 2019a and 2019b suggest a potential inefficiency in the market's assessment of away team victories during these periods.

A detailed examination of returns across different odds groups augments the understanding of odds efficiency, offering a more holistic view of the betting market dynamics. The analysis underscores the potential for more favorable odds settings for bettors in the Russian market, particularly in specific seasons such as 2019a and 2021. This observation calls for a deeper exploration into inefficiencies of the Russian betting market, potentially revealing more favorable betting opportunities in certain seasons.

This fluctuation in returns highlights the betting market's dynamic nature, reinforcing the need for a nuanced approach to betting. The observed patterns in Figure 2, in conjunction with the insights from

Figure 1 and the second model, emphasize the potential for more advantageous betting opportunities in certain outcomes and seasons. The combined insights from the model and figures highlight the importance of further investigation into the inefficiencies in the Russian betting market. These could have significant implications for market participants, offering more advantageous betting opportunities in certain seasons. This is especially true when combined with the insights from the second model, which suggests a potential bias in bookmakers' predictions.

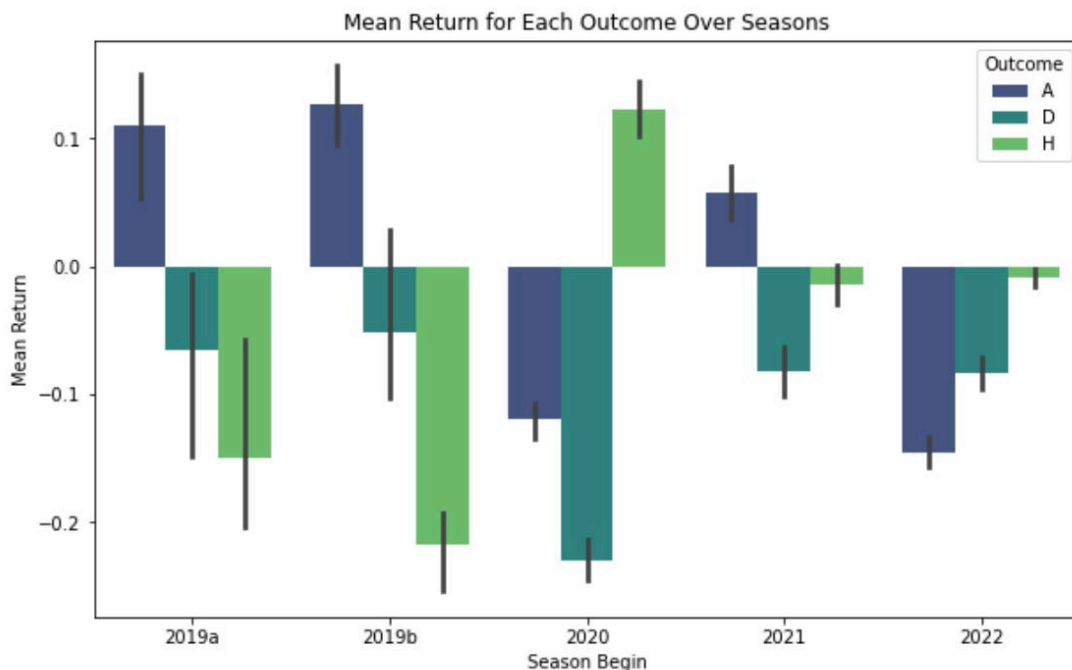


Figure 2. Mean return for each outcome over seasons

## Summary and discussion

In this pioneering research, a meticulous analysis is conducted on the efficiency of the online betting market with a special focus on the Russian football betting odds, a subject that has not been extensively explored in academic literature. The study employs a comprehensive dataset sourced from Football Data and Odds Portal, encompassing match results, average market odds, and odds from four Russian bookmakers across four seasons. The investigation reveals a general decline in average bookmakers' margins over the seasons, with notable fluctuations observed, particularly with the bookmaker Marathon. The division of the 2019/2020 season provides insight into the impact of "ghost" games. It highlights a pronounced decline in margins for Marathon, suggesting a potential correlation between the absence of an audience and diminished bookmaker margins.

The analysis further extends to testing the efficiency of the online betting markets for the average market price and the four Russian local bookmakers. The results indicate that all the estimates for  $\alpha_1$  are negative as expected, and the positive signs of the coefficients in the 2022/2023 season suggest a less efficient Russian betting market compared to the global average. This inefficiency is further corroborated by the examination of returns across different odds groups, revealing a consistent trend of negative returns, with the 2021 season showing less negative or even positive returns for certain bookmakers.

The exploration of average returns for different outcomes across various seasons as depicted in Figure 2, uncovers a clear pattern of fluctuating efficiency. The 2020 season is notable for yielding a positive return when betting on the home team winning, a stark contrast to the negative returns for away team wins and draws. This trend reverses in the 2019a season, where bets on away team wins result in positive returns, while home team wins and draws fall into the negative. The consistent positive returns for away team wins in the seasons 2019a and 2019b suggest a potential inefficiency in the market's assessment of away team victories during these periods.



While this study offers in-depth insights into the dynamics of the Russian online gambling market, it does have its constraints. Our analysis predominantly centers on four Russian gambling entities, potentially overlooking the broader market landscape. The Russian gambling sector, having legally emerged only in 2019, is relatively nascent, which might account for some inefficiencies in odds-setting and market expertise. Cultural nuances specific to Russia, characterized by distinct gambling perceptions, might also influence betting behaviors, sometimes skewing towards emotion rather than logic. Moreover, external economic volatilities experienced by Russia recently could impact market efficiency, an aspect not deeply explored in our study. The data, spanning just four seasons, might not encapsulate long-term trends. For a holistic understanding of the disparities between the Russian and global gambling markets, future research should delve deeper into these facets.

In conclusion, this research provides a comprehensive and novel insight into the dynamics of the online betting market, particularly focusing on the Russian market. The findings underscore the dynamic nature of the betting market, emphasizing the potential for more advantageous betting opportunities in certain outcomes and seasons. The observed inefficiencies in the Russian betting market, as highlighted by the study, warrant further exploration and analysis to understand the underlying factors contributing to these observed market dynamics, potentially offering more advantageous betting opportunities for market participants in certain seasons. The limitations of the study highlight the need for further research to provide a more holistic understanding of the Russian online betting market.

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# ИНФОРМАЦИОННАЯ ЭФФЕКТИВНОСТЬ В ОНЛАЙН-РЫНКЕ СТАВОК: НА ПРИМЕРЕ МАТЧЕЙ РОССИЙСКОЙ ПРЕМЬЕР-ЛИГИ ПО ФУТБОЛУ

Пан Юй

НИУ «Высшая школа экономики», Санкт-Петербургская школа экономики и менеджмента, аспирант  
Санкт-Петербург, Российская Федерация  
yurang@hse.ru

## Аннотация

Это исследование предпринимает оригинальный обзор эффективности российского онлайн-рынка ставок на футбол, предлагая свежий взгляд на относительно неизученную область. Данное исследование анализирует средние рыночные коэффициенты и коэффициенты от четырех конкретных местных российских букмекеров: 1хСтавка, Фонбет, Бетсити и Марафон, охватывая сезоны с 2019/2020 по 2022/2023. Результаты показывают заметное снижение средних маржей букмекеров на протяжении сезонов с существенными колебаниями и потенциальными корреляциями с отсутствием аудитории. Тесты эффективности онлайн-рынков ставок для средней рыночной цены и четырех российских букмекеров позволяют сформулировать важные выводы. Результаты указывают на стабильный тренд отрицательной доходности, при этом в определенные сезоны и у некоторых букмекеров наблюдаются менее отрицательные или даже положительные доходы. Исследование выявляет колеблющуюся эффективность в различных исходах на протяжении сезонов, выделяя потенциальные неэффективности рынка, особенно в оценке побед команд-гостей в определенные периоды. Несмотря на всесторонний анализ, исследование имеет ограничения, например, фокус на четырех российских букмекерах и исключение различных внешних факторов, что подчеркивает необходимость дальнейших исследований в этой области.

## Ключевые слова

информационная эффективность; онлайн-рынок ставок; футбол Российской Премьер-лиги; маржи букмекеров

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