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Surprise on the Pitch, Response in the Market: Evidence from the UEFA European Championship on Returns, Intraday Market Quality, and International Transmission

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and International Transmission

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Abstract

Understanding whether salient public events affect financial markets is important for assessing market efficiency and the role of investor sentiment in asset pricing. This dissertation examines whether national football outcomes influence stock market behaviour in European countries. Focusing on the UEFA European Championship, the study analyses six European markets - France, Germany, Italy, the Netherlands, Portugal, and Spain - over the period from 2004 to 2024. The empirical framework applies an event-study methodology, complemented by an odds-based measure of surprise derived from betting markets, which allows expected and unexpected match outcomes to be distinguished. To assess the timing of market reactions, daily returns are decomposed into close-to-open and open-to-close components. Additional extensions examine daily market-quality proxies and potential cross-market information transmission through a U.S.-listed instrument with European exposure.

The results provide limited evidence of a robust aggregate stock market response to football outcomes. While some suggestive patterns emerge in specific subsamples, particularly for matches played after the close of European markets, these effects are not consistently statistically significant. The analysis of market-quality proxies and international transmission also does not provide robust evidence of systematic changes in trading conditions or cross-market information transmission. Overall, the findings suggest that, at the level of broad national equity indices, football outcomes do not generate strong or systematic pricing effects.

The dissertation contributes to the literature by incorporating expectations-based measures of sporting outcomes, explicitly modelling the timing of information incorporation, and extending the analysis beyond returns to include trading conditions and cross-market interactions. The findings are relevant for market-efficiency research, investors, and regulators because they suggest that highly salient non-fundamental public events do not necessarily translate into systematic effects on prices, liquidity, or cross-market information transmission.

Keywords: Sports and financial markets; Event study; Betting odds; Investor sentiment; Market quality; UEFA European Championship

Resumo

Compreender se eventos públicos de elevada saliência afetam os mercados financeiros é importante para avaliar a eficiência de mercado e o papel do sentimento dos investidores na formação dos preços dos ativos. Esta dissertação analisa se os resultados de jogos de futebol de seleções nacionais estão associados ao comportamento dos mercados acionistas europeus. Focando-se no Campeonato Europeu de Futebol (UEFA European Championship), o estudo considera seis mercados europeus - França, Alemanha, Itália, Países Baixos, Portugal e Espanha - entre 2004 e 2024. A análise empírica utiliza uma metodologia de estudo de eventos, complementada por uma medida de surpresa baseada em odds de apostas, permitindo distinguir resultados esperados e inesperados. Para avaliar o momento de reação dos mercados, os retornos são decompostos em componentes close-to-open e open-to-close. São ainda analisadas proxies diárias de qualidade de mercado e potenciais mecanismos de transmissão internacional através de um instrumento cotado nos Estados Unidos com exposição à Europa.

Os resultados fornecem evidência limitada de uma resposta agregada robusta dos mercados acionistas aos resultados futebolísticos. Embora surjam padrões sugestivos em subamostras específicas, nomeadamente em jogos realizados após o fecho dos mercados europeus, estes efeitos não são estatisticamente consistentes. As análises de qualidade de mercado e transmissão internacional também não revelam alterações sistemáticas nas condições de negociação ou na transmissão de informação entre mercados.

A dissertação contribui para a literatura ao incorporar medidas baseadas em expectativas, ao considerar o timing da incorporação da informação e ao alargar a análise para além dos retornos. Os resultados são relevantes para a investigação sobre eficiência de mercado, investidores e reguladores, sugerindo que eventos públicos não fundamentais, ainda que salientes, não se traduzem necessariamente em efeitos sistemáticos sobre preços, liquidez ou transmissão internacional.

Palavras-chave: Desporto e mercados financeiros; Estudo de eventos; Odds de apostas; Sentimento dos investidores; Qualidade de mercado; Campeonato Europeu de Futebol

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1. Introduction

National football matches are among the most visible and emotionally salient public events in Europe. They attract widespread attention, generate strong collective reactions, and occur at precisely observable points in time. These features make them a useful setting for studying whether non-fundamental public events are associated with financial-market behaviour. If investor sentiment or attention affects asset prices, then football outcomes may be reflected in stock market returns or trading conditions even though they have no direct implications for firms' expected cash flows.

This question relates directly to the literature on sports sentiment and financial markets. Ashton et al. (2003) and Edmans et al. (2007) provide early evidence that national sporting outcomes may be associated with stock market returns, while Kaplanski and Levy (2010) show that major football tournaments can be linked to predictable market patterns. More recent work confirms that the relationship between football, investor sentiment, and financial markets remains an active area of research, including evidence based on betting odds, listed football clubs, and alternative sport-linked financial assets (Dimic et al., 2018; Supino et al., 2024; Truong et al., 2021). The present dissertation builds on this literature but differs by focusing on the UEFA European Championship, using an odds-based surprise measure, decomposing returns into close-to-open and open-to-close components, and extending the analysis to market-quality proxies and cross-market transmission.

This dissertation examines whether national football outcomes during the UEFA European Championship are associated with domestic stock market behaviour. The analysis focuses on six European countries - France, Germany, Italy, the Netherlands, Portugal, and Spain - over the period from 2004 to 2024. The central empirical question is whether football-match outcomes generate abnormal market responses in the corresponding domestic equity market and, if so, whether those responses occur at the next market opening or during the subsequent trading session.

Although the literature provides evidence that major sporting outcomes can influence financial markets, particularly through sentiment-related mechanisms, three limitations remain important for the present dissertation. First, many studies rely on realized win-loss indicators, even though financial markets should respond primarily to the unexpected component of public information. Second, most evidence is based on daily close-

to-close returns, which makes it difficult to identify when information is incorporated into prices. Third, less attention has been given to market-quality dynamics and to the possibility that information may be reflected first in securities trading outside the domestic European market.

This dissertation addresses these limitations in a unified empirical framework. First, it constructs an odds-based measure of match surprise using de-vigged betting-market probabilities, allowing expected and unexpected outcomes to be distinguished. Second, it decomposes domestic market returns into close-to-open and open-to-close components, thereby separating opening adjustment from within-session movements. Third, it complements the return analysis with daily market-quality proxies and a transmission test based on a U.S.-listed instrument with European exposure. This design allows the analysis to examine not only whether football outcomes are associated with abnormal returns, but also when any adjustment occurs and whether it is accompanied by broader changes in trading conditions or cross-market dynamics.

The empirical results provide limited evidence of a robust aggregate stock market response to football outcomes. The baseline abnormal-return estimates are generally small and statistically weak once clustered inference and multiple-testing adjustments are considered. The decomposition of returns shows that the absence of strong close-to-close effects is not simply concealing a clear opening reaction. The market-quality and U.S. transmission extensions also yield largely null results. Some suggestive patterns appear in the after-close subsample, but these do not remain sufficiently strong across benchmark-adjusted specifications.

These findings contribute to the literature in two ways. First, they provide evidence from the UEFA European Championship, a highly salient but comparatively underexplored setting in the sports-finance literature. Second, they show that when expectations, timing, and inferential discipline are explicitly incorporated, football-related effects at the level of broad national equity indices appear weaker and less systematic than a simple sentiment-based explanation might suggest. The contribution of the dissertation therefore lies not in documenting a strong headline effect, but in providing a more careful and structured test of whether such effects are present.

The remainder of the dissertation is organized as follows. Chapter 2 reviews the relevant literature on sports outcomes, betting-market expectations, investor attention, market quality, and international transmission. Chapter 3 describes the data, sample construction, and empirical methodology. Chapter 4 presents the empirical results. Chapter 5 provides discussion on implications, limitations and directions for future research.

2. Literature Review

This chapter reviews the literature most relevant to the relationship between national football outcomes and financial-market behaviour. The review is organized around four mechanisms that motivate the empirical design of the dissertation. First, studies on sports outcomes and stock returns provide the behavioural-finance foundation for testing whether emotionally salient events affect aggregate markets. Second, the literature on betting-market odds motivates the use of ex-ante expectations and surprise rather than simple win-loss indicators. Third, research on investor attention and market microstructure supports the analysis of market-quality proxies around match events. Fourth, the literature on cross-listings and international price transmission motivates the study of U.S.-listed instruments during European market closures. The chapter ends with an outline of the research gap that the dissertation addresses.

2.1. Sports outcomes and financial markets

The most direct starting point for this dissertation is the literature examining whether major sporting outcomes affect stock market returns. A major hypothesis in the research is that emotionally significant events may influence investors through mood, sentiment, or attention, rather than through direct effects on predicted cash flows. In one of the most influential contributions, Edmans et al. (2007) show that losses in important national sporting events are associated with negative abnormal stock returns on the following trading day, especially in settings where investor interest in the sport is high. Their results suggest that national sporting outcomes can matter for financial markets even when those outcomes are unrelated to economic fundamentals in a narrow sense. This provides an important behavioural-finance motivation for studying football matches at the national level.

Related evidence is provided by Kaplanski and Levy (2010), who examine the FIFA World Cup and show that major football events may be associated with predictable stock market patterns, further supporting the relevance of sport-related sentiment for financial-market research.

A related contribution is provided by Ashton et al. (2003), who document stock market effects associated with national football results in the United Kingdom. That study is especially relevant for the present dissertation because it focuses on a mature European market and therefore offers closer external validity for a country-level European setting than

studies based exclusively on broader international panels. Taken together, Edmans et al. (2007) and Ashton et al. (2003) support the view that football results may be reflected in aggregate domestic market behaviour, particularly when those results are emotionally important and widely followed by investors.

More recent studies confirm that the relationship between football outcomes, investor sentiment, and financial markets remains an active research topic. Dimic et al. (2018) show that publicly traded football clubs react asymmetrically to positive and negative match information, using betting odds to distinguish expected from unexpected outcomes. Boţoc et al. (2019) provide further evidence from Italian listed football clubs, while Truong et al. (2021) extend the sports-sentiment framework to a frontier-market setting using international football results as sentiment shocks. These studies indicate that the football–finance relationship continues to attract empirical attention and that expectations, market setting, and investor sentiment remain central dimensions of the debate.

At the same time, this literature also reveals several limitations in existing empirical designs. First, much of the prior evidence focuses on FIFA World Cup matches or other broad international sporting events, while the UEFA European Championship has received less attention despite its high salience for European investors. Second, many studies rely on simple win-loss indicators and close-to-close returns, which may obscure important variation in both the informational content of the result and the timing of market adjustment. As the research report correctly notes, this makes it difficult to distinguish between expected and unexpected outcomes and to identify whether any response occurs at the next market opening or during the subsequent trading session.

This point is particularly important for the present dissertation. If markets respond mainly to the unexpected component of football outcomes, then a simple victory dummy may be too coarse a measure of the relevant shock. Likewise, if many matches end after the close of the domestic market, then close-to-close returns may combine distinct timing effects that should be analysed separately. The literature on sports-related market responses therefore motivates not only the general research question, but also the need for a more refined empirical design based on surprise, return decomposition, and timing-sensitive identification.

The implication for the present dissertation is therefore twofold. On the one hand, the existing literature provides a clear behavioural-finance motivation for testing whether national football outcomes are associated with stock market behaviour. On the other hand, it also highlights the need for a more refined empirical design. If markets respond to the unexpected component of sporting outcomes, then realized wins and losses may be insufficient. Similarly, if many matches occur outside domestic trading hours, close-to-close returns may obscure the timing of price adjustment. These limitations motivate the use of an odds-based surprise measure and the decomposition of returns into close-to-open and open-to-close components.

2.2. Expectations from betting odds and the measurement of surprise

A central issue in this dissertation is how to distinguish between outcomes that were already largely expected before kick-off and outcomes that represented genuine surprises. This distinction is important because financial markets should, in principle, respond primarily to the unexpected component of public information rather than to events that were already anticipated by market participants. For that reason, the empirical design does not rely solely on realized football outcomes, such as wins or losses, but instead incorporates a measure of surprise derived from betting-market expectations. This approach is explicitly motivated in the research report as one of the key improvements over earlier studies that rely only on binary sporting outcomes.

The use of betting odds as a proxy for ex ante expectations is well grounded in the sports economics literature. Forrest et al. (2005) and Goddard and Asimakopoulos (2004) show that fixed-odds betting markets in football contain substantial predictive information and provide a useful summary of publicly available expectations regarding match outcomes. In practical terms, bookmaker odds aggregate information about team strength, injuries, form, venues, and other relevant factors into a market-based price. This makes them a natural benchmark for measuring whether the realized sporting outcome was expected or unexpected. The research report adopts exactly this logic by proposing the use of de-vigged implied probabilities based on bookmaker closing odds as the basis for a continuous surprise variable.

The distinction between expected and unexpected outcomes also matters because it avoids treating all nominal wins or losses as equally informative. A victory by a strongly favoured team should not carry the same informational content as an upset victory by an

underdog. Palomino et al. (2009) emphasize this point by showing that odds-based expectations can be used to construct a continuous surprise measure that distinguishes routine results from genuinely unexpected ones. This is especially valuable in the present setting because football matches differ not only in their result, but also in the extent to which that result was priced in advance by betting markets and, plausibly, by investors. The dissertation therefore follows this literature in treating the surprise component of the match outcome as the central explanatory variable rather than relying exclusively on realized outcomes.

A further practical issue concerns the fact that raw bookmaker odds include a margin, or overround, which implies that their directly implied probabilities do not sum to one. To address this, the betting-odds literature commonly employs de-vigging procedures that remove the bookmaker margin and recover a probability distribution that can be interpreted more coherently as a set of market-based expectations. The research report discusses proportional de-vigging as the baseline approach, while also noting that robustness can be assessed using alternative corrections such as Shin's structural adjustment or power normalization (Cain et al., 2000; Shin, 1992, 1993). This is important because it strengthens the credibility of the expectation measure and shows that the resulting surprise variable is not mechanically tied to one single probability-adjustment method.

In the context of this dissertation, the main surprise measure is defined as the realized favourable outcome for the focal country minus its de-vigged *ex ante* probability. This construction has two advantages. First, it provides a continuous variable that preserves more information than a simple binary win-loss indicator. Second, it aligns the magnitude of the empirical shock with the extent to which the sporting outcome departed from expectations. In that sense, the betting-odds framework improves the identification strategy by linking the strength of the estimated market response to the informational content of the football result itself.

Overall, the betting-odds literature provides the foundation for one of the dissertation's central methodological choices. By using de-vigged bookmaker probabilities to construct a continuous surprise measure, the analysis moves beyond simple realized outcomes and aligns the empirical shock with the information content of the match result. This is important because a routine victory by a strong favourite and an unexpected victory

by an underdog should not be treated as equivalent events from the perspective of market expectations.

2.3. Attention, distraction, and market-quality dynamics

A further dimension relevant to this dissertation concerns the role of investor attention and distraction around salient sporting events. The basic intuition is that major football matches do not only generate emotional reactions; they may also temporarily redirect the attention of market participants away from financial markets and toward the sporting event itself. If attention is limited, such shifts may affect trading behaviour, the speed of price adjustment, and broader market-quality conditions during the relevant event window. The research report explicitly identifies this mechanism as one of the motivations for extending the analysis beyond returns alone and considering liquidity-related outcomes as well.

This is consistent with a large literature suggesting that investor attention is limited, and prominent non-financial events can influence market activity. Barber and Odean (2008) suggest that attention is a crucial determinant of investor behaviour, whereas DellaVigna and Pollet (2009) find that periods of low attention may delay the absorption of information into prices. Likewise, Da et al. (2011) stress the importance of attention-related indicators in understanding short-run price pressure. Although these studies are not about sport specifically, they provide the conceptual foundation for expecting market activity and trading conditions to vary when a widely followed event temporarily competes with financial information for investors' attention.

Within the sports context, Ehrmann and Jansen (2012) provide particularly relevant evidence by showing that major football matches are associated with lower levels of trading and reduced newswire activity, consistent with investor inattention during match windows. This result is important because it shifts the focus from pure return effects to the broader trading environment. If football matches distract investors, the market response may not be visible only in prices; it may also appear in lower trading activity, thinner order books, wider spreads, or reduced depth. The research report uses this logic to motivate both an intraday market-quality extension for overlapping matches and a daily-proxy market-quality block when historical intraday coverage is not available consistently.

The market-microstructure literature provides the conceptual tools for interpreting these effects. Harris (2003) and O'Hara (1995) emphasize that trading conditions and price

discovery depend on the interaction between order flow, liquidity provision, and the institutional structure of markets. In periods of reduced attention or slower order-book replenishment, one may expect market quality to deteriorate temporarily, for example through wider spreads or lower depth. In the present dissertation, this logic is relevant because football matches often occur at highly specific and publicly known times, making them suitable settings for examining whether temporary shifts in collective attention are reflected in trading conditions as well as in prices.

At the same time, the measurement of market quality depends heavily on data availability. When quote or order-book data are available, spreads and depth can be examined more directly. When they are not, empirical finance typically relies on broader but still informative proxies. The research report therefore proposes the use of the Corwin and Schultz (2012) high-low spread proxy and the Amihud (2002) illiquidity ratio when richer intraday fields are unavailable. This is an important methodological point, because it shows that the market-quality dimension of the dissertation is grounded both in the microstructure literature and in the practical realities of data access. The resulting approach is less granular than a full intraday microstructure analysis, but it still allows the dissertation to examine whether football events are associated with broader changes in trading activity, price dispersion, and illiquidity.

This literature motivates the market-quality extension of the dissertation. Although quote-level intraday data would provide the most direct evidence on temporary changes in trading conditions, the historical and cross-country scope of the sample requires measures that are consistently available across markets and tournament editions. For this reason, the empirical implementation relies on daily proxies for trading activity, price dispersion, and illiquidity. These measures are less granular than order-book variables, but they preserve the central economic question of whether football events are associated with broader changes in market conditions.

Recent work has also broadened the empirical measurement of football-related sentiment beyond traditional match-result variables. Tanaltay et al. (2021) examine whether social-media sentiment helps predict listed football clubs' stock prices, while Supino et al. (2024) analyse UEFA Champions League failures through the joint lens of rational valuation and investor emotion. In a related extension to digital sports-linked assets, Saggu et al. (2024) show that FIFA World Cup matches are associated with fan-token returns and trading-

volume responses. Although these studies differ from the present dissertation in terms of assets and empirical setting, they reinforce the continued relevance of sports-related sentiment, expectations, and timing in financial-market research.

2.4. Cross-listings, venue leadership, and international transmission

A final strand of literature relevant to this dissertation concerns cross-listings, venue leadership, and the international transmission of information across markets. The central idea is that when related claims trade in more than one venue, new information may be incorporated first where trading is active and then transmitted to other venues as markets reopen or arbitrage links prices across locations. This issue is especially important in the present dissertation because many UEFA European Championship matches take place after the close of European cash markets but while U.S. markets remain open. The research report identifies this timing structure as a key opportunity to examine whether football-related information may first appear in U.S.-listed instruments with European exposure and only later be reflected in European opening prices.

The broader finance literature has developed several ways of thinking about such multi-venue price discovery. Hasbrouck (1995) formalizes the idea of information shares across markets, while Gonzalo and Granger (1995) propose a related component-share perspective. Although the dissertation does not estimate these measures directly, the underlying intuition is highly relevant: when multiple securities or claims reflect the same underlying economic risk, one venue may temporarily lead the price-discovery process if it is more liquid, more active, or open while the other venue is closed. The research report draws on this logic in arguing that U.S.-listed instruments may provide a real-time signal of information incorporation during evening European football matches.

This perspective is also consistent with the literature on cross-border listings. Eun and Sabherwal (2003) show that cross-listed securities can contribute to price discovery across venues, while Froot and Dabora (1999) emphasize that the location of trade can matter for how prices adjust in related claims. In the context of the present dissertation, this literature is relevant because the U.S.-listed instruments examined are not treated as separate and unrelated assets, but as vehicles through which European risk may continue to trade while European cash equity markets are closed. If football-related information is incorporated in those instruments during the evening match window, the next European

opening may partly reflect that prior adjustment rather than representing a completely independent pricing response.

The dissertation's focus on U.S.-listed exchange-traded funds and related claims is also informed by the practical properties of these instruments. As the research report notes, ETFs with European or country exposure continue to trade in the United States during evening European matches, which makes them natural candidates for studying whether information about football results is reflected before the next domestic European open. In the ETF setting, creation and redemption mechanisms help link ETF prices to the underlying net asset value once the underlying market reopens, while ADR-type instruments can also provide a conduit through which related pricing information is transmitted across venues (Eun & Sabherwal, 2003; Froot & Dabora, 1999; Madhavan, 2012). The report uses this reasoning to motivate a daily-frequency transmission test linking U.S. market responses during the match window to subsequent European close-to-open adjustment.

At the same time, the international transmission literature also highlights an important empirical challenge: identifying whether one venue truly leads another is easiest with intraday or quote-level data. The research report acknowledges this directly by noting that a more granular intraday sequencing design would be preferable where feasible, but that daily-frequency evidence can still serve as a useful diagnostic of whether any broader transmission pattern exists. In this sense, the present dissertation does not attempt to provide a full structural model of cross-market price discovery. Instead, it draws on the cross-listings literature to motivate a reduced-form empirical test of whether U.S.-listed instruments react during the evening football window and whether that reaction helps explain the subsequent European market response.

This literature motivates the dissertation's international transmission extension. The empirical implementation focuses on a U.S.-listed instrument with European exposure, which provides a reduced-form way to examine whether football-related information is reflected outside the domestic European market before the next European trading session. The test is therefore interpreted as a daily-frequency diagnostic of cross-market transmission rather than as a full intraday price-discovery analysis.

2.5. Research gap and contribution

Taken together, the literature reviewed above provides a clear motivation for examining whether football outcomes are associated with stock market behaviour, but it also reveals several important gaps that the present dissertation seeks to address. First, although the broader sports-finance literature documents stock market responses to emotionally salient sporting outcomes, much of the existing evidence focuses on FIFA World Cup matches, club-level results, or broad international samples. By contrast, the UEFA European Championship remains relatively underexplored, despite its high salience for European investors and its natural suitability for country-level analysis. The research report identifies this as one of the dissertation's central motivations.

Second, the literature often relies on simple realized-outcome indicators, such as wins or losses, rather than on measures that distinguish between expected and unexpected results. As the betting-odds literature makes clear, this may obscure an important part of the underlying mechanism, since financial markets should, in principle, respond more strongly to surprises than to outcomes that were already widely anticipated (Forrest et al., 2005; Goddard & Asimakopulos, 2004; Palomino et al., 2009). The present dissertation addresses this limitation by constructing an odds-based surprise measure from de-vigged bookmaker probabilities and using it as the main explanatory variable in the baseline analysis. In this respect, the dissertation contributes by aligning the measurement of the sporting shock more closely with ex ante expectations.

Third, much of the existing literature evaluates post-match stock market responses using close-to-close daily returns. While this approach is natural in many event-study settings, it is less informative when the timing of information arrival relative to trading hours is itself central to the research question. In the present context, many UEFA European Championship matches end after the close of domestic European equity markets, which creates a natural opportunity to distinguish between the opening adjustment on the next trading day and the movement during the subsequent session. Drawing on the event-study tradition summarized by MacKinlay (1997), the dissertation therefore contributes by decomposing post-match market responses into close-to-open and open-to-close components rather than treating the next trading day as a single undifferentiated return window.

Fourth, the literature on investor attention and market microstructure suggests that salient public events may affect not only prices but also trading conditions. Ideally, such effects would be examined with quote-level or high-frequency intraday data. Given the historical scope of this dissertation and the need for comparable coverage across six countries and six tournament editions, the empirical implementation relies on daily proxies for trading activity, price dispersion, and illiquidity. This adaptation preserves the economic question underlying the original design while ensuring that the analysis is conducted on a consistent cross-country sample.

Fifth, the international transmission literature suggests that when related claims trade in different venues, information may be incorporated first where trading remains active and only later be reflected elsewhere (Eun & Sabherwal, 2003; Hasbrouck, 1995). This possibility has received limited attention in the sports-finance setting. The dissertation therefore contributes by examining whether U.S.-listed instruments with European exposure react during evening football matches and whether those reactions are related to subsequent European abnormal returns. Even at daily frequency, this extension adds a cross-market perspective that is largely absent from the standard national-team sports-finance framework outlined in the literature and in the research report.

Taken together, these elements define the contribution of the dissertation. The study focuses on a major but comparatively underexplored European football competition, incorporates market-based expectations through an odds-based surprise measure, separates opening from within-session adjustment, examines daily proxies for trading conditions, and considers a reduced-form test of cross-market transmission through a U.S.-listed instrument. By combining insights from the sports-finance literature (Ashton et al., 2003; Edmans et al., 2007; Kaplanski & Levy, 2010), betting-market research (Forrest et al., 2005; Goddard & Asimakopoulou, 2004; Palomino et al., 2009), market microstructure (Amihud, 2002; Corwin & Schultz, 2012), and cross-market price discovery (Eun & Sabherwal, 2003; Hasbrouck, 1995), the dissertation provides a more disciplined test of the football-finance relationship than a standard close-to-close event study based only on realized match outcomes.

3. Methodology and Sample Selection

This chapter describes the empirical strategy used to examine whether UEFA European Championship outcomes are associated with domestic stock market behaviour. The analysis combines a country-level football event panel with daily financial-market data for six European equity markets. It first explains the construction of the match-event sample and the corresponding market data, then describes the odds-based surprise measure, the trading-day alignment procedure, the return decomposition, the abnormal-return estimation, and the econometric specifications. The chapter concludes by discussing data limitations and the empirical adaptations implemented in the market-quality and transmission extensions.

3.1. Research design

The dissertation adopts a country-level event-study design to examine whether national football outcomes are associated with abnormal stock market behaviour in the corresponding domestic market. Each observation links a national-team match to the equity market of the country represented by that team. This structure is appropriate because the hypothesis under study concerns national sentiment and aggregate investor attention rather than firm-specific cash-flow effects.

The identification strategy relies on two features of the setting. First, match outcomes are public, highly salient, and observed at clearly defined points in time. Second, pre-match betting odds provide a market-based measure of expectations, allowing the analysis to distinguish between outcomes that were anticipated and outcomes that were genuinely surprising. The empirical shock is therefore defined as the unexpected component of the football result rather than the result itself.

Rather than relying exclusively on aggregate daily returns, the empirical design decomposes the first relevant market response into three return windows: close-to-close, close-to-open, and open-to-close. This distinction is important because football matches often take place outside domestic trading hours, implying that any adjustment may occur primarily at the next market opening rather than throughout the full trading session. The decomposition therefore makes it possible to distinguish between overnight price adjustment and within-session dynamics, which is especially relevant in an event-study setting where the timing of information incorporation is part of the empirical question (MacKinlay, 1997).

The main explanatory variable is an odds-based surprise measure constructed from de-vigged pre-match betting probabilities¹. This variable captures the extent to which the realized sporting outcome differed from market expectations before the match. In this way, the empirical design distinguishes between results that were broadly anticipated and those that represented genuine surprises. This is an important feature of the identification strategy, because the same nominal sporting outcome may carry very different informational content depending on how strongly it was expected *ex ante*. In additional robustness and exploratory specifications, a simpler realized-outcome indicator based on whether the national team won the match is also considered.

The baseline empirical analysis is conducted using abnormal returns estimated through a market-model framework, following the logic of standard event-study methodology (MacKinlay, 1997). Country fixed effects and tournament-year fixed effects are included in the main specifications, while statistical inference is based on standard errors clustered at the event-trade-date level to account for cross-sectional dependence across observations associated with the same relevant trading day. Because the dissertation evaluates multiple related outcomes and specifications, a Benjamini-Hochberg false discovery rate adjustment is also implemented within test families to preserve inferential discipline and reduce the risk of over-interpreting isolated marginal results (Benjamini & Hochberg, 1995).

Beyond the baseline daily-return analysis, the empirical design includes two extensions. First, a market-quality block examines whether football events are associated with changes in daily proxies for trading activity, price dispersion, and illiquidity. Second, a U.S. transmission block evaluates whether a U.S.-listed ETF with European exposure reacts on the match day and whether that reaction is related to subsequent European abnormal returns. Together, these extensions broaden the analysis beyond the simple question of whether prices move, allowing the dissertation to explore when adjustment occurs and whether it is accompanied by changes in trading conditions or cross-market information transmission.

Overall, the research design is intended to address three closely related questions. First, do football matches affect domestic abnormal returns? Second, if they do, is the adjustment concentrated in the close-to-open window or during the subsequent trading

¹ Raw bookmaker odds were converted into implied probabilities and then adjusted to remove the bookmaker overround, so that the resulting probabilities sum to one and can be interpreted as market-based *ex ante* expectations.

session? Third, are such events associated with changes in trading conditions or with evidence of cross-market information transmission? The remainder of the chapter explains how these questions are operationalized in the data and empirical specifications used in the dissertation.

3.2. Match-event data and market sample

The empirical analysis is based on a hand-constructed panel of football match events involving six European national teams: France, Germany, Italy, the Netherlands, Portugal, and Spain. These countries have been picked on the basis of their sporting prominence in the UEFA European Championship competitions and the presence of well-developed domestic equities markets that can be correlated with wide national stock indices. This country-level structure is compatible with the main premise of the dissertation, which concerns aggregate market reaction to national sporting results rather than firm-level exposure to football-related news (Ashton et al., 2003; Edmans et al., 2007).

The information contains, for each event, the relevant national team, domestic market, tournament edition, local match date and competition stage. A distinction is made between group-stage and knockout-stage matches, since the informational salience, competitive importance, and expected market relevance of football results may vary across tournament phases. The cleaned event file contains 171 country-specific match-event observations, of which 105 correspond to group-stage matches and 66 to knockout-stage matches. **Table 1** summarizes the construction of the empirical samples used throughout the dissertation.

The temporal coverage of the sample spans UEFA European Championship tournaments from 2004 to 2024. For presentational purposes, the tournament played in 2021 is referred to in the dissertation as the 2021 European Championship, even though it is internally coded as 2020 in the working dataset due to the official naming convention retained after the tournament's postponement². This convention is adopted to preserve the chronological interpretation of the empirical analysis while maintaining consistency between the underlying data files and the final written presentation.

² Although UEFA retained the official label “UEFA Euro 2020”, the tournament was played in 2021 after being postponed because of the COVID-19 pandemic. In the dissertation text, references to the tournament follow the actual year of play for clarity.

On the financial side, the dissertation uses daily market data obtained from Refinitiv Datastream/LSEG Workspace for the main domestic equity index associated with each country in the sample, together with the European benchmark index employed in the market-model estimation of abnormal returns. For each domestic market, the available variables include open, high, low, close, and trading volume. These series are sufficient to construct close-to-close, close-to-open, and open-to-close returns, and they also support the daily market-quality proxies used later in the extension analysis.

The use of broad national equity indices, rather than individual firms, follows directly from the research question. Since the underlying hypothesis concerns the possible effect of national football outcomes on aggregate domestic investor behaviour, country-level stock market indices provide a more appropriate object of analysis than firm-level securities. This choice also avoids the need to define heterogeneous firm exposure to football events, which would shift the empirical design away from national sentiment and aggregate market adjustment and toward a different identification problem.

Once the event data and market data were assembled, the next step was to map each football match into the relevant trading-day structure. This step is necessary because the calendar date on which a match is played is not always the same as the date on which the domestic financial market can first react. When a match ends after the close of the domestic market, the relevant adjustment can only occur on the next trading day. The construction of this mapping is discussed in Section 3.4, while the distribution of observations across countries and tournament editions is reported later in **Table 3**.

Table 1. Sample construction summary

Table 1 summarizes the construction of the empirical samples used throughout the dissertation.

Sample step	Number of observations
Initial cleaned match-event sample	171
Group-stage events	105
Knockout-stage events	66
Baseline daily sample	105
Market-model sample	105
Daily market-quality sample	171
U.S. transmission matched sample	108
U.S. transmission group-stage sample	71

Notes: The baseline return analysis focuses on the market-model sample. The market-quality and U.S. transmission analyses use broader or partially matched samples depending on data availability.

3.3. Construction of odds-implied expectations and surprise

A central element of the empirical design is the construction of a measure of match surprise based on pre-match betting odds. The use of betting-market information is motivated by the idea that football results should not be treated as equally informative from the perspective of financial markets. A victory by a heavily favoured national team does not convey the same informational content as an unexpected win by an underdog. For this reason, the empirical analysis does not rely exclusively on realized sporting outcomes but instead incorporates a measure of how surprising each result was relative to ex ante expectations. This approach is consistent with the broader logic that asset prices should respond primarily to the unexpected component of public information rather than to events that were already anticipated by market participants (MacKinlay, 1997).

To construct this measure, raw bookmaker odds were first converted into implied probabilities for the relevant match outcomes. Because bookmaker odds embed a margin, these implied probabilities do not sum to one mechanically and therefore cannot be interpreted directly as unbiased market expectations. The probabilities were consequently adjusted to remove the bookmaker overround, yielding a de-vigged set of ex ante probabilities that sum to one and can be interpreted as a coherent market-based measure of

pre-match expectations³. The use of betting odds in this way follows the sports-forecasting and sports-finance literature, while the adjustment for the bookmaker margin is consistent with work on betting-market efficiency and favourite–longshot bias (Cain et al., 2000; Forrest et al., 2005; Goddard & Asimakopoulos, 2004; Palomino et al., 2009; Shin, 1992, 1993).

Using these adjusted probabilities, the dissertation defines a continuous surprise variable, denoted *surprise_main*, which captures the gap between the realized sporting outcome and its ex-ante implied probability. Intuitively, this variable is close to zero when the match result is broadly in line with prior expectations and larger in absolute value when the realized outcome departs more strongly from what betting markets had priced before kick-off. In this way, the variable isolates the unexpected component of the football event rather than the outcome alone.

This distinction is important for the empirical strategy. If domestic equity markets respond to football events because investors revise beliefs or sentiment in response to unexpected news, then the relevant explanatory variable is not simply whether a team won or lost, but whether the result was anticipated in advance. The odds-based surprise measure therefore plays a central role in the baseline specifications and serves as the main regressor in the daily abnormal-return analysis. A simpler realized-outcome indicator, *win_group*, is also used in selected robustness and exploratory specifications to assess whether any effects are better captured by the realized result itself than by the continuous surprise measure.

In addition to *surprise_main* and *win_group*, the empirical framework includes a small set of event-timing and return variables that are necessary for the subsequent analysis. In particular, the variable *after_close* identifies matches that ended after the close of the relevant domestic market, while the return measures *ret_cc*, *ret_co*, and *ret_oc* capture close-to-close, close-to-open, and open-to-close returns, respectively. Their abnormal-return counterparts, *ar_cc*, *ar_co*, and *ar_oc*, are then estimated through the market-model procedure described below. **Table 2** summarizes the main variables used in the empirical analysis and provides a concise description of their role in the dissertation.

³ The raw bookmaker odds were translated into implied probabilities and adjusted to exclude the overround of the bookmaker so that the resulting probabilities total to unity and can be understood as market-based ex ante expectations.

Table 2. Main variables used in the empirical analysis

Table 2 describes the main variables used in the baseline empirical analysis.

Variable	Description
surprise_main	Difference between the realized outcome and the de-vigged ex ante implied probability.
win_group	Dummy equal to 1 if the national team wins the group-stage match.
after_close	Dummy equal to 1 if the match ends after the domestic market closes.
ret_cc	Close-to-close return on the relevant domestic market day.
ret_co	Close-to-open return on the relevant domestic market day.
ret_oc	Open-to-close return on the relevant domestic market day.
ar_cc	Market-model abnormal close-to-close return.
ar_co	Market-model abnormal close-to-open return.
ar_oc	Market-model abnormal open-to-close return.

Notes: Betting-odds probabilities were adjusted to remove the bookmaker overround before constructing the surprise measure.

The use of odds-implied expectations strengthens the empirical design in two ways. First, it introduces a market-based benchmark for what was already expected before the match took place. Second, it allows the same nominal sporting outcome to carry different empirical meaning depending on the information available ex ante. This is especially important in tournament football, where matches differ not only in terms of competitive importance but also in the degree to which their outcomes are anticipated by spectators, betting markets, and, potentially, investors.

3.4. Event-date alignment and trading-day mapping

A key step in the empirical design is the alignment of football match events with the relevant domestic trading days. In principle, a football match is dated according to the calendar day on which it is played. However, that date does not necessarily coincide with the first date on which the corresponding domestic equity market can react. This distinction is essential in an event-study setting, since the timing of information arrival relative to trading hours determines whether a market response can occur on the same day or only on the following trading day (MacKinlay, 1997).

To address this issue, the dissertation maps each football event into a relevant market trading day based on the timing of the match relative to the closing time of the associated domestic market⁴. When a match ends before the market closes, at least in principle, some reaction may still occur on the same trading day. By contrast, when a match ends after the domestic market has already closed, any adjustment can only be incorporated on the next available trading day. The variable *after_close* is used to identify these cases and plays an important role in both the return decomposition and the exploratory analysis presented later in the dissertation.

This mapping procedure is especially important because football matches are not scheduled with financial markets in mind. Evening kick-offs are common in international tournaments, and many matches conclude after European cash equity markets have closed for the day. As a result, using the calendar match date mechanically would risk attributing price responses to the wrong trading window. The event-date alignment procedure therefore ensures that the dependent variables are matched to the first economically relevant moment at which the market could plausibly incorporate the information contained in the sporting event.

Operationally, the dissertation distinguishes between the local match date and the final event-trade date used in the financial analysis. The local match date records when the sporting event occurred, while the final event-trade date records the trading day on which the market response is measured. This distinction is particularly important for the close-to-open return, since overnight adjustment is only meaningful when the market has not already had the opportunity to react before the close. In this sense, the event-date mapping is not a secondary data-management step, but a core component of the identification strategy.

The same logic also helps motivate the decomposition of returns used in the next section. Once football events are aligned with the correct trading day, the empirical analysis can distinguish between overall daily adjustment and the timing of that adjustment within the close-to-open and open-to-close windows. This allows the dissertation to test not only whether football results are associated with abnormal market responses, but also whether

⁴ In practice, classification is based on the scheduled end time of the match with reference to the closing hour of the appropriate domestic cash stock market, taking into account additional time and stoppage time, if applicable.

those responses are concentrated at the market opening or spread throughout the subsequent session.

3.5. Return decomposition

Once football events are aligned with the relevant trading day, the next step is to decompose market returns into distinct timing components. This decomposition is important because the dissertation is not concerned only with whether football results are associated with abnormal market behaviour, but also with when that adjustment occurs. In an event-study setting, the timing of price incorporation may contain useful information about how markets process public news, particularly when the event takes place outside regular trading hours (MacKinlay, 1997).

The analysis distinguishes between three return windows: close-to-close, close-to-open, and open-to-close. The close-to-close return, denoted *ret_cc*, captures the overall market movement from the previous day's close to the close of the relevant trading day. As such, it provides the broadest measure of daily market adjustment and serves as the natural baseline outcome in the empirical analysis. However, by itself, it does not reveal whether the observed response takes place overnight, at the opening, or during the subsequent trading session.

To address this limitation, the dissertation decomposes the daily return into a close-to-open component, *ret_co*, and an open-to-close component, *ret_oc*. The close-to-open return captures the overnight adjustment between the previous market close and the opening price on the relevant trading day. This window is especially important when a football match ends after the domestic market has already closed, since any immediate reaction can only be incorporated once trading resumes. By contrast, the open-to-close return captures the movement that occurs during the trading session itself and therefore reflects any adjustment that is not immediately absorbed at the opening.

This decomposition is central to the empirical design. If football-related information is incorporated efficiently once trading resumes, the main response should be concentrated in the close-to-open window. If, instead, the information diffuses more gradually or interacts with trading conditions during the session, part of the adjustment may appear in the open-to-close window. Examining all three return measures therefore makes it possible to distinguish between aggregate daily effects and the timing of price incorporation, consistent

with the broader market-microstructure view that trading mechanisms shape how information is reflected in prices (Harris, 2003; O'Hara, 1995).

Formally, the return measures are constructed from the daily open and close prices of the relevant domestic market index. The close-to-close return is defined as the logarithmic difference between the close price on the relevant trading day and the close price on the previous trading day. The close-to-open return is defined as the logarithmic difference between the opening price on the relevant trading day and the previous trading-day close. The open-to-close return is defined as the logarithmic difference between the close and the open on the same trading day. By construction, the close-to-close return is approximately equal to the sum of the close-to-open and open-to-close returns, up to minor differences due to log-return aggregation⁵.

The same decomposition is preserved in the abnormal-return analysis discussed in the next section. In other words, the dissertation does not estimate abnormal performance only for the aggregate daily window, but also for the overnight and within-session components separately. This allows the empirical framework to test whether football results are associated with abnormal returns in the aggregate, at the opening, or during the trading session itself.

3.6. Abnormal returns and market model

The baseline empirical analysis is conducted using abnormal returns rather than raw returns alone. This choice follows standard event-study practice, in which the objective is to isolate the component of a security or market return that cannot be explained by normal co-movement with a broader benchmark (Brown & Warner, 1985; MacKinlay, 1997). In the present context, the use of abnormal returns is particularly important because the domestic equity markets under analysis are exposed not only to football-related events, but also to wider European and global market conditions that may affect returns on the same day.

To account for this broader market environment, the dissertation estimates a market model for each relevant return window. In its standard form, the market model expresses the return on a given domestic market as a linear function of the return on a benchmark market index plus an idiosyncratic error term. The abnormal return is defined as the

⁵ Because the return measures are constructed as logarithmic returns, the close-to-close return is additive across the overnight and within-session components, subject only to rounding differences in presentation.

difference between the realized domestic-market return and the return predicted by the estimated benchmark relationship. This approach makes it possible to evaluate whether the domestic market moved more or less than would normally be expected given contemporaneous benchmark performance.

The benchmark used in the market-model estimation is the STOXX Europe 600 index, which captures broad European equity-market movements. Using a European benchmark is appropriate because the six domestic markets in the sample are exposed to common regional shocks, including macroeconomic news, changes in risk sentiment, and continent-wide financial conditions. The abnormal-return estimates therefore remove broad European market movements before testing whether football-related surprise is associated with country-specific deviations. By filtering out this common component, the market model provides a cleaner measure of whether football events are associated with domestic market behaviour beyond normal European market dynamics.

Abnormal returns are estimated separately for the three return windows introduced in the previous section. Thus, the dissertation constructs abnormal close-to-close returns (ar_{cc}), abnormal close-to-open returns (ar_{co}), and abnormal open-to-close returns (ar_{oc}). This is an important feature of the empirical design, because it preserves the timing decomposition not only in raw returns but also in benchmark-adjusted returns. As a result, the empirical analysis can evaluate whether the unexpected component of a football result is associated with abnormal market adjustment in the aggregate, at the next opening, or during the subsequent session.

The market-model specification is estimated over an estimation window preceding the relevant event window, following the general logic of the event-study literature (MacKinlay, 1997). The purpose of this estimation window is to recover the normal relationship between the domestic market and the benchmark index in the absence of the football event under study. Once the parameters of that relationship are estimated, they are used to predict the normal return for the relevant event day, and the abnormal return is obtained as the residual. In this sense, the abnormal-return framework treats football matches as event shocks whose impact is assessed relative to a benchmark of normal market behaviour.

This benchmark-adjusted approach is preferable to the exclusive use of raw returns for two reasons. First, it reduces contamination from broad market movements that may otherwise obscure the effect of interest. Second, it improves comparability across countries by expressing each event-day market response relative to its own normal relationship with the benchmark market. Since the dissertation compares evidence across multiple national markets and tournament editions, this standardization is an important part of the overall empirical design.

For completeness, the dissertation also reports raw-return evidence in selected contexts, particularly when discussing the decomposition of returns and the exploratory after-close analysis. However, the baseline specifications focus on abnormal returns because they provide the most direct test of whether football results are associated with domestic stock market behaviour beyond ordinary market co-movement. The main regression outcomes in the core specification are therefore *ar_cc*, *ar_co*, and *ar_oc*, which are later examined in relation to the odds-based surprise measure and related explanatory variables.

3.7. Econometric specifications

The baseline empirical analysis is estimated at the country-event level and relates abnormal returns to the odds-based surprise measure constructed from pre-match betting probabilities. The main dependent variables are the three abnormal-return measures introduced in the previous sections: abnormal close-to-close returns (*ar_cc*), abnormal close-to-open returns (*ar_co*), and abnormal open-to-close returns (*ar_oc*). These variables capture, respectively, the overall next relevant daily adjustment, the overnight opening response, and the within-session adjustment on the corresponding market trading day. This decomposition follows the event-study logic that the timing of information incorporation is itself part of the empirical question when the event occurs outside regular trading hours (MacKinlay, 1997).

The main explanatory variable in the baseline specifications is *surprise_main*, which measures the unexpected component of the football result relative to ex ante betting-market expectations. Following the betting-odds literature, this variable is constructed as the realized favourable outcome for the focal country minus its de-vigged implied probability before kick-off, so that higher values correspond to outcomes that are more favourable than expected and lower values correspond to unfavourable surprises (Forrest et al., 2005; Goddard & Asimakopulos, 2004; Palomino et al., 2009). In selected robustness and

exploratory specifications, the dissertation also uses *win_group*, a realized-outcome indicator equal to one when the national team wins the group-stage match.

The baseline specification includes country fixed effects and tournament-year fixed effects. Country fixed effects absorb time-invariant differences across domestic markets, such as persistent variation in market structure, investor composition, and average return behaviour. Tournament-year fixed effects absorb shocks common to all observations within a given championship edition, including differences in macro-financial conditions and tournament-specific context. Statistical inference is based on standard errors clustered at the event-trade-date level, allowing for correlated shocks across observations associated with the same relevant trading day (Cameron & Miller, 2015).

The baseline specification relates abnormal returns to the odds-based surprise measure while controlling for country and tournament-year fixed effects:

$$AR_{i,t} = \alpha + \beta \text{ Surprise}_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t} \quad (3.1)$$

where $AR_{i,t}$ denotes one of the abnormal-return outcomes for country i on event-trade-date t , $\text{Surprise}_{i,t}$ is the odds-based surprise measure, γ_i represents country fixed effects, and δ_t represents tournament-year fixed effects. The coefficient of interest is β , which measures the association between football-match surprise and abnormal returns after controlling for persistent country differences and tournament-specific shocks. Robustness checks using alternative fixed-effects structures are reported in **Appendix A**.

In addition to the baseline surprise specification, the dissertation also considers selected robustness and exploratory specifications using *win_group*, a dummy equal to one when the national team wins the group-stage match⁶. This variable is not intended to replace the surprise measure in the main analysis, but rather to assess whether any empirical patterns are better captured by the realized sporting outcome itself than by the continuous odds-based measure. This alternative regressor is particularly useful in settings where the ex-ante surprise measure may be less informative or where a reduced-form interpretation is of independent interest.

⁶ The realized-win specification is used only in group-stage settings because the construction and interpretation of comparable outcome indicators differ across tournament phases.

Statistical inference is based on standard errors clustered at the event-trade-date level. This choice reflects the fact that multiple country-level observations may be associated with the same event-trade date, creating the possibility of cross-sectional dependence in the regression residuals. Clustering at this level provides more reliable inference than conventional heteroskedasticity-robust standard errors when observations linked to the same trading day are not independent (Cameron & Miller, 2015). In practical terms, the empirical analysis allows for correlated shocks across observations measured on the same relevant market date.

The same general econometric structure is preserved in the extension analyses, although the dependent variables differ across blocks. In the market-quality analysis, the outcomes become daily proxies for trading activity, price dispersion, and illiquidity. In the U.S. transmission analysis, the outcomes include returns on the U.S.-listed ETF and subsequent European abnormal returns. This consistency of design across empirical blocks helps maintain comparability while allowing the dissertation to study different dimensions of post-match market behaviour within a unified framework.

3.8. Multiple-testing adjustment

Because the dissertation evaluates several related outcomes within the same empirical framework, statistical significance is not assessed solely based on conventional unadjusted p -values. In settings involving multiple hypothesis tests, isolated significant results may arise by chance even when no systematic effect is present. To reduce this risk and preserve inferential discipline, the dissertation applies a Benjamini-Hochberg false discovery rate adjustment within families of related tests (Benjamini & Hochberg, 1995).

The use of a false discovery rate procedure is particularly appropriate in the present context because the empirical analysis involves groups of conceptually related regressions rather than one single hypothesis test. For example, the baseline return analysis considers three abnormal-return outcomes, while the market-quality block examines multiple daily proxies for trading activity, price dispersion, and illiquidity. In such settings, reporting only raw p -values may overstate the evidential strength of marginal results, especially when the number of tests increases.

The Benjamini-Hochberg procedure is applied separately within each relevant family of tests. This means that the adjustment is used to evaluate related sets of regressions

together rather than across the entire dissertation indiscriminately. Such an approach preserves comparability within each empirical block while avoiding an unnecessarily conservative treatment of conceptually distinct analyses. In the main results tables, the adjusted values are reported as Benjamini-Hochberg q -values alongside the conventional regression output.

The aim of this adjustment is not to replace standard statistical inference, but rather to complement it. Accordingly, the dissertation reports the underlying regression coefficients, clustered standard errors, and conventional significance levels, while also incorporating the false discovery rate adjustment in the interpretation of the evidence. This is especially relevant because the sample sizes of some empirical blocks are extremely small and isolated significant findings may not be robust after multiple testing is considered.

Overall, the multiple-testing adjustment is part of a broader effort to maintain transparency and credibility in the empirical analysis. For a dissertation that assesses multiple linked outcomes and extensions, it offers a systematic technique to discern suggestive patterns from those that are more persuasive after the broader testing environment is considered.

3.9. Sample description

Before turning to the empirical results, it is useful to describe the composition of the sample across countries, tournament editions, and main variables. This step is important for two reasons. First, it clarifies how the country-level event panel is distributed over time and across domestic markets. Second, it provides a descriptive benchmark for interpreting the regression evidence reported later in the dissertation.

Table 3 reports the distribution of match-event observations across national markets and UEFA European Championship editions. The sample includes six domestic markets: France, Germany, Italy, the Netherlands, Portugal and Spain, and covers tournament editions from 2004 to 2024. The distribution is reasonably balanced across tournament years, although some country-year cells contain fewer observations than others, reflecting the fact that national teams do not participate in every tournament under identical conditions and may exit at different stages of the competition. The event structure is therefore not perfectly symmetric across countries, but it remains sufficiently broad to support a comparative country-level analysis.

Table 3. Distribution of events by country and tournament year

Table 3 reports the distribution of match-event observations across national markets and UEFA European Championship editions.

Country	2004	2008	2012	2016	2021	2024	Total
France	4	3	4	7	4	6	28
Germany	3	6	5	6	4	5	29
Italy	3	4	6	5	7	4	29
Netherlands	5	4	3	0	4	6	22
Portugal	6	4	5	7	4	5	31
Spain	3	6	6	4	6	7	32
Total	24	27	29	29	29	33	171

At the country level, the largest numbers of observations are associated with Spain, Portugal, Germany, and Italy, while the Netherlands contributes a somewhat smaller number of match-event observations. This pattern reflects the realized tournament participation and progression of the corresponding national teams over the sample period rather than any discretionary sampling choice. In that sense, the cross-country composition of the event panel is an outcome of tournament histories rather than a source of selection imposed by the empirical design itself.

The time distribution of the sample is also relatively even across tournament editions, with observations recorded in each championship from 2004 through 2024. This feature is useful because it reduces the risk that the empirical evidence is driven disproportionately by a single tournament edition or by a narrow historical period. At the same time, the inclusion of tournament-year fixed effects in the baseline regressions helps absorb differences in macro-financial conditions and contextual features across championships, complementing the descriptive balance shown in Table 3.

Table 4 reports descriptive statistics for the main variables used in the empirical analysis. The first block of variables corresponds to the baseline daily-return analysis. In particular, the surprise measure, *surprise_main*, exhibits substantial variation across matches, which is consistent with the idea that the sample contains both highly anticipated outcomes and genuinely unexpected results. The raw return measures (*ret_cc*, *ret_co*, and *ret_oc*) and their abnormal-return counterparts (*ar_cc*, *ar_co*, and *ar_oc*) display means close to zero, as would be expected in daily financial data, but they also show non-trivial

dispersion, indicating that event-day market movements vary meaningfully across observations.

Table 4. Descriptive statistics of the main variables

Table 4 reports descriptive statistics for the main variables used in the empirical analysis.

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
surprise_main	105	-0.0140	0.2242	0.4759	-0.8427	0.6971
ret_cc	105	0.0014	0.0017	0.0125	-0.0283	0.0364
ret_co	105	0.0021	0.0009	0.0089	-0.0133	0.0514
ret_oc	105	-0.0007	-0.0002	0.0126	-0.0569	0.0318
ar_cc	105	0.0003	0.0003	0.0057	-0.0270	0.0181
ar_co	105	0.0012	0.0008	0.0047	-0.0078	0.0346
ar_oc	105	-0.0009	-0.0006	0.0086	-0.0460	0.0177
log_volume	171	18.780	18.636	0.980	16.192	21.273
hl_range	171	0.0157	0.0132	0.0094	0.0041	0.0658
amihud_daily	171	7.32e-11	4.45e-11	7.72e-11	1.98e-13	5.44e-10

Notes: *surprise_main* is the odds-based surprise measure, defined as the difference between the realized favourable outcome and the de-vigged ex ante implied probability. *ret_cc*, *ret_co*, and *ret_oc* denote close-to-close, close-to-open, and open-to-close raw returns, respectively. *ar_cc*, *ar_co*, and *ar_oc* denote the corresponding market-model abnormal returns. *log_volume* is the logarithm of trading volume, *hl_range* is the daily high-low price range, and *amihud_daily* is the daily Amihud illiquidity proxy. Market-quality variables are reported for the broader daily event sample.

The descriptive statistics also provide an initial sense of the relative importance of the return decomposition. The close-to-open and open-to-close components are both economically meaningful, which supports the motivation for analysing them separately rather than relying only on aggregate close-to-close returns. This is particularly relevant given the timing of football matches relative to domestic market hours, as discussed earlier in the chapter.

The second block of **Table 4** reports summary statistics for the daily market-quality proxies used in the extension analysis. These variables include log trading volume, the high-low range, and the Amihud illiquidity measure. As expected, these series are measured on different numerical scales and should not be compared mechanically in magnitude. Their descriptive role is instead to show that the broader daily event sample contains sufficient variation in trading activity, price dispersion, and illiquidity to support the extension analysis reported later in the dissertation.

Taken together, **Tables 3 and 4** show that the empirical sample is both temporally broad and cross-sectionally diverse, while also exhibiting meaningful variation in the main

explanatory and outcome variables. This descriptive evidence does not in itself establish any relationship between football results and stock market behaviour, but it provides an essential empirical context for the regression analysis that follows.

3.10. Data limitations and empirical adaptations

The empirical implementation follows the core structure proposed in the research report, but two extensions were adapted to reflect the historical data coverage available for the full sample period. An important limitation of the dissertation concerns the availability of historical intraday data for the markets and tournament years under study. The original research design envisaged an intraday extension aimed at examining whether football matches affected market quality through measures more directly linked to trading frictions, such as bid-ask spreads, depth, and intraday trading intensity. In practice, however, the data access available for this project did not provide historical intraday coverage for the relevant markets over the full period required for the UEFA European Championship editions included in the sample⁷.

This limitation does not affect the construction of the main daily event-study analysis, which relies on daily open, high, low, close, and volume data and is therefore fully implementable for the intended sample period. It does, however, constrain the extent to which the dissertation can evaluate intraday trading conditions in the exact form originally envisaged. More specifically, it prevents the direct estimation of quote-based or high-frequency market-quality measures for historical tournament events in 2004, 2008, 2012, 2016, 2021, and 2024 using a consistent intraday dataset across countries.

Instead of ignoring this dimension entirely, the dissertation adjusts the market-quality block down to the level of data that is accessible consistently. It uses daily proxies for trading activity, price dispersion and illiquidity, i.e. log trading volume, the high-low range and the Amihud illiquidity measure, instead of intraday metrics based on quotes. These variables are widely used in empirical finance as informative, though coarser, indicators of trading conditions when richer intraday or order-book data are unavailable (Amihud, 2002). This adaptation preserves the basic economic question underlying the original extension, namely,

⁷ In the available Refinitiv/LSEG access environment, intraday data could be retrieved only for a recent historical window, which did not overlap consistently with the earlier tournament years in the sample. As a result, a comparable cross-country intraday panel could not be constructed for the full study period.

whether football events are associated with changes in market quality and liquidity, while remaining consistent with the actual constraints of the available dataset.

A related adaptation concerns the international transmission block. In its most ambitious form, that extension could have been implemented using intraday U.S. and European trading data to trace the sequential incorporation of football-related information across venues and time zones. Given the same historical intraday coverage constraints, the dissertation instead implements this block at daily frequency using returns on a U.S.-listed ETF with European exposure and subsequent European abnormal returns. While this approach is less granular than a true intraday transmission design, it still provides a useful test of whether information potentially incorporated in U.S. trading is related to next-day European market behaviour.

These limitations should not be interpreted as undermining the core empirical contribution of the dissertation. The central research question - whether football-match outcomes are associated with domestic abnormal stock market returns, and whether such adjustment occurs at the opening or during the subsequent session - remains fully testable within the daily-frequency framework implemented here. The resulting adaptations affect the breadth and granularity of the extension blocks rather than the validity of the baseline event-study design.

Accordingly, the dissertation treats the daily abnormal-return analysis and the close-to-open/open-to-close decomposition as the core empirical contribution. The market-quality and U.S. transmission analyses are interpreted as complementary extensions rather than as full intraday microstructure tests. This distinction preserves alignment with the original research question while ensuring that the empirical claims remain consistent with the data actually available.

4. Empirical results

This chapter presents the empirical results of the dissertation. It begins with the baseline daily abnormal-return analysis, which examines whether football-match surprise is associated with abnormal close-to-close, close-to-open, and open-to-close returns in the corresponding domestic market. It then considers daily market-quality proxies, evidence on potential U.S. transmission through a U.S.-listed ETF, and an exploratory after-close specification. Taken together, these results provide evidence on whether football outcomes are reflected in domestic market prices, when any such adjustment occurs, and whether it is accompanied by broader changes in trading conditions or cross-market information transmission.

4.1. Baseline daily abnormal returns

Table 5 reports the baseline regressions of abnormal returns on the odds-based surprise measure across the three return windows considered in the dissertation: abnormal close-to-close returns (*ar_cc*), abnormal close-to-open returns (*ar_co*), and abnormal open-to-close returns (*ar_oc*). **Figure 1** complements the table by plotting the corresponding point estimates and 95% confidence intervals. Together, these results provide the main evidence on whether football-match surprise is associated with abnormal domestic stock market behaviour.

Table 5. Baseline daily abnormal returns

Table 5 reports the baseline relationship between football-match surprise and daily abnormal returns across the three return windows.

	(1) <i>ar_cc</i>	(2) <i>ar_co</i>	(3) <i>ar_oc</i>
surprise_main	0.0017 (0.0011)	-0.0013 (0.0011)	0.0031 (0.0019)
Country fixed effects	Yes	Yes	Yes
Tournament-year fixed effects	Yes	Yes	Yes
Clustered standard errors	Event-trade date	Event-trade date	Event-trade date
Observations	105	105	105
R-squared	0.069	0.157	0.181
BH q-value	0.169	0.221	0.169

Notes: The table reports baseline regressions of market-model abnormal returns on the odds-based surprise measure. *surprise_main* is defined as the difference between the realized favourable outcome and the de-vigged ex ante implied probability. *ar_cc*, *ar_co*, and *ar_oc* denote abnormal close-to-close, close-to-open, and open-to-close returns, respectively. Standard errors clustered at the event-trade-date level are reported in parentheses. BH q-values correspond to the Benjamini-Hochberg adjustment within the daily-return test family.

Appendix A provides additional robustness evidence for the baseline return specifications. **Table A1** reports alternative fixed-effects specifications for abnormal close-to-close returns, while **Table A2** extends the same exercise to abnormal close-to-open and abnormal open-to-close returns. Across these specifications, the estimated coefficients remain broadly stable in sign and magnitude, reinforcing the interpretation that the baseline results are not driven by one particular fixed-effects structure.

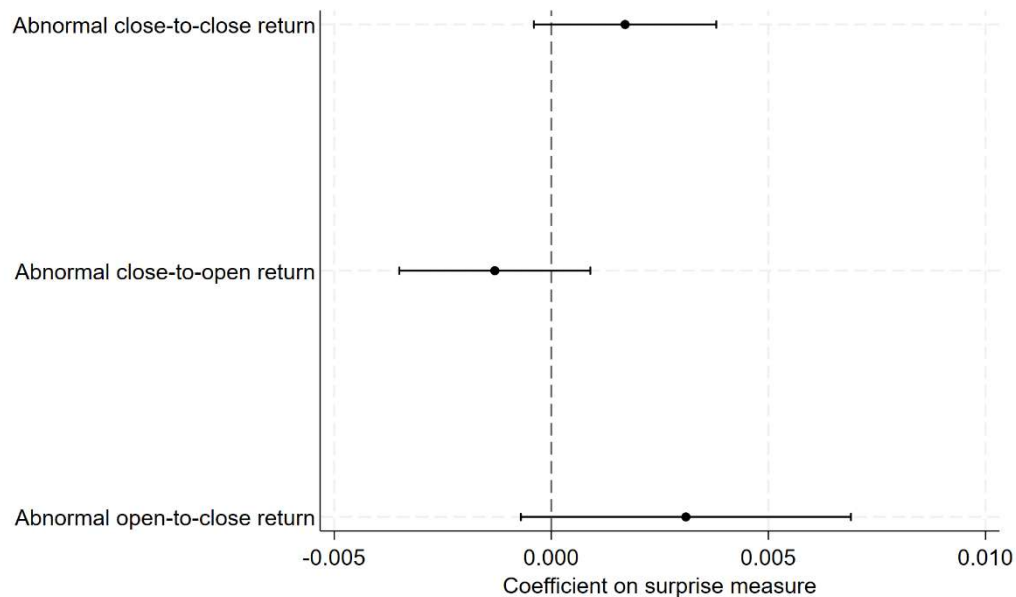
Across the three return windows, the estimated coefficients on *surprise_main* are small in magnitude and statistically weak. The close-to-close coefficient is positive, which is consistent in sign with the idea that favourable surprises may be associated with better market performance, but the estimate is not statistically persuasive once standard errors are clustered at the event-trade-date level. The close-to-open coefficient is negative, whereas the open-to-close coefficient is positive, and neither estimate provides robust evidence of a systematic abnormal-return response. The Benjamini-Hochberg q -values reported in **Table 5** reinforce this interpretation, indicating that none of the baseline coefficients remains convincing once multiple testing within the daily-return family is considered.

Although the baseline evidence is therefore predominantly weak, the decomposition across return windows remains informative. The estimated coefficient is more positive in the open-to-close specification than in the close-to-open specification, which suggests that any adjustment associated with football-match surprise does not emerge in a clean or systematic way at the next market opening. Instead, the results indicate that the overall close-to-close response is the net outcome of small and offsetting patterns across the overnight and within-session windows. In this sense, the decomposition helps clarify that the absence of strong close-to-close evidence is not masking a sharp and robust opening effect.

This interpretation is visible in **Figure 1**, where the confidence intervals for all three coefficients intersect zero. The figure therefore provides a compact visual summary of the baseline message: while the point estimates are not identical across return windows, the data do not support a clear and statistically robust abnormal-return response to football-match surprise in the baseline specification. The baseline daily evidence is therefore best described as suggestive in places, but ultimately weak.

Figure 1. Baseline daily abnormal returns

Figure 1 plots the baseline coefficients for the effect of football-match surprise on abnormal returns across the three return windows.



Notes: The figure reports point estimates and 95% confidence intervals from the baseline regressions of abnormal returns on the odds-based surprise measure.

From an economic perspective, these results imply that, at the aggregate domestic-market level, football outcomes may have less systematic pricing impact than is sometimes presumed in the broader discussion of sports-related investor sentiment. This does not mean that football matches are irrelevant for investors, nor does it rule out the possibility of effects in narrower samples, alternative frequencies, or more granular market segments. It does indicate, however, that in the benchmark daily abnormal-return framework implemented here, the evidence for a robust aggregate response is limited.

At the same time, the baseline results should not be interpreted in isolation from the structure of the empirical design. The event-study framework already controls for broad market co-movement through the market model, includes country and tournament-year fixed effects, and relies on clustered inference and multiple-testing adjustment. The absence of strong statistical significance is therefore not simply a mechanical consequence of an under-specified model, but rather a substantive feature of the data once the empirical design is implemented conservatively. The following sections examine whether this conclusion

changes when attention shifts from abnormal returns to market-quality proxies, cross-market transmission, and exploratory after-close specifications.

These findings should be interpreted in relation to prior evidence showing that sports outcomes can influence financial markets through sentiment-related channels (Ashton et al., 2003; Edmans et al., 2007; Kaplanski & Levy, 2010). The weaker statistical evidence in the present setting suggests that such reactions may depend on the competition studied, the measurement of expectations, the return window considered, and the level of market aggregation. This reinforces the importance of the return decomposition and robustness checks reported in **Appendix A**.

4.2. Daily market-quality proxies

Table 6 reports the results for the daily market-quality block. The dependent variables are daily proxies for trading activity, price dispersion, and illiquidity: log trading volume, the high-low range, and the Amihud illiquidity measure. These variables examine whether football outcomes are associated not only with abnormal returns, but also with broader trading conditions. These daily proxies are in line with empirical practice in finance when intraday or quote-data measures are not available. The Amihud measure is a commonly used proxy for illiquidity, while the high-low range captures the dispersion of prices within a day (Amihud, 2002; Corwin & Schultz, 2012).

Table 6. Daily market-quality proxies

Table 6 reports the relationship between football results and daily proxies for trading activity, price dispersion, and illiquidity.

	(1) <i>log_volume</i>	(2) <i>hl_range</i>	(3) <i>amihud_daily</i>
Panel A. Surprise measure			
surprise_main	-0.1247 (0.1023)	-0.0011 (0.0018)	7.16e-12 (1.43e-11)
Country FE	Yes	Yes	Yes
Tournament-year FE	Yes	Yes	Yes
Clustered s.e.	Event-trade date	Event-trade date	Event-trade date
Obs.	105	105	105
R-squared	0.792	0.439	0.214
BH q-value	0.618	0.618	0.618
Panel B. Realized win indicator			
win_group	-0.1052 (0.0864)	-0.0012 (0.0018)	8.14e-12 (1.20e-11)
Country FE	Yes	Yes	Yes
Tournament-year FE	Yes	Yes	Yes
Clustered s.e.	Event-trade date	Event-trade date	Event-trade date
Obs.	105	105	105
R-squared	0.791	0.440	0.215
BH q-value	0.618	0.618	0.618

Notes: The table reports regressions of daily market-quality proxies on football-related variables for the group-stage sample. *surprise_main* is the odds-based surprise measure, and *win_group* is a dummy equal to one if the national team wins the group-stage match. *log_volume* is the logarithm of trading volume, *hl_range* is the daily high-low price range, and *amihud_daily* is the daily Amihud illiquidity proxy. Standard errors clustered at the event-trade-date level are reported in parentheses. BH q-values correspond to the Benjamini-Hochberg adjustment within the market-quality test family.

Panel A of **Table 6** relates the daily market-quality proxies to the odds-based surprise measure. The estimated coefficients do not provide robust evidence that unexpected football outcomes are associated with systematic changes in trading conditions. The coefficient on *surprise_main* is negative for log trading volume and the high-low range, and positive for the Amihud illiquidity measure, but the estimates are imprecise and do not survive the Benjamini-Hochberg adjustment. This suggests that, at the daily frequency considered here, football-match surprise is not strongly associated with changes in aggregate trading activity, price dispersion, or illiquidity.

Panel B replaces the continuous surprise measure with the realized group-stage win indicator, *win_group*. The results remain consistent with Panel A. The coefficients do not indicate a statistically reliable association between realized wins and daily market-quality proxies. This comparison is informative because it shows that the absence of strong market-quality effects is not driven solely by the construction of the odds-based surprise variable; a simpler realized-outcome measure leads to the same broad conclusion.

Taken together, the market-quality results suggest that football outcomes are not associated with strong and systematic changes in daily trading conditions at the aggregate index level. This complements the baseline return evidence. If salient football events affected markets through a broad disruption in investor attention or liquidity provision, one might expect to observe changes in trading activity, price dispersion, or illiquidity. The absence of such patterns suggests that any sentiment or attention channel is either weak at the daily index level, short-lived, or concentrated in dimensions not captured by the available daily proxies.

These findings should also be interpreted in light of the data limitations discussed in Chapter 3. Because consistent historical intraday data were not available for the full sample period, **Table 6** should be viewed as a daily-frequency test of market-quality effects rather than as a quote-level microstructure analysis. Nevertheless, the evidence is informative because the available proxies capture broad dimensions of trading activity, price dispersion, and illiquidity that are central to the attention and market-quality mechanisms discussed in the literature (Amihud, 2002; Corwin & Schultz, 2012; Ehrmann & Jansen, 2012).

Overall, the market-quality evidence provides limited support for a systematic trading-conditions channel. In the context of the dissertation, this evidence complements

the baseline abnormal-return results by showing that the absence of strong price effects is not accompanied by robust changes in daily liquidity or broader trading conditions.

The absence of robust market-quality effects also suggests that any football-related sentiment or attention channel is not visible through the daily trading-conditions proxies used in this analysis. The next section examines whether a clearer signal emerges instead through cross-market information transmission using a U.S.-listed ETF with European exposure.

4.3. U.S. transmission results

Table 7 reports the results of the U.S. transmission block, while **Figure 2** provides a visual summary of the corresponding coefficients and confidence intervals. This part of the analysis examines whether football-related information is reflected in a U.S.-listed ETF with European exposure and whether that response is related to subsequent abnormal returns in the corresponding European markets. The test is motivated by the literature on cross-listed securities, venue leadership, and price discovery, which suggests that information may be incorporated first where related claims continue to trade and only later reflected in markets that were closed at the time of the information event (Eun & Sabherwal, 2003; Hasbrouck, 1995). Given the daily-frequency implementation, the results should be interpreted as reduced-form evidence on cross-market transmission rather than as a full intraday price-discovery test.

Table 7. U.S. transmission results

Table 7 reports daily-frequency evidence on the reaction of the U.S.-listed ETF and its relation to subsequent European abnormal returns.

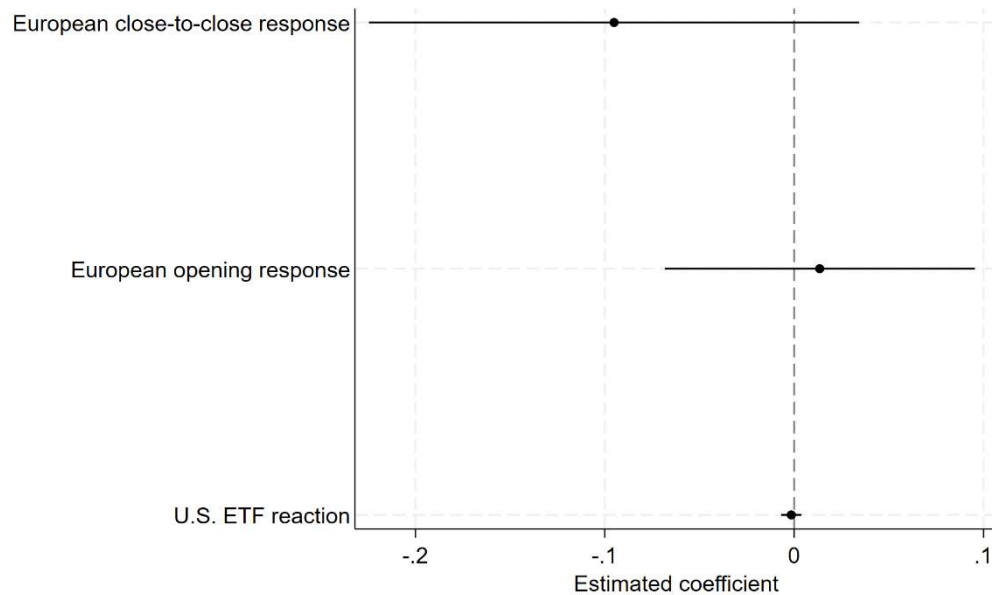
	(1) <i>us_ret_cc</i>	(2) <i>ar_co</i>	(3) <i>ar_cc</i>
Panel A. U.S. ETF reaction			
surprise_main	-0.0015 (0.0027)		
Country FE	Yes		
Tournament-year FE	Yes		
Clustered s.e.	Event-trade date		
Obs.	71		
R-squared	0.074		
Panel B. European market response			
us_ret_cc		0.0135 (0.0407)	-0.0951 (0.0643)
surprise_main		0.0001 (0.0008)	
Country FE		Yes	Yes
Tournament-year FE		Yes	Yes
Clustered s.e.		Event-trade date	Event-trade date
Obs.		71	71
R-squared		0.109	0.151

Notes: Column (1) reports the reaction of the U.S.-listed ETF to the football-match surprise measure. Columns (2) and (3) report whether the ETF return helps explain subsequent European abnormal returns. *us_ret_cc* denotes the close-to-close return on the U.S.-listed ETF, while *ar_co* and *ar_cc* denote abnormal close-to-open and close-to-close returns in the corresponding European market. *surprise_main* is the odds-based surprise measure. Standard errors clustered at the event-trade-date level are reported in parentheses.

Panel A of **Table 7** examines whether the U.S.-listed ETF reacts to the football-match surprise measure. The estimated coefficient is negative, small in magnitude, and imprecisely estimated, with the confidence interval including zero. This provides little evidence that football-match surprise is systematically incorporated into the ETF return at the daily frequency considered here. **Figure 2** reinforces this interpretation by showing that the point estimate is close to zero relative to its confidence interval.

Figure 2. U.S. transmission results

Figure 2 plots the estimated coefficients for the U.S. ETF reaction and its relation to subsequent European abnormal returns.



Notes: The figure reports point estimates and 95% confidence intervals from the U.S. transmission regressions. The U.S. ETF reaction is measured by the coefficient on the surprise variable, while the European responses are measured by the coefficient on the ETF return.

Panel B examines whether the U.S. ETF return is related to subsequent European abnormal returns. The abnormal close-to-open return is the most natural European outcome for this test, because information incorporated while European markets are closed should be reflected first when those markets reopen. The estimated coefficient on the U.S. ETF return is positive in the close-to-open specification but imprecisely estimated, and the confidence interval includes zero. When the surprise measure is included alongside the ETF return, the coefficient on *surprise_main* is also close to zero and statistically weak. Taken together, these results do not provide robust evidence that the ETF return operates as a systematic daily-frequency transmission channel into the next European opening.

The final specification in **Table 7** relates the U.S. ETF return to abnormal close-to-close returns in the European markets. Here too, the estimated coefficient is not statistically persuasive. The corresponding point estimate in **Figure 2** is negative, but the confidence interval remains sufficiently wide that no robust conclusion can be drawn. As a result, the

evidence does not indicate that daily ETF returns provide a reliable signal of subsequent abnormal performance in the domestic European markets under study.

Substantively, these findings provide limited daily-frequency evidence of cross-market information transmission through the U.S.-listed ETF. This result is informative because it indicates that the weak domestic abnormal-return evidence is not offset by a clearer response in a parallel U.S. trading venue. In the context of the cross-market price-discovery literature, the evidence therefore suggests that any football-related information effect is not sufficiently strong to generate a systematic daily sequence between the U.S.-listed instrument and subsequent European market adjustment (Eun & Sabherwal, 2003; Froot & Dabora, 1999; Hasbrouck, 1995; Madhavan, 2012).

At the same time, these results should be interpreted in light of the scope of the extension. As discussed in Chapter 3, this block is implemented at daily frequency because consistent historical intraday coverage was not available for the full study period. A more granular intraday design could, in principle, provide a sharper test of the timing of cross-market adjustment. Within the daily-frequency framework implemented here, however, the evidence provides limited support for a systematic transmission mechanism.

From a broader perspective, these findings suggest that any football-related pricing response is unlikely to be persistent or systematic at the daily frequency considered here. This further reinforces the interpretation that football outcomes are not associated with strong or systematic pricing effects in the analysed markets at the daily frequency considered here. The final subsection therefore turns to the exploratory after-close analysis, which provides a narrower reduced-form perspective on the timing of adjustment for matches ending after the domestic market close.

4.4. Exploratory after-close evidence

Table 8 reports exploratory regressions for the subsample of matches ending after the domestic market close, while **Figure 3** provides a visual summary of the corresponding point estimates and confidence intervals. This analysis focuses on the setting in which the timing of information arrival is most clearly separated from domestic trading hours. When a match ends after the market close, any immediate domestic adjustment can only occur when the market next opens. The test is therefore interpreted as a reduced-form complement to the baseline abnormal-return analysis rather than as a substitute for it.

Table 8. Exploratory after-close evidence

Table 8 reports exploratory evidence for matches ending after the domestic market close.

	(1) <i>ret_co</i>	(2) <i>ar_co</i>	(3) <i>diff_oc_co</i>
win_group	-0.0040 (0.0018)	-0.0013 (0.0010)	0.0044 (0.0030)
Country FE	Yes	Yes	Yes
Tournament-year FE	Yes	Yes	Yes
Clustered s.e.	Event-trade date	Event-trade date	Event-trade date
Obs.	101	101	101
R-squared	0.312	0.156	0.207

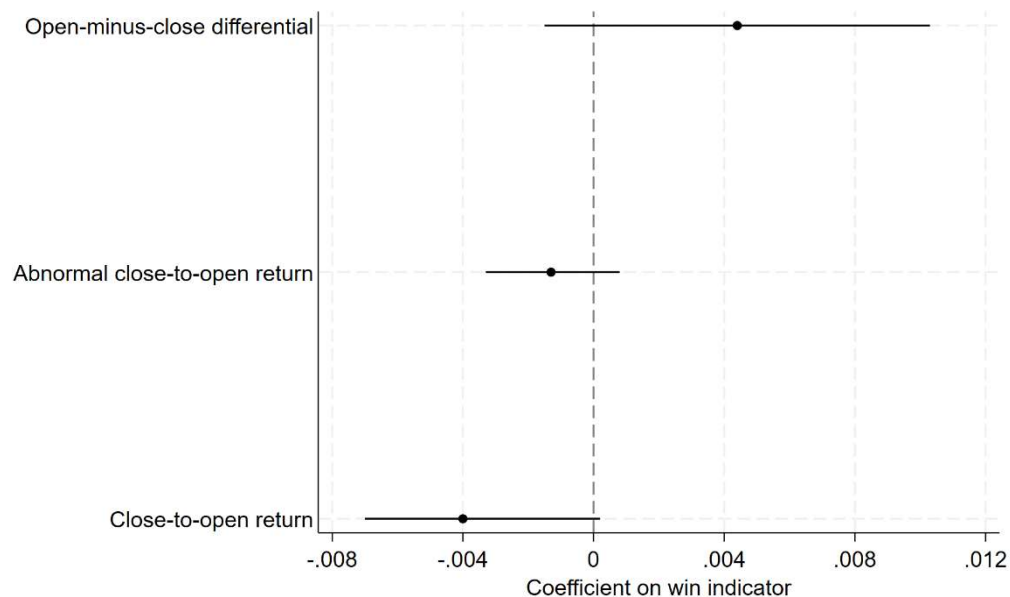
Notes: The table reports exploratory regressions for the subsample of matches ending after the domestic market close. *win_group* is a dummy equal to one if the national team wins the group-stage match. *ret_co* denotes the raw close-to-open return, *ar_co* denotes the abnormal close-to-open return, and *diff_oc_co* denotes the open-minus-close differential used to compare within-session and opening movements. Standard errors clustered at the event-trade-date level are reported in parentheses.

The key explanatory variable in this block is ***win_group***, which identifies whether the national team won the group-stage match. This specification is deliberately simpler than the baseline surprise-based model. Its purpose is to assess whether a directional reduced-form pattern emerges in the after-close setting, where the next market opening is the first trading opportunity after the football outcome becomes known. The results should therefore be interpreted as supplementary evidence on timing rather than as the main test of the expectations-based mechanism.

The first column of **Table 8** uses the raw close-to-open return, ***ret_co***, as the dependent variable. The coefficient on ***win_group*** is negative and larger in magnitude than the estimates in the benchmark-adjusted specifications. This indicates a suggestive reduced-form association between group-stage wins and next-opening raw returns within the after-close subsample. However, because the estimate is based on raw returns and the confidence interval remains close to zero, the result should be interpreted cautiously and not as evidence of a robust abnormal-return effect.

Figure 3. Exploratory after-close evidence

Figure 3 plots the estimated coefficients for the exploratory after-close regressions.



Notes: The figure reports point estimates and 95% confidence intervals from exploratory regressions for the subsample of matches ending after the domestic market close.

The second and third columns move from raw returns to benchmark-adjusted and decomposition-based outcomes. When the dependent variable is the abnormal close-to-open return, *ar_co*, the coefficient on *win_group* remains negative but becomes smaller and less precisely estimated. When the dependent variable is the open-minus-close differential, *diff_oc_co*, the coefficient becomes positive, suggesting that any raw opening pattern is not reinforced over the subsequent trading session. Taken together, these results indicate that the suggestive signal in raw close-to-open returns weakens once benchmark co-movement and within-day dynamics are considered.

This distinction is important for the interpretation of the exploratory block. The after-close evidence does not overturn the baseline conclusion that the overall empirical results are predominantly weak. Rather, it suggests that there may be a limited reduced-form pattern in raw opening returns for matches ending after market close, but that this pattern is not robust across abnormal-return specifications. In this sense, the exploratory analysis is informative precisely because it helps identify where a suggestive signal does and does not survive.

Accordingly, the results in **Table 8** and **Figure 3** should be interpreted as supplementary rather than confirmatory evidence. They do not provide a basis for a strong causal claim about football wins and domestic market adjustment. They do, however, support the broader methodological choice of separating close-to-open from open-to-close returns. Even where the evidence is only suggestive, the after-close analysis shows that the timing of match outcomes relative to trading hours is an economically relevant dimension of the empirical design.

This heterogeneity analysis is related to the broader literature on behavioural responses to salient events, which suggests that investor reactions may depend on attention, context, and the salience of the information environment (Barber & Odean, 2008; Da et al., 2011; Ehrmann & Jansen, 2012). The absence of consistent effects across specifications indicates that such mechanisms, if present in this setting, are not sufficiently strong to generate robust aggregate pricing patterns at the daily index level. The final section of the chapter draws the different empirical blocks together and discusses their implications for the dissertation.

4.5. Discussion of findings

Taken together, the empirical results reported in this chapter point to a consistent conclusion: the association between national football outcomes and aggregate domestic stock market behaviour is limited within the daily-frequency framework implemented in the dissertation. This conclusion does not rely on a single specification. The baseline abnormal-return analysis produces some suggestive coefficient patterns, but these are not statistically robust once clustered inference and multiple-testing adjustment are considered. The market-quality block does not reveal systematic changes in daily trading conditions, and the U.S. transmission block does not provide robust evidence that football-related information is incorporated through the U.S.-listed instrument before being reflected in subsequent European abnormal returns.

This conclusion is also consistent with the robustness checks reported in **Appendix A**, where the baseline coefficients remain relatively stable under alternative fixed-effects specifications for both aggregate and decomposed abnormal-return outcomes.

This overall pattern is informative in relation to the sports-finance literature. Prior studies show that emotionally salient sporting outcomes may affect markets through

sentiment, attention, or mood-related mechanisms (Ashton et al., 2003; Edmans et al., 2007; Kaplanski & Levy, 2010). The present results do not rule out these channels, but they suggest that their aggregate pricing implications are limited in this UEFA European Championship setting. In particular, even if football outcomes influence investor mood or attention, such effects do not necessarily translate into stable abnormal-return patterns at the level of broad national equity indices.

A second implication concerns the timing of adjustment. One motivation of the dissertation was to move beyond the standard close-to-close event-study framework and examine whether any response was concentrated in the close-to-open window or during the subsequent trading session. The return decomposition is useful precisely because it shows that the weak close-to-close evidence is not concealing a large and robust opening response. The exploratory after-close analysis provides some suggestive evidence in raw close-to-open returns, but this pattern weakens once benchmark adjustment is introduced. This reinforces the conclusion that the timing dimension is empirically relevant, even though the evidence does not support a strong abnormal-return effect.

The market-quality results add a further dimension to this interpretation. If football events affected markets through a broad attention or liquidity channel, one might expect parallel movements in trading activity, price dispersion, or illiquidity. The daily market-quality block does not provide robust evidence of such movements. This suggests that the available proxies do not reveal a strong market-wide trading-conditions channel, although more granular intraday or quote-level data would be needed to rule out short-lived microstructure effects (Amihud, 2002; Corwin & Schultz, 2012; Ehrmann & Jansen, 2012).

The U.S. transmission evidence leads to a similar conclusion. If football-related information were incorporated through a U.S.-listed instrument while European markets were closed and then transmitted back into European prices at the next opening, one would expect a more systematic relation between the ETF return and subsequent European abnormal returns. The results do not provide robust daily-frequency evidence of such a sequence. This complements the domestic findings by suggesting that the absence of strong European abnormal-return effects is not offset by a clearer response in the parallel U.S. venue examined here (Eun & Sabherwal, 2003; Froot & Dabora, 1999; Hasbrouck, 1995; Madhavan, 2012).

These conclusions should be interpreted in light of the deliberately disciplined empirical design. The dissertation combines abnormal-return estimation, fixed effects, clustered standard errors, and false discovery rate adjustment in order to reduce the risk of over-interpreting isolated significant coefficients. This conservative approach is appropriate in a setting with multiple related outcomes and relatively modest event samples. The absence of strong statistical significance should therefore be read as a substantive empirical finding under a careful identification strategy, rather than as a failure of implementation (Benjamini & Hochberg, 1995; Brown & Warner, 1985; Cameron & Miller, 2015; MacKinlay, 1997).

More broadly, the findings suggest that football outcomes may not generate large, uniform, and easily detectable pricing effects in broad national equity indices, even when the underlying events are highly salient. This is compatible with several interpretations. Any sentiment or attention effects may be concentrated in narrower investor segments, specific sectors, or individual securities; they may be too short-lived to be captured cleanly at daily frequency; or they may depend on tournament stage, match importance, or country-specific investor attention. These possibilities do not weaken the contribution of the dissertation. Instead, they clarify the boundary conditions under which sports-related sentiment effects appear difficult to detect in aggregate market data.

Overall, the empirical evidence presented in this chapter is best described as limited rather than strongly supportive of a football-related market effect, with only exploratory signs of timing-related adjustment in the after-close subsample. The value of the dissertation therefore lies in the disciplined implementation of a multi-part empirical design that tests the football–finance relationship across abnormal returns, timing, trading conditions, and cross-market transmission. This provides a more complete assessment than a standard close-to-close event study focused only on realized match outcomes.

The findings therefore qualify, rather than reject, earlier evidence of sports-related sentiment effects by showing that such effects may be sample-specific, time-varying, or attenuated in broad and diversified market settings (Ashton et al., 2003; Edmans et al., 2007; Kaplanski & Levy, 2010). The final chapter summarizes the main findings and discusses their broader implications, limitations, and avenues for future research.

5. Conclusions

The relationship between salient public events and financial markets is important both theoretically and practically. From a theoretical perspective, it speaks to the extent to which asset prices reflect only fundamental information or may also be affected by investor sentiment, attention, and collective emotion. From a practical perspective, it is relevant for investors, market participants, and regulators interested in understanding whether highly visible non-fundamental events can influence prices, trading conditions, or the transmission of information across markets.

Against this background, this dissertation examined whether national football outcomes during the UEFA European Championship are associated with domestic stock market behaviour in six European countries: France, Germany, Italy, the Netherlands, Portugal, and Spain. Motivated by the literature on sports-related investor sentiment and market reactions to salient public events, the analysis addressed three related questions: whether football-match outcomes are associated with abnormal returns, whether any adjustment is concentrated in the close-to-open window or during the subsequent trading session, and whether football events are accompanied by changes in market quality or cross-market transmission through a U.S.-listed ETF with European exposure. To answer these questions, the dissertation implemented a multi-part empirical framework combining an event-study design, odds-based surprise measures, return decomposition, daily market-quality proxies, and a daily-frequency transmission extension (Ashton et al., 2003; Edmans et al., 2007; Kaplanski & Levy, 2010; MacKinlay, 1997; Palomino et al., 2009).

The central empirical conclusion is that the evidence for a robust aggregate stock market response to football outcomes is limited. In the baseline abnormal-return analysis, the coefficients on the odds-based surprise measure vary across return windows but do not provide statistically robust evidence once clustered inference and the Benjamini-Hochberg adjustment are considered. The decomposition into close-to-close, close-to-open, and open-to-close returns is nevertheless informative: it shows that the weak aggregate evidence is not concealing a strong opening response. Instead, any football-related response appears small, imprecisely estimated, or offset across return windows.

The market-quality block leads to a similar conclusion. Using daily proxies for trading activity, price dispersion, and illiquidity, the dissertation does not find robust evidence that

football outcomes are systematically associated with broader trading conditions. This result is informative because an attention or liquidity channel would plausibly be reflected in trading activity, price dispersion, or illiquidity. The absence of such patterns suggests that football events do not generate a strong market-wide trading-conditions effect at the daily index level, while leaving open the possibility of shorter-lived microstructure effects that would require intraday or quote-level data to detect (Amihud, 2002; Corwin & Schultz, 2012; Ehrmann & Jansen, 2012).

The U.S. transmission block also provides limited evidence of a systematic cross-market sequence. The results do not support a robust relation between returns on the U.S.-listed ETF and subsequent European abnormal returns. This is important because it suggests that the weak domestic findings are not simply explained by football-related information being incorporated first in a parallel U.S. venue and then transmitted to European markets at the next opening. Within the daily-frequency framework implemented here, the analysis therefore does not uncover a clear transmission mechanism of the type suggested by the cross-market price-discovery literature (Eun & Sabherwal, 2003; Froot & Dabora, 1999; Hasbrouck, 1995; Madhavan, 2012).

The most suggestive evidence arises in the exploratory after-close analysis. For matches ending after the domestic market close, raw close-to-open returns display a clearer reduced-form association with group-stage wins. However, this pattern weakens once benchmark adjustment is introduced and does not translate into equally strong abnormal-return evidence. This finding should therefore be interpreted as exploratory rather than confirmatory. It nevertheless supports the methodological relevance of distinguishing between close-to-open and open-to-close returns when studying events that occur outside regular trading hours.

Taken together, these findings suggest that the aggregate pricing consequences of football outcomes in broad national equity indices are limited in this setting. This does not imply that football outcomes are irrelevant to investors, nor does it invalidate the behavioural mechanisms proposed in the wider literature. Rather, it qualifies that literature by showing that sentiment and attention effects may be difficult to detect at the country-index level, especially when expectations, timing, benchmark adjustment, clustered inference, and multiple-testing concerns are explicitly incorporated (Ashton et al., 2003; Edmans et al., 2007; Benjamini & Hochberg, 1995; MacKinlay, 1997).

The contribution of the dissertation therefore lies in providing a disciplined and multidimensional test of the football–finance relationship. The study does not rely only on aggregate close-to-close abnormal returns. Instead, it incorporates odds-based expectations, separates close-to-open from open-to-close adjustment, examines daily proxies for trading conditions, and considers cross-market transmission through a U.S.-listed ETF. In doing so, the dissertation connects the sports-finance literature with event-study methodology, betting-market expectations, market-quality measurement, and cross-market price discovery (Brown & Warner, 1985; MacKinlay, 1997; Palomino et al., 2009; Amihud, 2002; Eun & Sabherwal, 2003).

The dissertation is also subject to limitations that define the scope of its conclusions. The most important limitation concerns the lack of consistent historical intraday data for the tournament years and markets under study. As a result, the market-quality and transmission blocks were implemented at daily frequency using consistently available proxies. A second limitation is that the analysis focuses on broad national equity indices, which are appropriate for testing aggregate market sentiment but may not capture effects concentrated in narrower sectors, specific firms, or particular investor groups.

These limitations point to several avenues for future research. First, future studies could use consistent historical intraday, auction, or quote-level data to examine opening-price formation, intraday price discovery, and microstructure-based measures of market quality more directly. Second, future work could test whether football-related effects are stronger at the sectoral, firm, or investor-clientele level than at the level of broad national indices. Third, researchers could examine whether any market response depends on contextual features such as tournament stage, elimination risk, match importance, surprise magnitude, or country-specific investor attention. These extensions would help determine whether the limited aggregate evidence documented in this dissertation reflects a genuinely small market-wide effect or instead a more localized effect that requires more granular data to identify.

Overall, the dissertation shows that a careful and methodologically disciplined examination of UEFA European Championship outcomes does not provide strong evidence of robust aggregate domestic pricing effects in the sample considered. This conclusion should not be interpreted as a negative result, but as evidence that sports-related sentiment effects are not automatically visible in broad national equity indices once expectations, timing, benchmark adjustment, and multiple-testing concerns are explicitly addressed.

Appendices

Appendix A. Additional Regression Results

Table A1. Baseline Regressions Under Alternative Fixed-Effects Specifications

	(1)	(2)	(3)
surprise_main	0.0011 (0.0012)	0.0012 (0.0012)	0.0015 (0.0012)
Country FE	No	Yes	Yes
Tournament-year FE	No	No	Yes
Observations	105	105	105
R-squared	0.0075	0.0388	0.0621

Note: This table reports baseline regressions of abnormal close-to-close returns on the odds-based surprise measure under alternative fixed-effects specifications. Standard errors clustered at the event-trade-date level are reported in parentheses.

Table A2. Baseline Close-to-Open and Open-to-Close Regressions Under Alternative Fixed-Effects Specifications

	Panel A: ar_co			Panel B: ar_oc		
	(1)	(2)	(3)	(4)	(5)	(6)
surprise_main	-0.0022 (0.0013)	-0.0025 (0.0015)	-0.0025 (0.0013)	0.0033 (0.0019)	0.0037 (0.0020)	0.0039 (0.0019)
Country FE	No	Yes	Yes	No	Yes	Yes
Tournament-year FE	No	No	Yes	No	No	Yes
Observations	105	105	105	105	105	105
R-squared	0.0274	0.0791	0.2747	0.0294	0.0910	0.1855

Note: This table reports baseline regressions of abnormal close-to-open (Panel A) and abnormal open-to-close (Panel B) returns on the odds-based surprise measure under alternative fixed-effects specifications. Standard errors clustered at the event-trade-date level are reported in parentheses.

References

- Amihud, Y. (2002). Illiquidity and stock returns: Cross-section and time-series effects. *Journal of Financial Markets*, 5(1), 31–56. [https://doi.org/10.1016/S1386-4181\(01\)00024-6](https://doi.org/10.1016/S1386-4181(01)00024-6)
- Ashton, J. K., Gerrard, B., & Hudson, R. (2003). Economic impact of national sporting success: Evidence from the London stock exchange. *Applied Economics Letters*, 10(12), 783–785. <https://doi.org/10.1080/1350485032000133282>
- Barber, B. M., & Odean, T. (2008). All that glitters: The effect of attention and news on the buying behavior of individual and institutional investors. *Review of Financial Studies*, 21(2), 785–818. <https://doi.org/10.1093/rfs/hhm079>
- Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society: Series B (Methodological)*, 57(1), 289–300. <https://doi.org/10.1111/j.2517-6161.1995.tb02031.x>
- Boțoc, C., Mihancea, E., & Molcuț, A. (2019). Football and stock market performance correlation: Evidence from Italy. *Scientific Annals of Economics and Business*, 66(4), 525–539. <https://doi.org/10.47743/saeb-2019-0044>
- Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics*, 14(1), 3–31. [https://doi.org/10.1016/0304-405X\(85\)90042-X](https://doi.org/10.1016/0304-405X(85)90042-X)
- Cain, M., Law, D., & Peel, D. (2000). The favourite–longshot bias and market efficiency in UK football betting. *Scottish Journal of Political Economy*, 47(1), 25–36. <https://doi.org/10.1111/1467-9485.00151>
- Cameron, A. C., & Miller, D. L. (2015). A practitioner's guide to cluster-robust inference. *Journal of Human Resources*, 50(2), 317–372. <https://doi.org/10.3368/jhr.50.2.317>
- Corwin, S. A., & Schultz, P. (2012). A simple way to estimate bid-ask spreads from daily high and low prices. *Journal of Finance*, 67(2), 719–760. <https://doi.org/10.1111/j.1540-6261.2012.01729.x>
- Da, Z., Engelberg, J., & Gao, P. (2011). In search of attention. *Journal of Finance*, 66(5), 1461–1499. <https://doi.org/10.1111/j.1540-6261.2011.01679.x>

DellaVigna, S., & Pollet, J. M. (2009). Investor inattention and Friday earnings announcements. *Journal of Finance*, 64(2), 709–749. <https://doi.org/10.1111/j.1540-6261.2009.01447.x>

Dimic, N., Neudl, M., Orlov, V., & Äijö, J. (2018). Investor sentiment, soccer games and stock returns. *Research in International Business and Finance*, 43, 90–98. <https://doi.org/10.1016/j.ribaf.2017.07.134>

Edmans, A., García, D., & Norli, Ø. (2007). Sports sentiment and stock returns. *Journal of Finance*, 62(4), 1967–1998. <https://doi.org/10.1111/j.1540-6261.2007.01262.x>

Ehrmann, M., & Jansen, D.-J. (2012). The pitch rather than the pit: Investor inattention during FIFA World Cup matches. *Journal of Money, Credit and Banking*, 44(6), 1185–1199. <https://doi.org/10.1111/j.1538-4616.2012.00524.x>

Eun, C. S., & Sabherwal, S. (2003). Cross-border listings and price discovery: Evidence from U.S.-listed Canadian stocks. *Journal of Finance*, 58(2), 549–575. <https://doi.org/10.1111/1540-6261.00537>

Forrest, D., Goddard, J., & Simmons, R. (2005). Odds-setters as forecasters: The case of English football. *International Journal of Forecasting*, 21(3), 551–564. <https://doi.org/10.1016/j.ijforecast.2005.03.003>

Froot, K. A., & Dabora, E. M. (1999). How are stock prices affected by the location of trade? *Journal of Financial Economics*, 53(2), 189–216. [https://doi.org/10.1016/S0304-405X\(99\)00020-4](https://doi.org/10.1016/S0304-405X(99)00020-4)

Goddard, J., & Asimakopoulos, I. (2004). Forecasting football results and the efficiency of fixed-odds betting. *Journal of Forecasting*, 23(1), 51–66. <https://doi.org/10.1002/for.877>

Gonzalo, J., & Granger, C. W. J. (1995). Estimation of common long-memory components in cointegrated systems. *Journal of Business & Economic Statistics*, 13(1), 27–35. <https://doi.org/10.1080/07350015.1995.10524576>

Hasbrouck, J. (1995). One security, many markets: Determining the contributions to price discovery. *Journal of Finance*, 50(4), 1175–1199. <https://doi.org/10.1111/j.1540-6261.1995.tb04054.x>

- Kaplanski, G., & Levy, H. (2010). Exploitable predictable irrationality: The FIFA World Cup effect on the U.S. stock market. *Journal of Financial and Quantitative Analysis*, 45(2), 535–553. <https://doi.org/10.1017/S0022109010000153>
- MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature*, 35(1), 13–39.
- Madhavan, A. (2012). Exchange-traded funds, market structure, and the flash crash. *Financial Analysts Journal*, 68(4), 20–35. <https://doi.org/10.2469/faj.v68.n4.6>
- O'Hara, M. (1995). Market microstructure theory. Blackwell Publishers.
- Palomino, F., Renneboog, L., & Zhang, C. (2009). Information salience, investor sentiment, and stock returns: The case of British soccer betting. *Journal of Corporate Finance*, 15(3), 368–387. <https://doi.org/10.1016/j.jcorpfin.2008.12.001>
- Refinitiv Datastream. (2026). *Financial market data retrieved from Refinitiv Datastream/LSEG Workspace database.*
- Saggu, A., Ante, L., & Demir, E. (2024). Anticipatory gains and event-driven losses in blockchain-based fan tokens: Evidence from the FIFA World Cup. *Research in International Business and Finance*, 70, 102333. <https://doi.org/10.1016/j.ribaf.2024.102333>
- Shin, H. S. (1992). Prices of state contingent claims with insider traders, and the favourite–longshot bias. *The Economic Journal*, 102(411), 426–435. <https://doi.org/10.2307/2234526>
- Shin, H. S. (1993). Measuring the incidence of insider trading in a market for state-contingent claims. *The Economic Journal*, 103(420), 1141–1153. <https://doi.org/10.2307/2234240>
- Supino, E., Tenucci, A., & Di Nanna, G. (2024). Sports failures and stock returns between rationality and emotionality: Evidence from the UEFA Champions League. *Research in International Business and Finance*, 70, 102359. <https://doi.org/10.1016/j.ribaf.2024.102359>
- Tanaltay, A., Safari Langroudi, A., Akhavan-Tabatabaei, R., & Kasap, N. (2021). Can social media predict soccer clubs' stock prices? The case of Turkish teams and Twitter. *SAGE Open*, 11(2). <https://doi.org/10.1177/21582440211004153>

Truong, Q.-T., Tran, Q.-N., Bakry, W., Nguyen, D. N., & Al-Mohamad, S. (2021). Football sentiment and stock market returns: Evidence from a frontier market. *Journal of Behavioral and Experimental Finance*, 30, 100472. <https://doi.org/10.1016/j.jbef.2021.100472>