

The effectiveness of futures markets as a mechanism for price risk management

Plamen PENEV¹

¹ University of Economics, Varna, Bulgaria

plamen.penev@ue-varna.bg

Abstract. This study explores the utility of futures markets in the agricultural sector, examining their effectiveness in mitigating price risk and their capacity to reflect market fundamentals. It also examines the impact of the growing presence of non-commercial participants on the price efficiency of derivative markets and the relation with corresponding physical markets. The paper analyses at the correlation between futures and spot prices, as well as the stability of the basis as a key indicator of hedging effectiveness. Despite increased market liquidity, futures markets retain their function as a viable mechanism for price risk management, particularly in the context of short-term strategies. The findings emphasize the need to tailor hedging approaches to specific market conditions and time horizons, reaffirming that futures contracts remain a relevant and adaptable tool for managing price volatility when applied with sensitivity to market dynamics and the diverse objectives of market participants.

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1. Introduction

Futures markets serve multiple critical functions within the modern economic system. They provide mechanisms for managing price risk, contribute to the process of price discovery, and simultaneously enable agricultural commodities to be treated as a distinct asset class, accessible to a broad spectrum of investors—including hedge funds and financial institutions that have traditionally remained outside the area of physical commodity trading.

Market participants employ futures contracts primarily as a hedge against adverse price fluctuations. For instance, agricultural commodity processors such as flour manufacturers, who require physical supplies of wheat, may purchase futures contracts to mitigate the risk of future price increases. In the event of a price surge—whether in the spot or futures markets—these participants can offset the higher costs of physical procurement through the gains realized from their futures positions.

However, futures markets are not confined to participants directly engaged in the physical trade of commodities. Alongside producers, merchants, and processors, these markets also attract non-commercial actors who are not involved in the physical handling of goods. Often referred to as “speculators,” these participants enter futures contracts with the sole intent of profiting from price fluctuations, without any intention of taking physical delivery of the underlying asset.

Over the past decade and in some cases, even earlier, there has been a marked surge in trading activity involving financial instruments linked to commodities. These instruments encompass exchange-traded futures and options, as well as over-the-counter (OTC) forward contracts and options. Concurrently, the increasing involvement of investment funds and institutional capital has further intensified market dynamics (United Nations, 2011).

This study aims to assess the effectiveness of futures prices as instruments for hedging against commodity price risk, with particular emphasis on the recent evolution of their efficacy. The analysis is framed as a test of the hypothesis that the growing presence of speculative participants in futures markets has contributed to a functional decoupling from underlying physical markets, potentially undermining their role in risk management.

Despite expert recommendations and the acknowledged benefits of hedging, the actual participation of agricultural producers in futures markets remains limited. As noted by Blank et al. (1991, 1997), even when farmers do engage with these markets, they frequently do so as speculators rather than as hedgers. Considering this, the central question posed by the present article is whether the practice of hedging through futures contracts has lost its appeal as a risk management strategy, or whether it continues to offer a relevant and effective means of protecting producers from price volatility.

2. Hedging Between Volatility and Speculation

A substantial number of recent research concerning commodity price dynamics suggests an intensification of volatility, particularly in agricultural and food-related commodities. But whether this elevated volatility represents a structural, long-term trend remains an open question within academic and policy-oriented debates. Gilbert and Morgan (2010) report an increase in the price instability of key agricultural products over recent years. However, historical precedents of elevated volatility provide grounds for the counterargument that current levels may, over time, revert toward previous levels.

This hypothesis intersects with a broader discourse on the potential consequences of intensified speculative activity for the functioning of commodity markets as suggested by Bohl & Stephan, (2012). At the core of this debate lies the question of whether the increasing presence of speculative traders has been a principal driver not only of elevated price levels but also of heightened volatility. In fact, the role of speculators in futures markets has long been the subject of scholarly scrutiny. While often cast as providers of liquidity, the difficulty in precisely defining the term "speculator", a challenge raised as early as Gray (1967), complicates efforts to assess their impact on market behaviour with empirical precision.

Several prominent authors, including Gheit (2008), Masters (2008), and Masters and White (2008), argue that speculative practices, particularly those undertaken by hedge funds in futures and over-the-counter (OTC) derivatives markets, have caused destabilization. According to this view, heightened demand from financial investors has led to the formation of price bubbles, wherein commodity prices—including those of crude oil—significantly exceeded levels justifiable by fundamental supply and demand factors during periods of peak valuation (Irwin et al., 2009).

UNCTAD (2009) likewise notes that the growing involvement of institutional investors in agricultural futures markets reflects a broader trend of treating commodities as an alternative asset class, primarily for the purposes of portfolio diversification and optimization of risk-return profiles. In such investment frameworks, market fundamentals are frequently subordinated to broader portfolio considerations. Of particular interest is the growing influence of so-called index traders—market participants who tend to maintain long-only positions and thus exert persistent upward pressure on prices. The sheer scale of their positions can result in significant price distortions and the formation of speculative bubbles, with potentially adverse consequences for normal market functioning and price discovery. Subsequently, in this environment, hedging becomes not only more complex and costly but, in many cases, practically inaccessible to participants in developing economies. Moreover, the reliability of price signals originating from major exchanges such as Euronext and CBOT is significantly diminished, impairing the ability of real-economy participants to make informed investment decisions and manage production and consumption strategies effectively, as suggested by UNCTAD (2009).

In contrast to the speculative bubble hypothesis, Irwin et al. (2009) maintain that price dynamics in commodity markets are primarily governed by fundamental economic variables. The authors convey four essential arguments to support this position:

First, they challenge the conceptual foundation underlying the bubble narrative, contending that it rests on a flawed understanding of futures markets. Specifically, they dispute the notion that capital flows into derivative markets translate into increased demand for physical commodities, since such flows are confined to financial instruments and do not involve physical delivery.

Second, the empirical features of commodity markets do not succeed in verifying the presence of substantial price bubbles. Notably, there is no observable shift in the ratio of speculative to hedging positions that would indicate a systematic transformation in market structure.

Third, there is a lack of evidence that particular investor groups such as index funds maintaining long-only positions consistently influence price trajectories through the magnitude of their market exposure.

Fourth, the authors recall a historical pattern: in times of increased volatility, speculators are often scapegoated for market distortions and crises, irrespective of their actual role in these developments.

If, however, futures price dynamics are increasingly shaped by forces detached from underlying supply and demand fundamentals, one would expect to observe a weakening or even a breakdown of the correlation between

futures and spot prices. Such a decoupling would have direct implications for the effectiveness of futures-based hedging strategies. As the literature consistently emphasizes, a robust correlation between spot and futures prices is a critical precondition for calculating the optimal hedge ratio under the minimum variance approach (Ederington, 1979; Sanders & Manfredo, 2004).

Figure 1 presents the dynamics of futures prices versus spot prices of milling wheat since January 2020. The two variables taken are EURONEXT (MATIF) Milling wheat futures and Bulgarian Milling wheat spot prices delivered to Varna/Burgas ports.

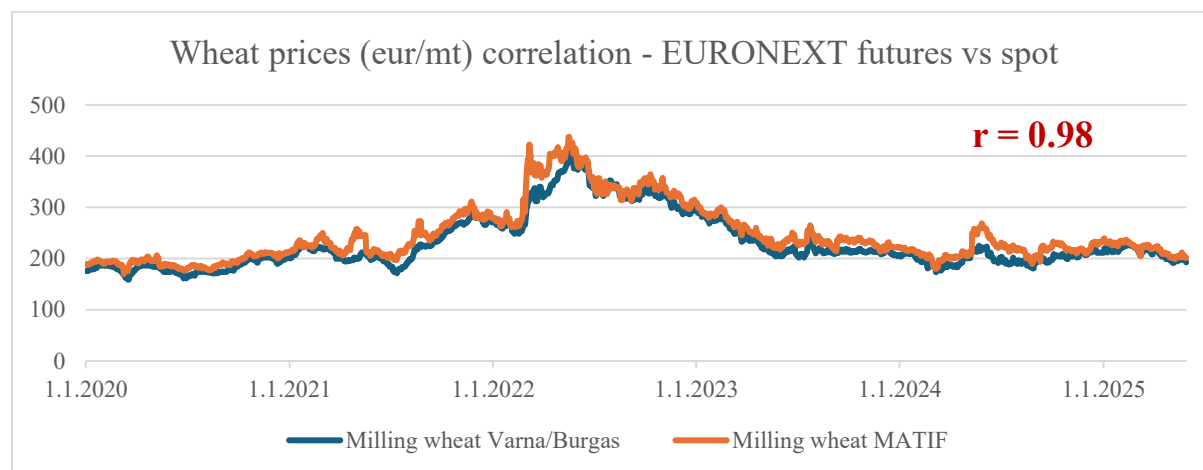


Figure 1. Wheat prices (EUR/mt) correlation - EURONEXT futures vs spot
Source: Own elaboration

Wheat prices displayed in Figure 1 exhibit superior correlation at the level of 0.98. Small gaps only appear irregularly, with the major one being at the beginning of the war in Ukraine in February 2022.

It must also be stressed that in the context of hedging, the critical variable is not the absolute movement of spot and futures prices, but rather the consistency of their relationship, encapsulated in the concept of the "basis." To shed light on the notion – 'basis' is considered a fundamental concept that measures the difference between the spot price (cash price) of a commodity and the futures price of that same commodity at a given time. In brief: **Basis = Spot Price–Futures Price**. From this follows a logical inference: if hedging strategies and their associated performance metrics continue to affirm the utility of futures markets as risk management tools, this implies a preserved correlation between the two price segments and respectively, the absence of a significant distortion arising from excess liquidity or speculative behaviour.

Figure 2 represents the dynamics of futures prices versus spot prices of milling wheat since January 2020. The two variables taken this time are CBOT wheat futures and Bulgarian Milling wheat spot prices delivered to Varna/Burgas ports.

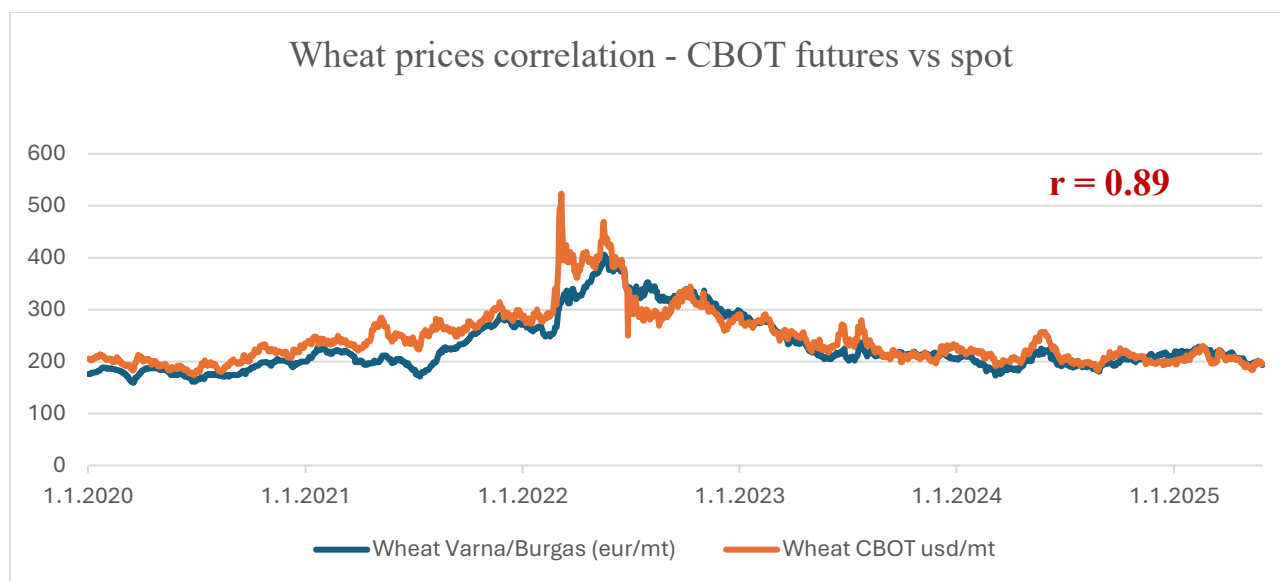


Figure 2. Wheat prices correlation - CBOT futures vs spot
Source: Own elaboration

The correlation demonstrated between Bulgarian wheat prices and CBOT prices in Figure 2 is clearly weaker at the level at 0.89, compared to the same couple, but with the EURONEXT futures quotes in it, instead of CBOT. Thus, an inference could be made favouring the EURONEXT as a better correlated benchmark to Bulgarian milling wheat levels for the period starting from 2020.

3. Analysis of Market Efficiency

The continuous flow of information, being publicly available or not, supports the persistent fluctuations in market prices. There is a notion that a futures market is deemed efficient when it meets two fundamental criteria:

- First, prices respond promptly to the arrival of new information, indicating the presence of informational efficiency in the pricing mechanism.
- Second, there is no systematic bias favouring one category of market participants over another—holders of long or short positions—signalling for neutrality within the market.

It is commonly assumed that markets with lower liquidity, such as European exchanges (e.g., Euronext, LIFFE), tend to exhibit higher price volatility compared to more active markets like the Chicago Board of Trade (CBOT). Contrary to this expectation, empirical data suggest that price fluctuations on the CBOT are, in fact, more evident than on its European counterparts.

Figure 3 observes the corn price fluctuation between EURONEXT and CBOT. The two variables used are EURONEXT corn futures and CBOT corn futures starting from 01.01.2020.

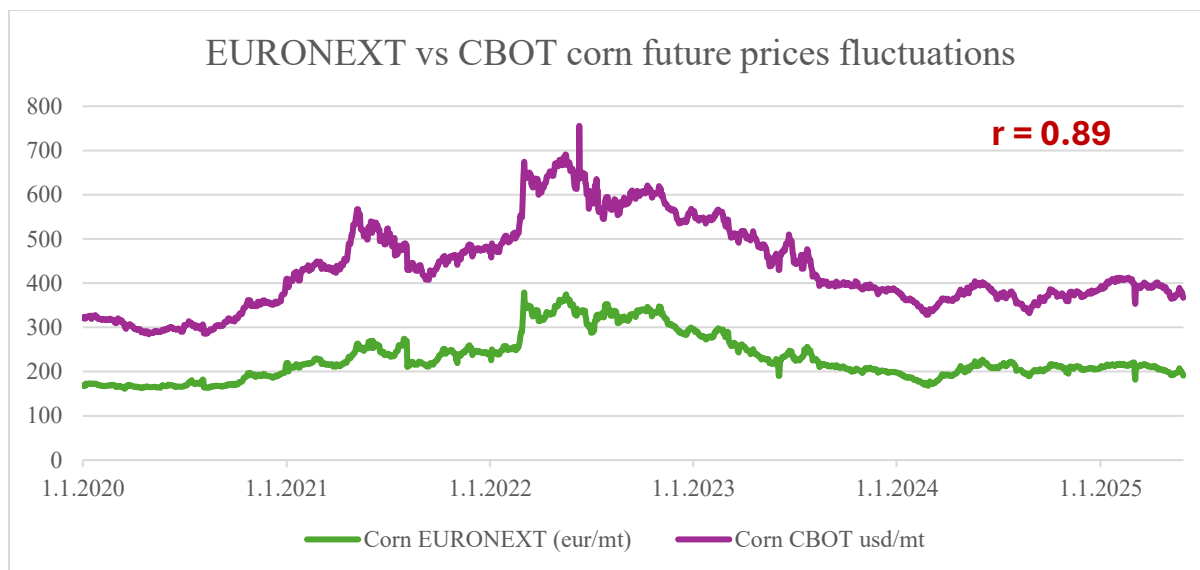


Figure 3. EURONEXT vs CBOT corn future prices fluctuations
Source: Own elaboration

As the empirical data in Figure 3 show, the exchange with the allegedly lower expected fluctuations, i.e. CBOT, (due to the higher liquidity and volumes traded) is indeed more volatile compared to the EURONEXT exchange for the observed 5-year period. The strong level of correlation examined (0.89) also suggests a rather solid one-directional movement between the two major commodity exchanges.

As another example for the purpose of this study, the fluctuation parity of wheat has also been explored. Figure 4 suggests again the slightly less obvious volatile exchange, namely CBOT, although supposed to be softer in its movement, due to the liquidity provided, to show stronger volatility:

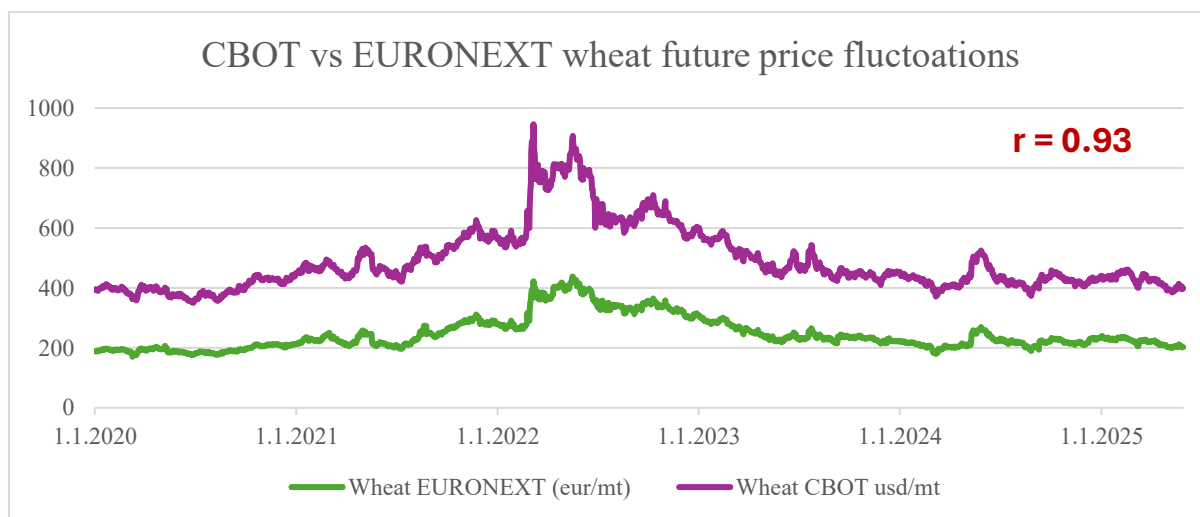


Figure 4. CBOT vs EURONEXT wheat future price fluctuations
Source: Own elaboration

Wheat futures traded in CBOT and EURONEXT have also shown higher levels of correlation at the level of 0.93, compared to the corn correlation examined at both exchanges. Nevertheless, it worth mentioning that both corn and wheat future prices demonstrate high magnitudes of correlation, which suggests a strong linear relationship between CBOT and EURONEXT as instruments for hedging the respective commodities.

As the United Nations (2011) observes, since the early 2000s, derivative markets—including those for agricultural commodities—have experienced a significant influx of capital from non-traditional investors. Given its global importance, the CBOT generates substantial liquidity and attracts a wide array of market participants, making it the most prominent hub for speculative activity relative to other exchanges.

Figure 5 below summarizes the average percentage of open interest or in other words – what market share is held by each participant category annually:

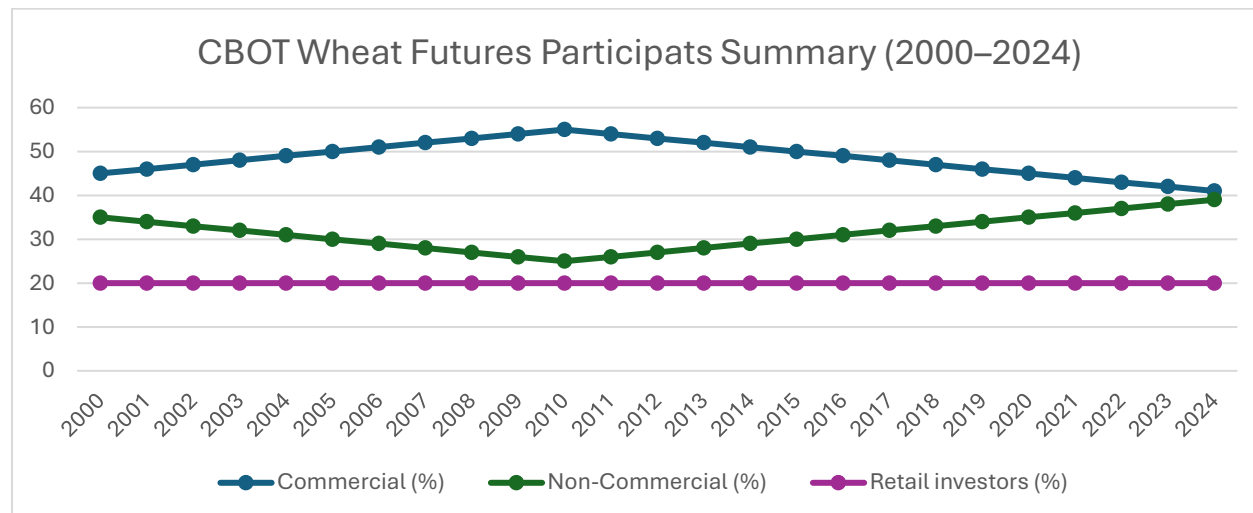


Figure 5. CBOT Wheat Futures Participats Summary (2000–2024)

Source: Own elaboration/ Commodity Futures Trading Commission's (CFTC) Commitments of Traders (COT) reports.

To clarify the observed groups of participants:

- Commercial: it encompasses the Producers/Merchants/Processors.
- Non-commercial: consist of financial institutions, hedge funds, index funds and similar.
- Retail investors: small traders and retail investors.

As the chart suggests, there's a gradual decline in participation in the Commercial segment throughout the years, indicating a slight reduction in hedging activities by farmers, traders and processing companies. Concerning the non-traditional investors, i.e. non-commercial participants, it could be reported that a visible upward trend reflects increasing interest from institutional investors and hedge funds in wheat futures for speculative purposes. As for the Retail investors, those have remained relatively stable, indicating consistent participation from smaller traders.

Investors maintain large positions across numerous futures contracts, including those tied to core crops such as wheat, corn, and soybeans, as well as commodities like cocoa, coffee, and sugar. While speculative participation plays a crucial role in sustaining market liquidity, an excessive concentration of speculative capital may contribute to greater frequency and unpredictability of price swings on the CBOT, compared to European exchanges.

Risk transfer and price discovery constitute two of the primary functions of futures markets, each contributing to the structure and efficiency of global economic activity (Garbade & Silber, 1983). Risk transfer allows market participants seeking protection against price uncertainty to use futures contracts to shift risk onto others. Price discovery, in turn, refers to the role of futures prices as benchmarks that inform spot market transactions. The relevance and effectiveness of both functions depend critically on the existence of a stable and robust linkage between futures prices and the values of the corresponding physical commodities.

Volatility in spot prices reflects actual price variability in the underlying physical market and represents a tangible source of risk for producers, merchants, and processors. Although widely used as a risk management tool, hedging strategies cannot eliminate price risk entirely; rather, they serve to reduce its financial impact.

Accordingly, in examining the efficiency of futures markets, it is essential to ask whether basis risk has become more unstable, thus a less reliable instrument for price risk mitigation. An increase in basis risk may be linked to heightened speculative activity by investors whose trading behaviour is poorly related to underlying

market fundamentals. This divergence between futures and spot markets can distort the correlation between the two and result in higher basis risk. The degree of correlation between futures and spot prices is a critical determinant of basis risk, which tends to rise when the direction or magnitude of price movements in the two markets diverge in the period leading up to contract expiration.

Figure 6 describes how the evolution in prices in both EURONEXT Milling wheat futures and Bulgarian milling wheat spot prices reflect on the 'basis' progression for the period of roughly 5 years.

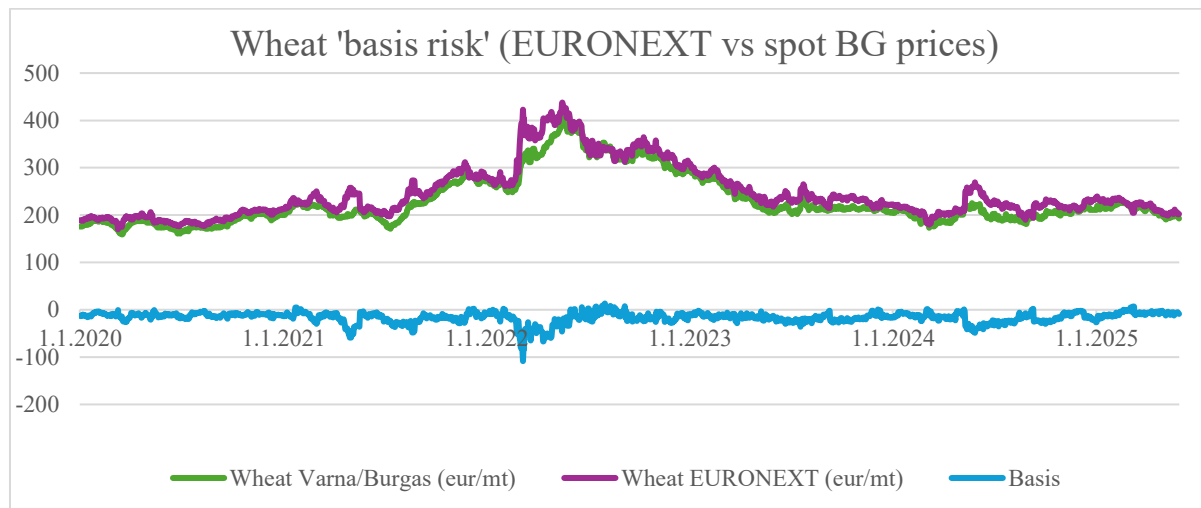


Figure 6. Wheat 'basis risk' (EURONEXT vs spot BG prices)
Source: Own elaboration

As observed in Figure 5, in its major part, the 'basis' acts counter directional to the movement of future/spot prices. As steeper the price fluctuations are, the deeper the 'basis' level directs to, leading to an assumption that the magnitude of price movements is a fundamental variable to the calculation of the basis risk.

The classical function of hedging lies in limiting potential losses arising from unfavourable movements in spot prices. In this context, hedging transforms spot price risk into basis risk, which stems from fluctuations in the differential between futures and spot prices.

It is important to note that different types of market participants adopt distinct hedging strategies based on their objectives and hedging time horizons. Agricultural producers, for example, typically initiate short positions by selling futures contracts at the beginning of the planting season and hold these positions until the harvest period, thereby insuring against adverse price movements between planting and harvest.

In contrast, merchants and processors engage in hedging throughout the year rather than in accordance with seasonal cycles. Their hedging operations are usually shorter in duration compared to those of agricultural producers and are oriented toward short-term protection against temporary market disruptions. This type of hedging is classified as operational and aims to mitigate the effects of near-term price volatility.

4. Conclusion

The primary objective of this study has been to examine two interrelated dimensions: first, the effectiveness of futures markets as a hedging instrument; and second, their applicability in managing price risk by substituting spot price exposure with basis risk. The latter dimension is of particular importance, as any structural decoupling of futures markets from spot markets, resulting from the growing use of futures contracts as components of diversified financial portfolios, could imply a diminished capacity for commercial participants engaged in physical commodity trade (such as agricultural producers, merchants, and processors) to use futures as a reliable risk management tool.

The findings presented in this analysis indicate that the increasing participation of financial investors unconnected to the physical trade of commodities—such as hedge funds and institutional capital managers—has not undermined the pricing efficiency or hedging utility of futures exchanges. On the contrary, the results of the hedging effectiveness assessment suggest that futures markets continue to serve as a primary mechanism for managing price volatility, largely owing to the robust correlation observed between spot and futures prices.

These findings offer indirect evidence that the growing presence of financial speculators has not resulted in a structural disconnection between futures and physical markets. Nevertheless, some reservations remain regarding the long-term hedging strategies employed by agricultural producers, particularly in terms of their sustained effectiveness. This nuance highlights the complexity of hedging practices across market participants with differing temporal horizons.

Overall, the evidence supports the view that futures markets remain not only a viable and effective instrument for risk management but also a potentially valuable component in the broader framework of food security.

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