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Revised rollover measure: an application to Euronext's wheat futures contract

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Abstract

This article extends an existing model on contracts rollover, that allows us to lower the bound measuring the number of contracts rolled by verifying that the difference between the number of contracts opened and closed is non-negative. This new model is later applied to a futures contract (on milling wheat), to better understand the hedging activity that takes place, and in particular to increase our knowledge on the behavior of hedgers.

Introduction

Starting January 2018, European trading platforms are under the obligation of reporting the trading positions of each agent in the market. This reform follows the entry into force of the second Markets in Financial Instruments Directive (MiFID II), a European legislative framework that intends to improve the functioning of financial markets. Given that one of its main objectives is to increase transparency, MiFID II imposes new reporting requirements, where trading platforms communicate daily to the local market authority the aforementioned positions, and publish an aggregate report of these positions weekly. And thus these regulations apply to Euronext's commodity products.

It is therefore along these lines that Euronext started publishing in 2018 the weekly Commitment of Traders (CoT) reports, that detail the operations by type of agent (investment firms or credit institutions, investment funds, other financial institutions and commercial undertakings), type of activity (hedging or other) and type of position (long or short). The reports indicate aggregate volumes per category but also the percentage of total open interest and their structure is close to the CoT reports of the US Commodity Futures Trading Commission (CFTC). However, the positions being self-reported and the late availability of these reports do not facilitate complete microstructure analyses.

We take an interest in the rolling activity performed by hedgers, meaning the transfer of the positions held in the nearest contract to other next contracts by closing the current contract and simultaneously opening another one in a further maturity. In other words, rolling a hedge is performed "by closing out one futures contract and taking the same position in a futures contract with a later delivery date" (Hull *et al.*, 2007).

Estimating the rollover amount is important when analyzing the information content of trading volumes. As a proxy for information flow (Sutcliffe, 2017), volume data can be blurred by rollover noise that does not reflect new market information. For example, identifying rollover transactions enables us to know whether a lack of liquidity is due to rollovers or to other market information. Moreover, understanding when does rollover take place is useful when analyzing futures prices, it is general practice to transform them into a continuous series. Many authors proposed different rollover points (Trujillo-Barrera *et al.*, 2012; Lien *et al.*, 2013; Franken *et al.*, 2011; Arnade and Hoffman, 2015; Ma *et al.*, 1992) but this switching date should reflect rollover in practice. Overall, as stated by Karanasos *et al.* (2019) while citing the thesis of Margaronis (2016) : "taking into account the roll can significantly change the time series since there roll values can be significant".

On the other hand, examining rollovers enables us to better understand the behavior of contract holders, especially hedgers.

For this, we depart from the model of Holmes and Rougier (2005), to create our own model that lowers the upper bound of the number of rolled contracts by verifying that the difference between the number of contracts opened and closed during a trading session is non-negative.

We then empirically illustrate the new rollover model with the futures contract on milling wheat (EBM), that is considered as a "global price benchmark for the European underlying physical markets" by Euronext (Raevel and Porte, 2016) and is exchanged in large amounts, making it a liquid contract (for 2016, more than 450,3 millions of tons were traded, 16 times the French wheat production of the same year). Being traded on Euronext, the CoT reports of the EBM contract are available only starting April 22nd 2018. This complicates the understanding of the dynamics of milling wheat financial instruments, hence making it more difficult to take informed decisions. It is for this reason that we are particularly interested in the rollover behavior of hedgers from 2010 to 2018.

To the best of our knowledge, the analysis of the rollover activities has never been explored previously, as the only result we can find is that for EBM, 75 to 85% of the activity is led by hedgers (Wuchner, 2012). However, no further detail is given on how this result was obtained, and no evolution is presented.

In light of the above, we try to answer the following research questions: How can an additional hypothesis allow us to have a more accurate rollover measure? And what are the dynamics of the rolling activity in the milling wheat futures contract?

We first formulate the following assumptions: There are 2 categories of investors: hedgers and speculators. The number of hedgers is significantly constant during the nearest contract's lifetime.

The hedgers are on the nearest contract and they rollover their positions towards the last sessions before expiration (not necessarily to the first next contract). Hedgers avoid rolling over too late for liquidity reasons of liquidity.

The remainder of the article is structured as follows. Section 2 presents the rollover model's novelty compared to the Holmes and Rougier (2005) model, section 3 shows the results when applied to the EBM contract and section 4 discusses the results and concludes the analysis.

1. Materials and Methods

To have a clearer picture of the traders' behavior, we study their rollover strategy. It enables us to induce the number of contracts rolled over that are hedged. For that, the model of Holmes and Rougier (2005) provides us with a starting point. Their model allows to obtain an upper bound for the number of contracts rolled over, however we believe that their measure overestimates this bound.

By formulating the links between open interest and volume for the near and next contracts, Holmes and Rougier (2005) succeed in defining an upper bound to the rolling activity.

They present their model as follows:

Near (1) **Next (2)**

$$V_t^1 = E_t^1 + S_t^1 + r_t \qquad V_t^2 = E_t^2 + S_t^2 + r_t \quad V_t^1 ; V_t^2 \geq 0$$

$$\Delta OI_t^1 = E_t^1 - S_t^1 - r_t \qquad \Delta OI_t^2 = E_t^2 - S_t^2 + r_t \quad E_t^1 ; E_t^2 \geq 0$$

$$S_t^1 ; S_t^2 \geq 0$$

$$E_t^1 = \frac{(V_t^1 + \Delta OI_t^1)}{2} \qquad E_t^2 = \frac{(V_t^2 + \Delta OI_t^2)}{2} - r_t$$

$$S_t^1 = \frac{(V_t^1 - \Delta OI_t^1)}{2} - r_t \qquad S_t^2 = \frac{(V_t^2 - \Delta OI_t^2)}{2}$$

$$0 \leq r_t \leq \frac{(V_t^1 - \Delta OI_t^1)}{2} \qquad 0 \leq r_t \leq \frac{(V_t^2 + \Delta OI_t^2)}{2}$$

Where V_t^i is the volume for maturity i, with 1 being the nearest maturity; ΔOI_t^i is the change in open interest; E_t^i is the number of entries (contracts opened); S_t^i is the number of exits (contracts closed); and r_t is the number of contracts rolled over.

They obtain the following relationship:

$$0 \leq r_t \leq Min[\frac{(V_t^1 - \Delta OI_t^1)}{2} ; \frac{(V_t^2 + \Delta OI_t^2)}{2}]$$

This relationship is then generalized for a rollover to *n* next contracts:

$$0 \leq r_t \leq Min[\frac{(V_t^1 - \Delta OI_t^1)}{2} ; \sum_{i=2}^{n} \frac{(V_t^i + \Delta OI_t^i)}{2}]$$

We depart from this relationship that we rearrange as

$$r_t^* = Max\ (Min[\frac{(V_t^1 - \Delta OI_t^1)}{2} ; \sum_{i=2}^{n} \frac{(V_t^i + \Delta OI_t^i)}{2}] ; 0)$$

Holmes and Rougier (2005) state that since r_t is the quantity of contracts rolled, it does not provide any new market information, hence it cannot be used as a proxy for "information arrival". This implies that $\sum r_t$ can be considered as a hedged quantity, given that only hedgers keep their positions long enough to roll it. Also, by considering that it is rolling, they omit the case where speculators operate the same day on the 2 (or n) contracts (sale with exit of OI in the nearest contract and purchase with entry of OI in the Next (or others)). This way, their bound varies significantly and by omitting to verify that (E-S)>0, the number of rolled over contracts is overestimated.

For this reason, we suggest to rewrite r_t, the number of contracts rolled over as follows:

$$r_t = \alpha_t . (\sum_{i=1}^{n} r_i)$$

$\sum_{i=1}^{n} r_t$ is the total number of rolled contracts for the n sessions that form the lifetime of the contract, from the opening to the expiration day.

α_t that can be written as: $\alpha_t = \frac{r_t}{\sum_{i=1}^{n} r_t}$ is the proportion of contracts rolled on day t, with respect to the total amount of contracts rolled, and $\sum_{i=1}^{n} \alpha_t = 1$.

Moreover, the hedging open interest for a specific period cannot exceed the lowest open interest of that period. Similarly, the hedging open interest over multiple maturities for a specific period cannot exceed the lowest sum of open interests of these contracts.

This sum becomes the new upper bound for the hedging rollovers that replaces $\sum_{i=1}^{n} r_i$, and we denote it OI^*.

Since the open interest is equal to sum of the number of hedging contracts OI^* and the number of speculative contracts (E-S), and since the latter cannot be negative, we add an additional restriction.

Whenever (E-S) is negative in the data, we lower the number of hedging contracts such that (E-S) becomes non negative and that the open interest stays unchanged. To do that, we simply subtract a variable Δ to OI^* when needed. This verification is not performed by Holmes and Rougier (2005), making their bound higher than ours. This is because when the number of speculative contracts (E-S) is negative, the hedged open interest exceeds the total open interest making it artificially high. In other words, Holmes and Rougier (2005) bound overestimates the rollover amount at least by the excess negative contracts of (E-S).

The model is presented considering that the rollovers are performed from the near contract to the second next. However, we can also consider that the rollover can happen from the near to all the other next contracts (up until the 12^{th} next contract).

We apply our model to the futures contract EBM, traded on Euronext. For this purpose, we use the daily volume and open interest data available on Euronext's website that we collect and synthesize. We carry out our analysis for different contracts: from the November 2011 maturity contract to the September 2019 maturity contract, while excluding the August 2012 maturity that comprises outlier values. We are then left with 33 contracts. Since the traded volume is low at the beginning of the contract's life, and since different contracts have different life lengths, we start the analysis 300 trading sessions before expiration for all contracts, to be able to aggregate our results.

Results

We consider the 33 contracts, and for each contract we compute the daily sum of the near and the first next volumes, but also the daily sum of the near volume and all other next contracts volumes, up to 12 maturities, when available. The same total values are computed for the open interest. We then proceed in two steps:

We compute the parameters of our model, separately for the near and next contract in the first place, and then for the near and the 12 other next contracts. These parameters are: r_t the number of contracts rolled, X the number of hedging contracts per session and (E-S) the number of speculative contracts.

These parameters allow us to obtain the variables OI^{*1}, $OI^{*} - \Delta$ and $\sum r_t$, and to compute $\frac{OI^{*1}}{\Sigma\, r_t}$.

$OI^{*} - \Delta$ is the open interest devoted to hedging with our approach after correcting for the non-negative speculative contracts, $\sum r_t$ is the open interest devoted to hedging according to Holmes and Rougier (2005) model, $OI^{*1}$is the open interest hedged on the near contract, hence $\frac{OI^{*1}}{\Sigma\, r_t}$ allows us to compare our measure to the one of Holmes and Rougier (2005).

For each contract, we start the analysis 20 sessions before expiration, because as stated in our assumptions, we suspect rollover to start few sessions before expiration. But also in order to have the same period of analysis for all contracts.

First, we look at the evolution of α, the percentage of contracts rolled by session (Figure 1) for the last 20 sessions. We notice that hedgers leave the near contracts before the last week (the last 5 days) in the case where they roll to the first next but also in the case where they roll to all the other next contacts.

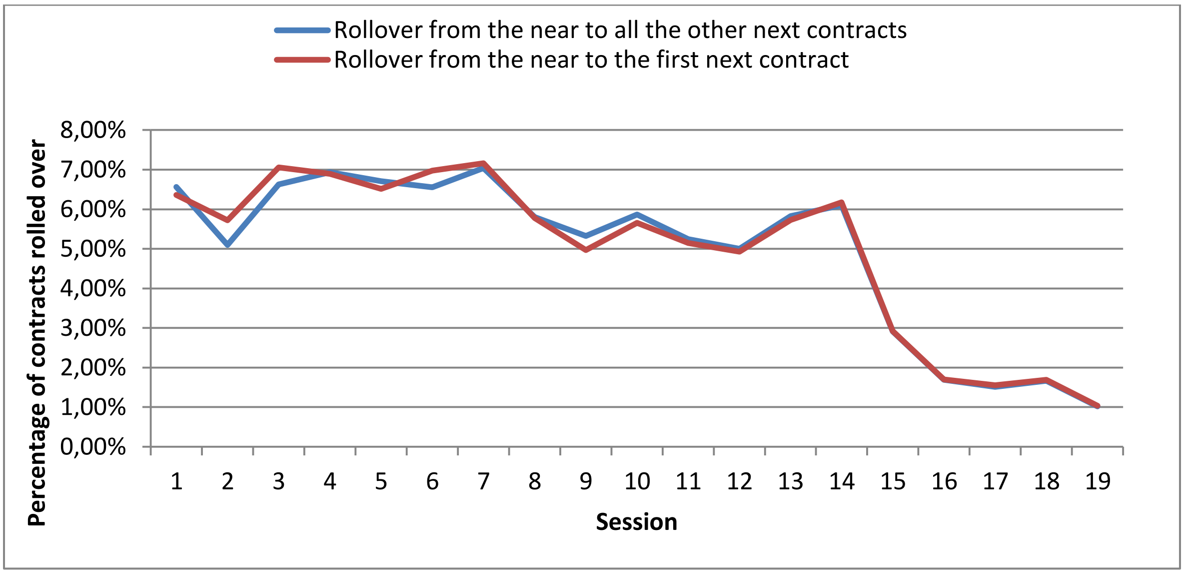

Figure 1 : Percentage of contracts rolled over by session on average

Second, by looking at the evolution of the number of hedging contract $OI - \Delta$ for the last sessions (Figure 2), we notice an increase with time, as the hedged open interest in the near and all other contracts almost doubled (it is multiplied by 1.67) from the January 2012 maturity contract to the September 2019 maturity contract. We also note that hedgers do not necessarily stay in the near and first next contract: on average, the number of contracts for hedging is 124 631 for the near and first next contracts, and 247 129 for the near and all other next contracts. It reaches important levels: 230 730 for the near and first next contracts, and 407 940 for the near and all other next contracts (Table 1 and Table 2). Graphically, we see that the hedging contracts still open (OI^{*1}) are roughly the same for the near contract, whether the rollover takes place in the first next or all the other next contracts, except for some contracts where the open interest is higher for rollovers in all the other next contracts.

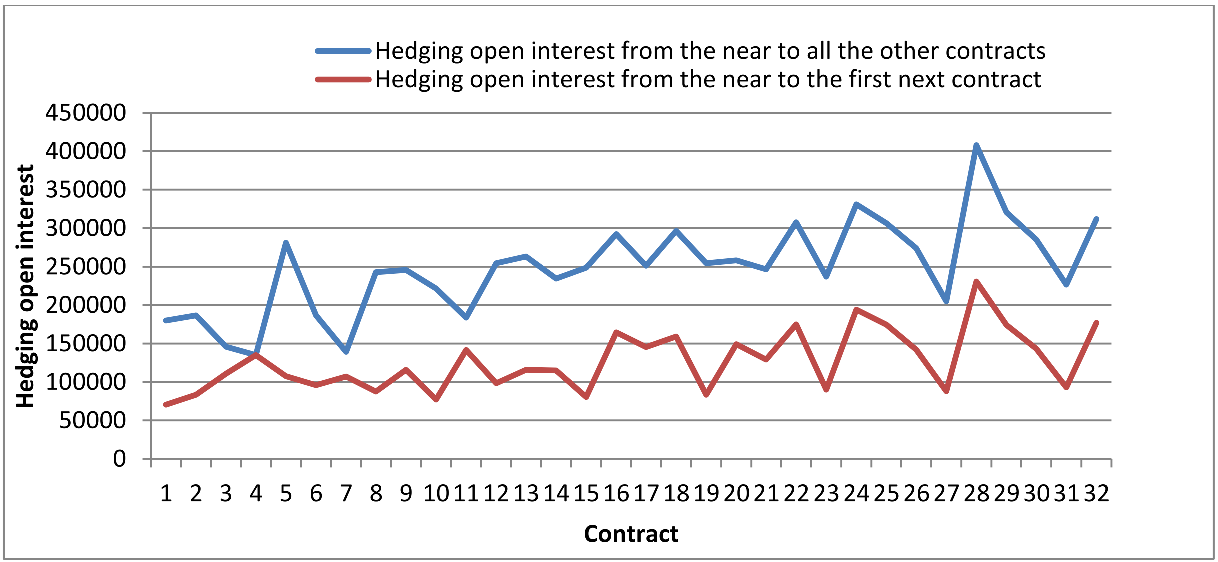

Figure 2 : Open interest dedicated to hedging

Figure 3 illustrates the percentage by which we decrease Holmes and Rougier (2005) bound ($\Sigma\, r_t$), that counts the hedging open interest in the near contract, devoted to hedging. We compare it to OI^{*1} obtain with our model, and that also represents the hedging open interest in the near contract. Hence Figure 3 is the plot of 1- $\frac{OI^{*1}}{\Sigma\, r_t}$. On average, the bound is decreased from 100% to 29% for the near and first next contract, and from 100% to 31% for the near and all other next contracts (Table 1 and Table 2). These cases occur when the amount of speculative contracts is negative.

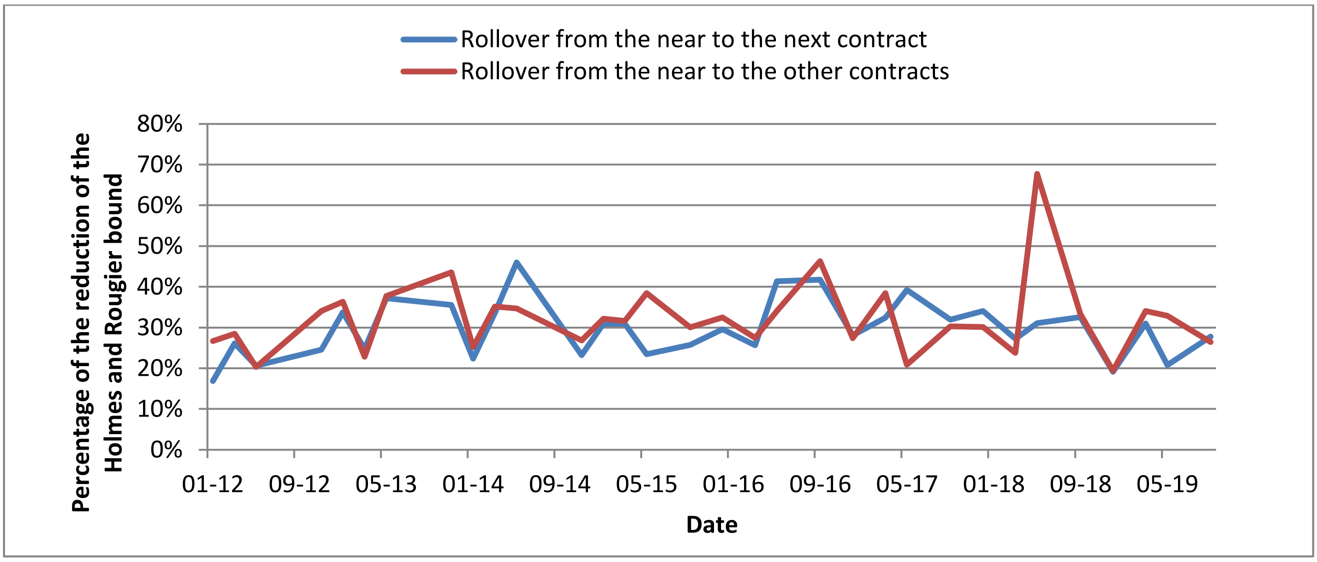

Figure 3 : Comparison with the Holmes and Rougier model

	Hedging OI	Hedging OI in the near contract	Holmes and Rougier bound	Reduction of the Holmes and Rougier bound
Min	59 927	34 477	41 451	-0.068
1st Qu.	90 014	62 360	89 320	0.245
Median	115 674	74 841	110 565	0.295
Mean	124 631	77 885	110 655	0.285
3rd Qu.	149 169	90 596	134 030	0.335
Max.	230 730	142 402	180 808	0.459

Table 1 : Descriptive statistics for the rollovers between the near and the first next

	Hedging OI	Hedging OI in the near contract	Holmes and Rougier bound	Reduction of the Holmes and Rougier bound
Min	134 924	30 782	41 961	-0.063
1st Qu.	205 034	55 156	85 590	0.266
Median	248 483	73 681	115 762	0.316
Mean	247 129	76 716	112 499	0.309
3rd Qu.	285 029	88 298	130 762	0.346
Max.	407 940	139 631	189 494	0.676

Table 2: Descriptive statistics for the rollovers between the near and the other next contracts

1. Discussion

For this study, we analyze the 20 last sessions by studying the rollover behavior of hedgers. First, we extend Holmes and Rougier (2005) model that sets an upper bound to the number of contracts rolled over. For that we adjust the open interest when the condition that (E-S) (the difference of opened and closed contracts) should be non-negative is not verified. We then apply this model to EBM futures contracts, and we find that over the years, the number of contracts for hedging increases. Also, we observe that hedgers rollover their positions before the last week of trading (before the expiration of the contract). In addition, regarding the performance of our model, we find that on average, the upper bound for the number of hedged contracts is reduced from 100% (Holmes and Rougier (2005) measure), to 30%.

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