DISCUSSION PAPER

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The impact of long-only index funds on price discovery and market performance in agricultural futures markets

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ABSTRACT

For a considerable time, long-only index funds have been suspected of being responsible for price increases on agricultural futures markets, particularly those for grain. Utilizing partial equilibrium concepts, we analyze the market impacts of long-only index funds. Our analysis reveals that long-only index funds stabilize the market. The market entry of long-only index funds lowers risk premiums, so farmers can hedge at lower costs. This gives incentives for storage and dampens seasonal price fluctuations on spot markets, which is also in favor of consumers. However, the entry of long-only index funds reduces the profitability of speculation. Thus, there is no need for political action in this particular field.

JEL: G1, G13, Q02, Q14

Keywords: Agricultural futures markets, price discovery, long-only index funds.

ZUSAMMENFASSUNG

DER EINFLUSS VON LONG-ONLY-INDEXFONDS AUF DIE PREISFINDUNG UND DAS MARKTERGEBNIS AN LANDWIRTSCHAFTLICHEN WARENTERMINMÄRKTEN

Long-only-Indexfonds stehen seit geraumer Zeit unter Verdacht, für die Preisanstiege an landwirtschaftlichen Warenterminmärkten, insbesondere für Getreide, verantwortlich zu sein. Anhand von partiellen Gleichgewichtskonzepten untersuchen wir die langfristige Marktwirkung von Long-only-Indexfonds. Unsere Analyse zeigt, dass Long-only-Indexfonds den Markt stabilisieren. Der Markteintritt von Long-only-Indexfonds verringert die Risikoprämie, so dass Landwirte sich zu geringeren Kosten absichern können. Dieses fördert die Lagerhaltung und schwächt so saisonale Preisschwankungen am Kassamarkt ab, was auch im Interesse der Konsumenten ist. Allerdings wird durch den Markteintritt von Long-only-Indexfonds die Rentabilität des Spekulierens verringert. Von daher gibt es keine Notwendigkeit für politische Maßnahmen in diesem speziellen Bereich.

JEL: G1, G13, Q02, Q14

Schlüsselwörter: Landwirtschaftliche Warenterminmärkte, Preisbildung, Long-only-Indexfonds.

Introduction

Long-only index funds[1] have long been suspected of driving price increases in agricultural futures markets, notably prices of grain. This suspicion was strengthened by the observation that shortly before the marketing year 2007/8, long-only index funds appeared as new and powerful players in agricultural futures markets. These funds' fixed assets expanded, from less than 50 bn USD in 2004 to about 400 bn USD in 2011 (Irwin & Sanders, 2011). However, Irwin and Sanders also show that the market share of long-only index funds had already more than doubled in all agricultural futures markets from 2004 thru 2007, i.e. before the first extreme price peaks in 2007/8.

Critics surmised that long-only index funds contributed to artificial excess demands in agricultural futures markets, as such funds exclusively take long positions. It is feared that such positioning decouples market prices from fundamental data and permanently disturbs price discovery in agricultural futures and spot markets (Masters, 2009). The vehemence of the debate about long-only index funds is also due to the financial and economic crisis of 2009. Several critics advocate the view that the same profit seeking that entices financial investors to invest into high-risk financial products is also behind investments by institutional investors into long-only index funds; while investors tacitly accept distortions in agricultural markets.

Such reproaches overlook that financial investors and institutional investors pursue markedly different investment goals. Financial investors adopt active investment strategies in search of short-term profit, while institutional investors wage a long-term strategy. Institutional investors typically are pension and retirement funds (Sanders et al., 2010) that also seek to maximize their fund returns, although with the restriction of not exceeding a defined fund risk. The main priority for pension and retirement funds is collateralized liquidity, as pension and retirement payments are continually due. Long-only index funds are bespoke for their needs. Such funds not only promise similarly high returns as traditional investments (Erb & Harvey, 2006; Gorton & Rouwenhorst, 2006), but also guarantee a constant risk (Willenbrock, 2011). If, in addition, one bears in mind that the performance of agricultural commodities has a low correlation with that of traditional investments, it becomes evident why long-only index funds are particularly suitable for portfolios of pension and retirement funds. Long-only index funds help further reduce fund risk, while fund returns do not alter.

Most of the literature provides findings that do not support an impact of long-only index funds on agricultural futures markets (e.g. Irwin & Sanders, 2012). Only a few studies find a role of long-only index funds for price peaks that occurred in 2007/8 (e.g. Gilbert, 2009).[2]

Recent theoretical findings suggest that long-only index funds – due to the underlying investment strategy – are not likely to "push up" prices. Under a passive investment strategy, long-only index funds are obliged to sell commodities contracts partially that have (relatively) gained value, and partially buy commodities contracts that (relatively) lost value. Therefore, such funds do not behave pro-cyclically, and thus have a price-stabilizing effect (Prehn et al., 2013). Still unclear is the potential impact of increased fixed assets of long-only index funds. Increasing fixed assets raise the demand of agricultural futures market contracts. It

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[1] The following statements relate only to long-only index funds. The statements do not refer to long-short index funds or "subindex/single commodity" index funds, which have different trading strategies and/or investment goals.

[2] For a comprehensive literature review, see Irwin & Sanders (2011) and Will et al. (2012).

can be anticipated that this will give rise to impacts on price discovery and the market equilibrium in agricultural futures markets and corresponding spot markets.

In view of the above discussion, the following work focuses on the theoretical impact analysis of intensified business activities of long-only index funds on price discovery and market performance in agricultural futures markets. Partial equilibrium concepts based on CARTER (2012) will be used to analyze the impact of increased fixed assets of long-only index funds. Moreover, we look at interactions between long-only index funds and speculators, such as hedge funds.[3,4]

Our analytical findings support that long-only index funds do not push prices, but compete directly with "classical" speculators (e.g. hedge funds) to provide collateral to farmers. This particularly enhances the hedging function of agricultural futures markets, as farmers can hedge at lower cost in the agricultural futures market. Also, an unlimited commitment of long-only index funds in agricultural futures markets is unlikely. The profitability of long-only index funds is negatively correlated with the number of long-only index funds placed in the agricultural futures market. Long-only index funds are thereby self-limiting. Hence, position limits for long-only index funds are not effective to reducing or preventing price peaks. Finally, long-only index funds have positive feedback effects on spot markets. Farmers can hedge at lower cost, by which incentives for storage increase and seasonal fluctuations of supply and prices are dampened.

The paper is structured as follows. We start with a general discussion of price discovery and market performance in agricultural futures and spot markets. Following, the analysis is extended by examining the role of long-only index funds for the markets. Finally, we summarize our findings and draw some conclusions.

PRICE DISCOVERY IN AGRICULTURAL FUTURES MARKETS

"Futures trading has a long history, both in the U. S. and around the world. Futures trading on a formal futures exchange in the U. S. originated with the formation of the Chicago Board of Trade (CBoT) in the middle of the Nineteenth Century. Grain dealers in Illinois were having trouble financing their grain inventories. The risk of grain prices falling after harvest made lenders reluctant to extend grain dealers credit to purchase grain for subsequent sale in Chicago. To reduce their risk exposure, grain dealers began selling "To Arrive" contracts, which specified the future date (usually the month) a specified quantity of grain would be delivered to a particular location at a price identified in the contract. Fixing the price in advance of delivery reduced the grain dealer's risk exposure and made it easier to obtain credit to finance grain purchases from farmers. The "To Arrive" contracts were a forerunner of the futures contracts traded today. Although dealers found it advantageous to trade what essentially were forward cash contracts in various commodities, they soon found these forward cash contract markets inadequate and formed futures exchanges" (PECK, 1985).

Futures exchanges now exist all over the world. As their name implies, on futures exchange futures contracts are traded. "A futures contract is a binding agreement between a seller and a buyer to make (seller) and to take (buyer) delivery of the underlying commodity

[3] The following comments are based on the assumption of rational behavior by market players and full market transparency. Full market transparency, however, does not imply that there is information about future events in hand, such as droughts, etc. Such types of risks continue to exist.

[4] This paper does not analyze whether there is speculation in agricultural futures markets or not. KNITTEL & PINDYCK (2013) explain how speculative behavior in agricultural futures markets can be reviewed.

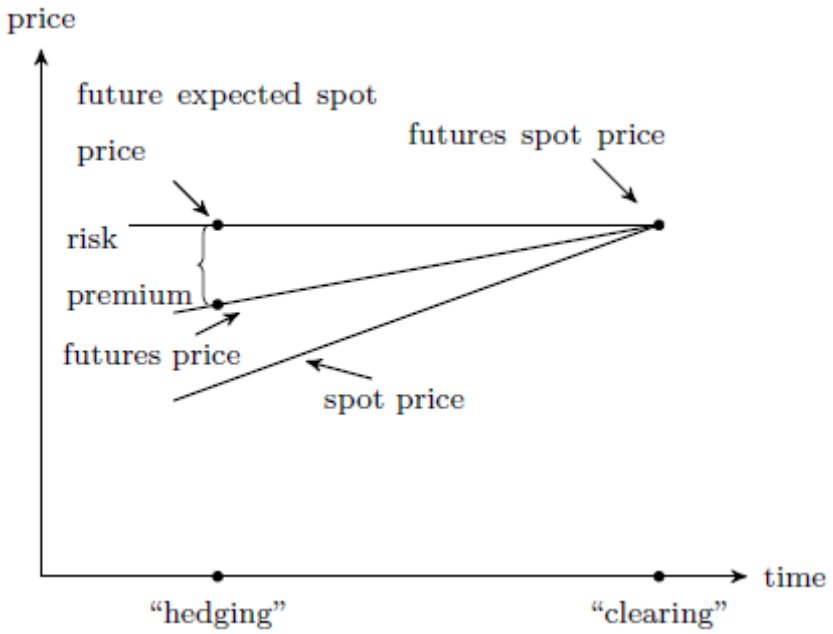
at a specified future date with agreed upon payment terms. Most futures contracts do not actually result in delivery of the underlying commodity. Instead, most traders find it advantageous to clear their futures market obligation by selling a contract (in the case of a contract that was purchased initially) or by buying it back (in the case of a contract that was sold initially). The trader then completes the actual cash transaction in his or her local cash market" (Penn State Cooperative Extension). Margin calls guarantee fulfillment of contracts.

Futures contracts can be used to hedge price risks of expected future cash market transactions. If a farmer expects to sell wheat after the harvest, he can sell a futures contract (short contract) to lock in the price that is determined for the futures contract. In case the futures contract is fulfilled by delivery, the price risk is zero. If the contract is cleared before delivery, the basis (price) risk remains.[5]

A trade on an agricultural futures market requires a match between buyers and sellers' bids. If a farmer wants to (short) hedge his expected harvest, another participant on the agricultural futures market needs to buy (long) the contract.

The pivotal aspect to ensure the functioning of an agricultural futures market is that a short contract always requires concluding a long contract and vice versa. What was observed in the past was that frequently, more farmers[6] desired to hedge their selling prices in the agricultural futures market than commercial traders desired to hedge their purchase prices. This typically creates an excess supply of short contracts (CARTER, 2012). Speculators can fill this gap and take over the price risk. Speculators should receive a risk premium in return (KEYNES, 1930). The risk premium concept is outlined in Figure 1.

Figure 1: Risk premium concept

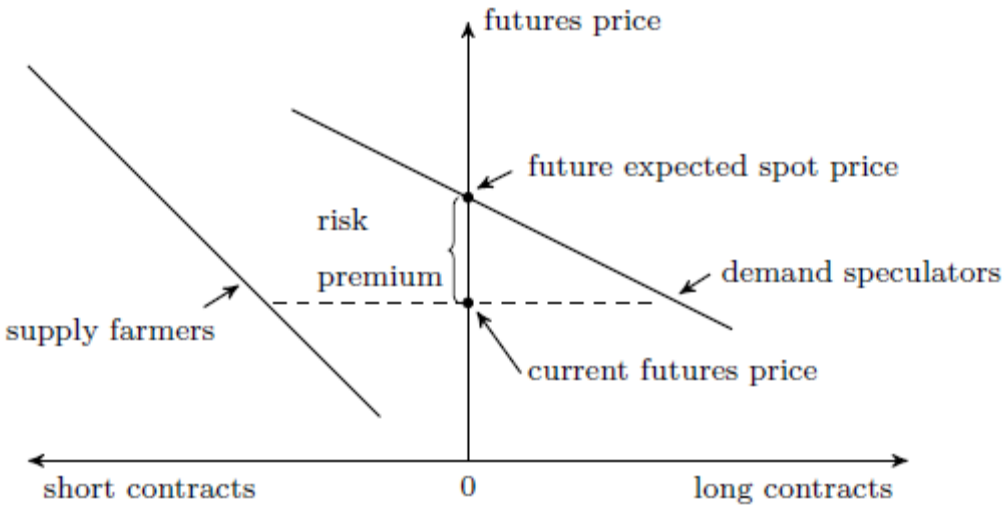


[5] Agricultural futures markets, in addition to the described hedging function, also fulfill an information function: the commodities futures price typically represents the current value of all future expectations.

[6] In principle, most farmers do not hedge their price risk directly. However, usually for each forward contract between a farmer and grain trader the grain trade sells a short contract to hedge the price risk associated with the forward contract. So, farmers indirectly sell short contracts.

Figure 1 shows the price development on the agricultural futures market against the spot market. The futures and the spot price converge at the time of maturity of the futures contract (HULL, 2005).[7] The farmer who hedges the price risk accepts to grant a risk premium to the (long position) speculator. Thus, the futures price the farmer locks in is equal to the expected future spot price at maturity minus the risk premium. The market in Figure 1 shows "normal backwardation" or an "inverse market". The opposite market situation is called a "normal market" or "contango". A normal market describes a market situation where the futures price converges from a higher price level towards the expected future spot price. In a "contango" market, speculators would not take over the hedgers' price risk. Figure 2 illustrates how a price in the agricultural futures market is discovered prior to market entry of long-only index funds.

Figure 2: Price discovery in the "traditional" agricultural futures market



Source: Adopted from CARTER, 2012.

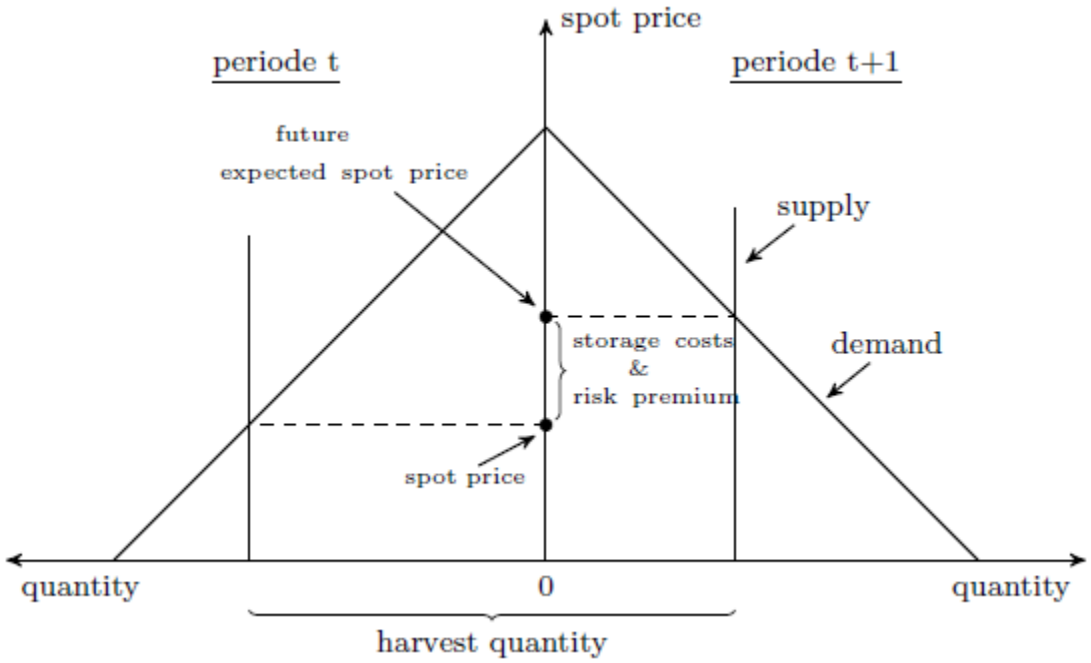
Figure 2 shows supply [8] and demand of futures contracts. Farmers generally take a short position. For higher futures prices, the supply of contracts increases. The market position taken by speculators depends on the ration between the futures price and the expected future spot price at maturity. If futures prices are higher than the expected future spot price, speculators take short positions. If futures prices are below the expected future spot price at maturity, speculators take long positions. The demand for contracts decreases for higher levels of the futures price. The market equilibrium (dashed line) determines the futures price.

The price discovery on the agricultural futures market in Figure 2 presumes an expected future spot price. The simple two-period model used in Figure 3 shows how the (expected future) spot price is discovered on the spot market.

[7] This was not always the case in the past. In some instances, spot and futures prices do not converge, although this would have been expected theoretically. GARCIA et al. (2012) demonstrate that this problem cannot be attributed to speculation, but rather to misspecification in futures contracts.

[8] A net concept is employed in this context: the offer of short contracts is already netted out with the demand for long contracts by commercial traders.

Figure 3: Price discovery in the spot market



First, the real demand in both periods is represented in a price-quantity diagram. An identical demand in both periods is assumed. The harvest quantity is known (or anticipated) in advance, and is fully distributed across the two periods. Then, the relevant equilibrium price that determines the exact distribution of the harvest across both periods corresponds to the spot price in t and the expected future spot price in t+1. The spot price and the expected future spot price differ only by the incremental costs of storage and the risk premium in the agricultural futures market.

As can be seen from the last two figures, the futures price and the expected future spot price are mutually dependent. There is a firm interrelation between the two prices. The exact character of this relation is determined by fundamental data, i.e. demand and harvest quantity, but also by the number of market participants in the agricultural futures market (gradient of demand and supply curves). It also becomes apparent that price discovery in both the spot market and the agricultural futures market is based on the same fundamental data.

MARKET ENTRY OF LONG-ONLY INDEX FUNDS

Figures 1 through 3 illustrate the competitive market situation in agricultural futures markets prior to market entry of long-only index funds. Risk premiums were rather low and thus agricultural futures markets were not attractive to institutional investors (SANDERS & IRWIN, 2012).

This situation fundamentally changed with the beginning of the new millennium. Various papers (GORTON & ROUWENHORST, 2006; ERB & HARVEY, 2006) demonstrate that – by bundling several agricultural commodities and keeping their percentage value over time, i.e. tracking an index – in addition to risk premiums an additional premium can be achieved, i.e. the so-called diversification return. This makes agricultural commodities attractive for institutional investors. Depending on the combination of agricultural commodities, total returns could increase up to 10 percent (IRWIN & SANDERS, 2011). This prompted intensified engagement of institutional investors in agricultural futures markets.

Institutional investors either buy directly into agricultural futures markets or indirectly through long-only index funds. Long-only index funds are investment funds that commit to tracking a certain index. Long-only index funds always take long positions in agricultural futures markets. However, they do not pursue this investment strategy by any means, as widely assumed (e.g. MASTERS, 2009), in order to push excess demand and increase prices. An index can only be tracked if long positions are taken on respective agricultural futures markets, and, secondly, the percentage values of individual commodities in the index are kept constant. Accordingly, commodities contracts that gained in relative prices are partially sold to keep their relative value constant. Commodities contracts that lost in relative prices are bought to keep their constant relative value.[9] The benefit of tracking an index is that continually adapting commodity percentages yields diversification returns at a constant level of risk (WILLENBROCK, 2011). Long-only index funds have been particularly introduced to serve as part of institutional investors' portfolios.

As a result investments into long-only index funds and related certificates significantly increased. The volume of fixed assets rose from ca. 50 bn USD in 2004 to ca. 400 bn USD in 2011. Depending on the agricultural futures market, the market shares of long-only index funds increased from about 10 percent up to 40 percent (IRWIN & SANDERS, 2011). Long-only index funds have become an important group on many agricultural futures markets.

The market entry of long-only index funds is also disputed to play a role in the price peak of 2007/8. Though the increasing interest of index funds started way before the price peak, there was a high level of (seemingly) positive correlation between prices and index fund volume.[10] Quotations of long-only index funds also benefited from those price increases (long-only index funds track market trends, hence, also upward market trends), which is why long-only index funds increasingly drew criticism. Such criticism particularly related to the long position these funds take. It was suspected that long-only index funds would create an excess demand and drive up futures prices. If this would be true, long-only index funds would not only reinforce short-term price trends, but also distort price discovery in the agricultural futures market in the long term (MASTERS, 2009).

This argument can be tackled by considering the investment strategy of long-only index funds. It is true that long-only index funds, as a rule, only take long positions in agricultural futures markets. But they oblige to partially sell commodities contracts that gain in relative value in order to keep their percentage values constant. Consequently, it is not possible for long-only index funds to reinforce a price trend. Quite the contrary: Long-only index funds counteract price trends by stabilizing price levels and reducing volatility (PREHN et al., 2013).[11]

What could be objected to regarding this argumentation is that it is merely a snapshot that leaves the continual increase of fixed assets in long-only index funds unconsidered. Long-only index funds are obliged under their passive investment strategy to sell commodities contracts when prices rise in order to keep percentage values constant, but due to increased

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[9] The counterpart of long-only index funds would be short-only index funds. Such funds, in contrast to long-only index funds, do not track the market trend but the inverse market trend. The type of construction is the mirror image of long-only index funds.

[10] Prices increased mainly in grain markets, but not in animal product markets. The latter gives rise to doubts about whether long-only index funds are responsible for price increases in agricultural futures markets, as their engagement also includes agricultural futures markets for animal products (IRWIN et al., 2009).

[11] This statement requires that funds' fixed assets are constant. The market impact of changing funds' fixed assets is discussed below.

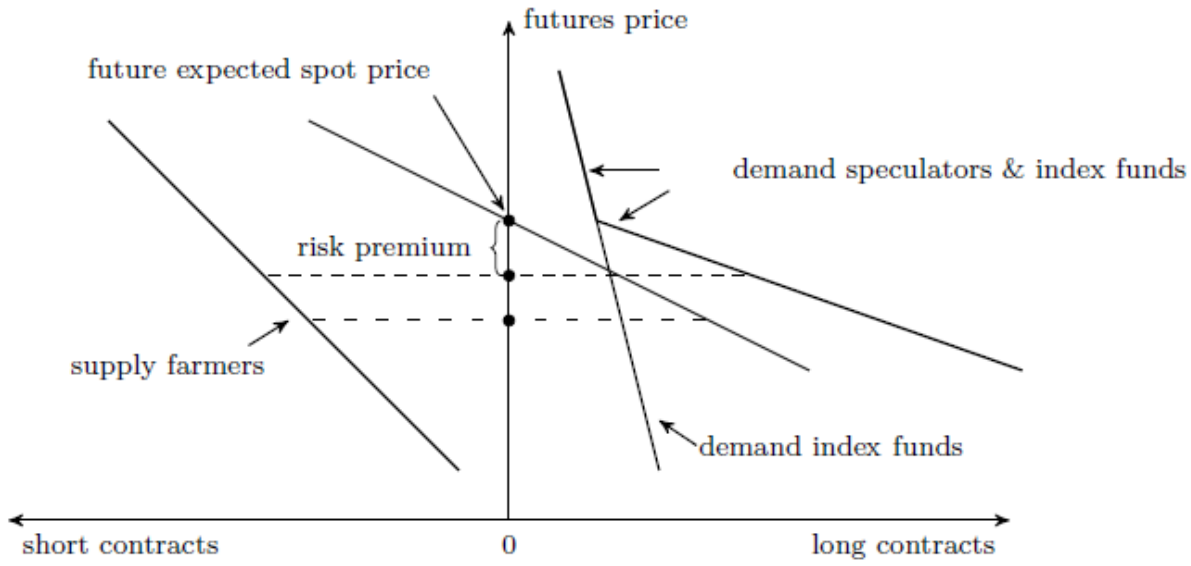
fixed assets, they have to simultaneously buy in commodities contracts. Seen in this light, it could be assumed that this second effect, which we refer to as the "fixed assets effect", superimposes the first price effect and thus triggers price increases.

This objection, however, does not apply because it neglects the fact that long-only index funds also have to identify a counter-position in the agricultural futures market in order to conclude a long contract. Farmers and large-scale agricultural trade companies offer themselves as trading partners. Yet farmers typically hedge only their own harvest quantity in the agricultural futures market. Long-only index funds are thus forced to find other trading partners besides farmers and commercial traders. In other words, long-only index funds also always need speculators, such as hedge funds, to take short positions.

If price discovery in agricultural futures markets works speculators will take short positions. They can expect the market mechanism to bring down futures prices to fundamentals even if index fund trading wrapped them up for a short time. Taking a short position when futures prices exceed fundamentals promises a profit. However, this is not criticized; what is criticized is that long-only index funds would push up futures prices and decouple them from fundamentals for a long time. If this would be the case, then a rational speculator would hardly be prepared to take a short position in the agricultural futures market. Taking a short position in this market situation and betting on falling futures prices would entail a loss in a foreseeable manner. Long-only index funds would hardly find enough trading partners to invest all fixed assets. Hence, long-only index funds must influence price discovery in the agricultural futures market in a different manner then feared by critics.

Figure 4 describe the entry of long-only index funds. If long-only index funds have to partially sell commodities contracts that have gained in relative price and buy commodities contracts that have lost in relative price, then this implies a drop in the demand of futures contracts. This results in the above-described "price effect" of long-only index funds. Entering the respective demand into Figure 2 results in the following market situation, see Figure 4.

Figure 4: Long-term market effect of long-only index funds in the agricultural futures market

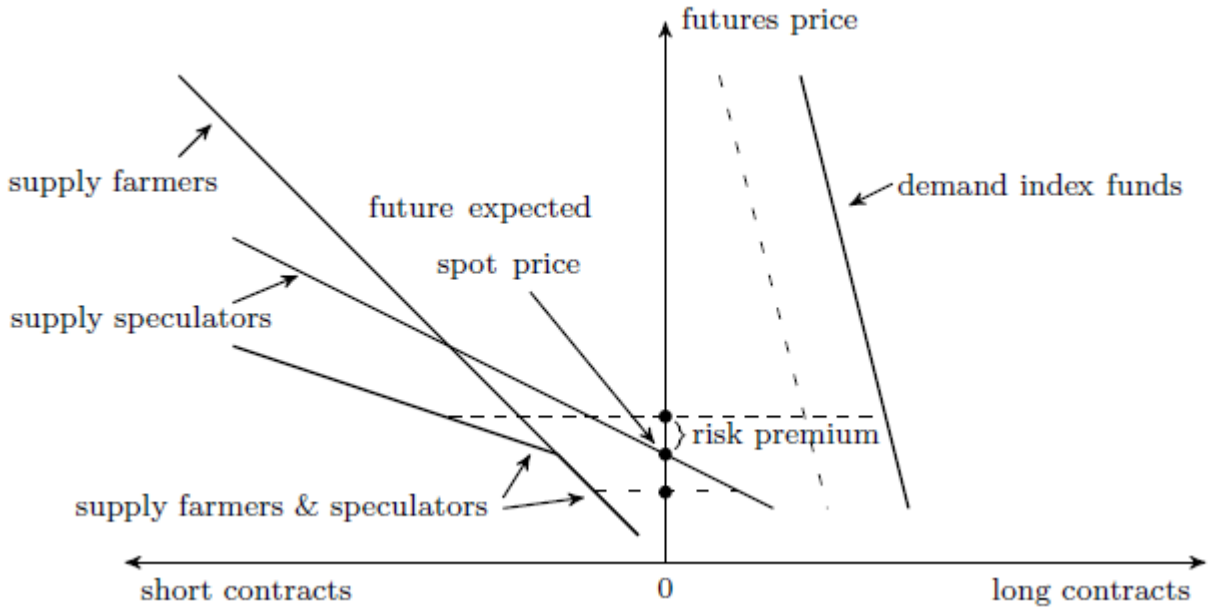


As can be seen in Figure 4, the result is a cumulated demand for futures contracts. Both long-only index funds and speculators are buying contracts up to the expected future spot price. Should the futures price rise above the expected future spot price, only long-only index funds will buy contracts. Speculators, on the other hand, change their position and offer short contracts. The new equilibrium price in the agricultural futures market is above the previous equilibrium (upward shift of the dashed line). This is accompanied by a lower risk premium and a smaller market share of speculators.[12] The lower risk premium brought about by the market entry of long-only index funds provides benefits, notably for farmers, i.e. hedging at lower costs.

What should be noted is that the analysis abstracts from market inefficiencies. It is implicitly assumed that the difference between the futures price and the expected future spot price is only determined by the risk premium. In reality, however, market inefficiencies may also contribute to futures prices and the expected future spot prices and their deviations (FRANK & GARCIA, 2009). The market entry of long-only index funds into an inverse market will not only lower the risk premium, but also enhance market efficiency because futures prices converge to the expected future spot prices.

It is especially interesting to see how the market entry of further long-only index funds will influence price discovery in the agricultural futures market. The comparative statistical analysis of generated effects is depicted in Figure 5.

Figure 5: Market effect of market entries of further long-only index funds



For illustrative reasons, it is assumed that the expected future spot price is lower compared to Figure 4. Accordingly, net demand of speculators moves downward.[13] Figure 5 shows that the market entry of further long-only index funds and an increase of fixed assets in existing long-only index funds (shift of demand curve for long-only index funds to the right) may cause the equilibrium price not only to converge to the expected future spot price, but

[12] Speculators' market shares have to decrease as futures price increases, which also means a lower return and thus reduces profitability for speculators. Hence, speculators with the highest opportunity costs will leave the agricultural futures market.

[13] In order to align with the quotation, Figure 5 depicts negative net demand as positive net supply.

may even exceed it. In such a market situation, farmers and speculators would take short positions in the agricultural futures market. Speculators would anticipate falling futures prices and the risk premium would switch from positive to negative.

From the analytical findings above three conclusions can be drawn: First, an excessive market entry of long-only index funds reduces fund profitability. The market has an inherent mechanism to prevent price to deviate from fundamental values. Investors withdraw fixed assets in response to dropping profitability. Second, after the introduction long-only index funds tend to stabilize futures prices. Third, hedge funds or similar speculators will take short positions and bet on falling market prices. This also tends to result in falling futures prices.

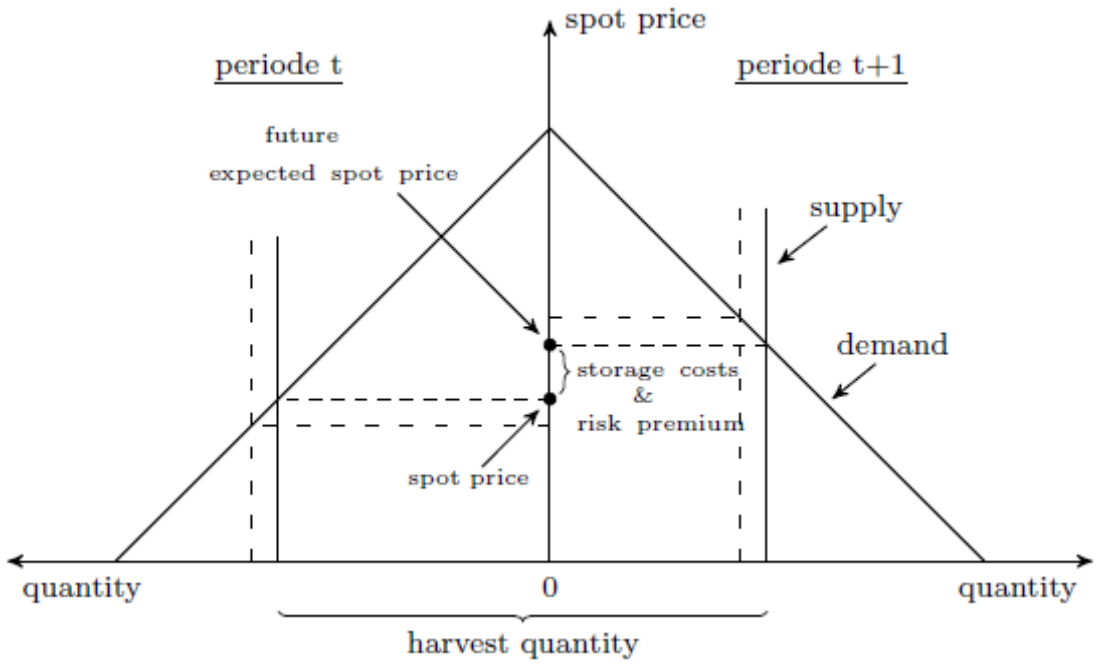
As pointed out by other authors, the difference between futures prices and expected future spot prices cannot be fully interpreted as risk premium, but may also be caused by market inefficiencies (FRANK & GARCIA, 2009).[14] In a normal ("contango") market the market entry of long-only index funds, in the short term, may increase market inefficiency, that is, the difference between the futures price and the expected future spot price. In the long term, however, it can be anticipated that long-only index funds will counteract enhanced market inefficiency. In a normal market, long-only index funds achieve lower returns or even losses.[15] Hence, it can be expected that at least several long-only index funds will retire, which will decrease market inefficiency. Long-only index funds improve market efficiency not only in an inverse market but also in a normal market in the long run.

The market entry of long-only index funds not only has an impact on price discovery in the agricultural futures market, but also on the cash market due to arbitrage. Futures trades by long-only index funds lower the risk premium and thus storage costs. Lower storage costs, however, imply relatively lower prices for stored commodities. The consequence in the spot market is that the current spot price and the expected future spot price converge; the former increases, while the latter drops. This means an even more balanced distribution over time for the distribution of harvest quantity. The relevant market situation is shown in Figure 6.

[14] Market efficiency requires that futures prices equal expected future spot prices plus or minus a risk premium, see MCKENZIE & HOLT (2002).

[15] It is conceivable despite a positive diversification return that individual risk premiums become so negative that total return also becomes negative.

Figure 6: Long-term market effect of long-only index funds in the spot market



N.B.: The initial situation is represented by weak dashed lines.

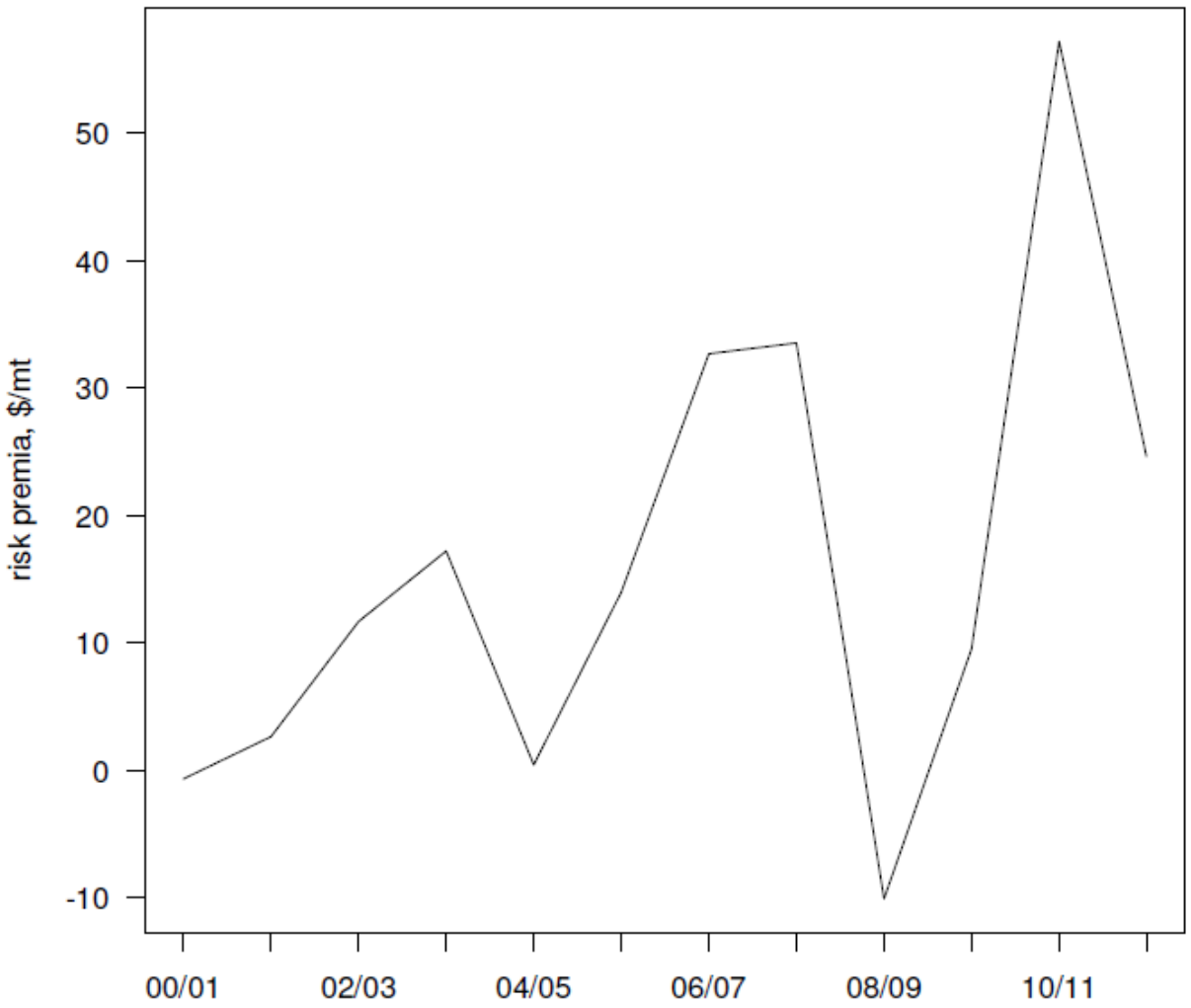
The entry of long-only index funds on agricultural futures markets has real economic consequences: Seasonal fluctuations in supply and price are dampened in the spot market. The market entry of long-only index funds is thus not only in the interest of farmers but also consumers.

When analyzing the development of average annual risk premiums in the corn market (free on board)[16][17] (see Figure 7) and the average number of relevant contracts held per marketing year and market participant (see Table 1), a further advantage becomes apparent, which comes with the market entry of long-only index funds. That is, long-only index funds have boosted liquidity in the agricultural futures market. The increase in risk premiums indicates that such an increase in liquidity was actually necessary.

[16] See Annex for calculation of risk premiums.

[17] Risk premium is not corrected by basis. Depending on the delivery point, the basis may be positive or negative. It should be positive for 'free on board', i.e. the 'true' risk premium should be lower than calculated here.

Figure 7: Development of average, annual risk premiums for corn (free on board)



The past twelve marketing years from 2000/01 thru 2011/12 are also characterized by changes in market volumes of other market participants, notably farmers and commercial traders (see Table 1). A comparison between Table 1 and Figure 7 shows that the development of risk premiums in the corn market coincides with the development of the number of short contracts held by farmers and commercial traders (see Column 3, Table 1). There is a one-on-one relationship between these variables. An increase in the number of short contracts held by farmers and commercial traders brings up the risk premium, and vice versa (cf. Figure 8). This close relationship and the fact that the risk premium has risen indicate that farmers and commercial traders are increasingly hedging in the agricultural futures market. The rise of the risk premium also suggests that the market engagement of farmers and commercial traders has extended much more than that of long-only index funds (Column 4)[18] and hedge funds (Column 6). Thus, the hedging pressure has increased relatively higher than the speculative pressure; otherwise, one had observed a decrease in risk premium. Consequently, the

[18] There is a broad intersection between positions of swap dealers and long-only index funds. Still swap dealers cannot be equated with long-only index funds. Swap dealers may also cover positions of other market participants.

market entry of long-only index funds was by no means "excessive", as feared by several critics, but provided urgently required liquidity to the agricultural futures market.[19]

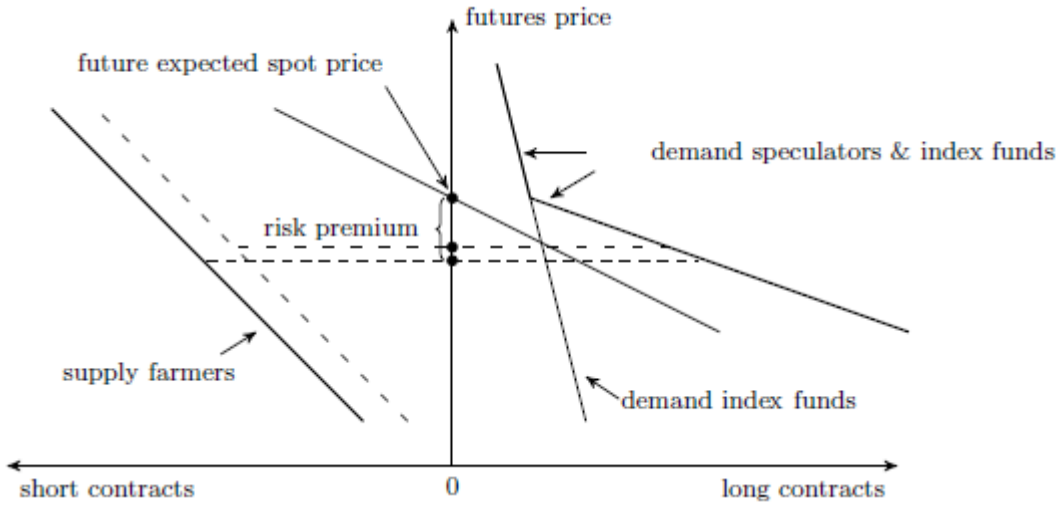
Table 1: Number of average contracts per fiscal year and market participants

	Farmers/Traders		Swap Dealer		Managed Money	
	Long	short	Long	Short	long	Short
2011/12	242235	616789	280309	41885	255652	69394
2010/11	231538	840314	334847	44996	357331	37635
2009/10	180122	492364	337969	8600	188000	103730
2008/09	210985	466740	236074	18822	144454	64176
2007/08	250219	772206	351331	4682	234087	59814
2006/07	258036	771477	363277	1912	210920	53485

Source: US Commodity Futures Trading Commission (CFTC), Disaggregated Futures Only Reports.

Figure 8 illustrates the effect of intensified engagement of farmers and commercial traders in the agricultural futures market. The supply curve shifts to the left, which makes the futures price drop and increases the risk premium.

Figure 8: Market effect of increased market engagement of farmers



N.B.: The initial situation is represented by weak dashed lines.

In summary, it can be stated that the market entry of long-only index funds has likely not distorted the price discovery in the agricultural futures market. Rather, the exact opposite occurred. First, long-only index funds, due to their specific investment strategy, stabilize the development of agricultural commodity prices. Second, such funds provide liquidity in agricultural futures markets, and thus enable farmers and commercial traders to hedge against price risks. Third, such funds spur competition between "Hedging providers" in agricultural futures markets. This particularly applies to competition on the demand side. This competition leads to lower risk premiums. Long-only index funds improve the functioning of agricultural futures markets, and following the functioning of respective spot markets. Farmers are enabled to hedge at lower costs and consumers may benefit from reduced seasonal price variations. Fourth, the increased market entry of long-only index funds is not

[19] A rise in risk premiums for corn is also identified by MAIN et al. (2013). The authors, however, do not further elaborate on this observation.

"excessive", as widely presumed. There is no indication of inherently negative risk premiums. Also fund returns are negatively correlated with the number of long-only index funds in the market (and their investment volume). Indeed, there is an inherent trend on agricultural futures markets to automatically self-correcting "excessive" demands or supplies.

SUMMARY AND CONCLUSION

Long-only index funds have long been the focus of public attention and criticism, and there are fears that their market entry led to artificial excess demands and thus contributed to the dramatic price increases in agricultural futures markets that have been observed since 2007/8. This prompted critics to raise the accusation that long-only index funds are "Hunger-Makers", and to suggest that long-only index funds caused the decoupling of market prices from fundamental data, and thus lastingly distorted price discovery both in agricultural futures markets and spot markets. Such critics derive the demand from the above to dramatically restrict the activity radius of long-only index funds, or to prohibit their engagement in agricultural futures markets through regulation (e.g. MASTERS, 2009; critical comment by PIES, 2012). Both this diagnosis and the demands are diametrically opposed to the finding of this paper.

(1) Long-only index funds pursue a passive long-term-oriented investment strategy (IRWIN & SANDERS, 2011; PREHN et al., 2013; WILLENBROCK, 2011). Such funds attempt to keep the fund risk constant by tracking the market index. To achieve this, commodities contracts that have gained in relative value are partially sold and commodities contracts that have lost in relative value are partially bought. Long-only index funds thus have a price-stabilizing effect; this particularly applies to largely constant fixed assets in such funds.

(2) What was previously unclear were the theoretical effects of increasing fixed assets from long-only index funds in agricultural futures markets, as observed over the past ten years. This is why the present paper focused on analyzing the impact of intensified market entries of long-only index funds on price formation in agricultural futures markets. Based on partial analytical concepts, it was verified that long-only index funds, besides the mentioned price-stabilizing effect, step up competitive pressure on speculators such as hedge funds, and thus fulfill an important competitive function. An intensified engagement of long-only index funds brings down risk premiums. The consequence is that farmers and commercial traders are able to hedge against their price risk in agricultural futures markets at more favorable terms.

(3) In addition to this price dimension, a volume dimension should also be considered: Long-only index funds boost liquidity in agricultural futures markets. Since such funds look for long contracts, they make it possible for more farmers and commercial traders to hedge in the agricultural futures market.

(4) Public sentiment that the activity level of long-only index funds is "excessive" is without any factual foundation. There are no reasons to fear an unlimited market entry because lower risk premiums reduce profitability and thus trigger a market-based self-correction mechanism. Hence, the market volume of long-only index funds is limited in the long-term in the agricultural futures market.

(5) Activities of long-only index funds in the agricultural futures market have positive effects on the spot market. Lower risk premiums motivate farmers to store a larger part of their harvests. Therefore, the seasonal supply and price fluctuations are dampened. Long-only index funds are thus also in the interest of consumers.

(6) These findings suggest that it is prudent for politics to abstain from measures widely demanded by the public that would be aimed at particularly strict regulation of long-only index funds. Notably stricter position limits are neither reasonable nor practicable. Indeed, they could be easily circumvented because long-only index funds could be floated in any number repeatedly. If such regulations had a limiting effect, they would be harmful because they impair the functionality of the agricultural futures market. This especially applies to a prohibition of long-only index funds, which have acquired a system-relevant position in the agricultural futures market. This is why a ban would decisively restrict liquidity in the agricultural futures market. It is important to warn against such an approach. For the time being, there is no economic necessity – beyond transparency-enhancing measures – to intervene on or to restrict the activities of long-only index funds in agricultural futures markets.

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ANNEX

RISK PREMIUM CALCULATION

Average annual risk premiums were calculated as follows (PIETZ, 2009): The mean value was first determined for the last ten monthly quotations of the nearest futures contracts. This mean value was subtracted from the relevant spot price. The result was twelve risk premiums for the respective marketing year. The mean value corresponds to the average, annual risk premium.

The futures prices for the CBOT corn contract ($/mt) were surveyed by HGCA Market Data Centre (http://data.hgca.com/archive/future.asp), and the spot prices ($/mt) for corn free on board by Quandl (http://www.quandl.com/). The spot price corresponds to FOB price ($/mt) for corn class U.S. No. 2 Yellow, free Gulf port.

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