

PRICE FORMATION IN COMMODITIES MARKETS: FINANCIALISATION AND BEYOND

REPORT OF AN ECMI/CEPS TASK FORCE

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EXECUTIVE SUMMARY

Commodities lie at the heart of the global economy. Access to and affordability of commodities are essential to the wellbeing, growth and competitiveness of our economies, which are highly dependent on commodity trade. Indeed, access to and affordability of essential food commodities, such as staple foods, are important elements for the stability of many societies. Markets are seen as a guarantee to ensure this access and affordability, with the preconditions that they are transparent and competitive, and that market failures are properly addressed.

Volatile prices and actual or perceived government interference have raised questions over the efficient functioning of commodities price formation and sparked fears that instability could wreak havoc on global markets. Against this background, this CEPS-ECMI Task Force Report takes a fresh look at the structure of commodities markets and their price formation mechanisms, including their interaction with the international financial system.

The report surveys the functioning and market organisation of eleven different (storable) commodities markets to ascertain drivers of price formation and highlight potential market failures. These markets are: crude oil, natural gas, iron ore, aluminium, copper, wheat, corn, soybean oil, sugar, cocoa and coffee. The commodities can be grouped into four categories: energy, raw materials and base metals, agricultural, and soft commodities.

➤ **A complex marketplace**

The way prices are formed in markets for physical commodities and futures contracts is the result of complex interactions between *idiosyncratic factors*, such as product characteristics (quality, storability or substitutability, etc.) and supply and demand factors (capital intensity, industry concentration, production facilities, average personal income level or technological developments, etc.), and *exogenous factors*, such as access to finance, public subsidies and interventions, and the weather.

Price formation relies on the efficient functioning of the market organisation for physical commodities and linked futures contracts. *Market microstructure developments*, such as market liberalisation, the development of futures market infrastructure and the expansion of international trade, have significantly altered the organisation of commodity markets over the last decade.

In general, supply factors (such as capital intensity) are more important drivers of price formation for *energy commodities and industrial metals*, while *agricultural and soft commodities* markets are more influenced by demand factors (such as income growth) and exogenous factors that can cause

supply shocks (such as weather events or government policies). Energy commodities and industrial metals rely on a more complex market organisation with easier access to finance due to their ability to hold value (for carry trades), which may enhance pro-cyclicality with regards to shocks within the financial system (opportunity costs).

➤ **Market fundamentals**

Volatile spot price levels across several commodities and a growing correlation between returns of financial and non-financial assets have raised concerns over the role of factors that are unrelated to market fundamentals in price formation. Exogenous factors, such as greater interaction with the financial system and supply constraints in the freight markets, have become increasingly important over the last decade. More detailed analysis is needed, however. The empirical analysis conducted in this report confirms that *demand and supply fundamentals* remain solid drivers of futures price formation across all the commodities markets covered by the report. By channelling information about supply and demand fundamentals to the physical and futures markets, together with ensuring smooth management and aggregate transparency of inventories, the functioning of commodities price formation mechanisms can be improved.

The growth of emerging economies (in particular, of Chinese industrial consumption) lies behind the structural shift in prices, which – through the astonishing growth of international markets – has contributed to greater interconnection between physical commodities markets and so to higher responsiveness to *pro-cyclical global demand factors*. Despite the growth in demand slows down across commodities markets, demand levels are still reaching new historical peaks, thanks also to product and market characteristics. For instance, technological changes have promoted the widespread use of some commodities for *alternative applications*, such as corn for fuels or soybean oil for pharmaceutical products. New fundamental factors may therefore affect the use of a commodity and its price formation, which may ultimately increase the correlation with other factors that are not directly linked to the underlying physical commodity (the weight of crude oil prices in the price formation of corn, for example).

In fact, some commodities may be very responsive to crude oil prices. First, responsiveness is the result of the (exogenous) link to transport fuels or costs of fertilizers for agricultural commodities, for instance. Second, responsiveness to crude oil prices may be linked to direct government interventions to promote biofuels. This is the case for corn, for instance. However, the evidence points to only a weak (but strengthening) link between corn and crude oil, which rules out for the moment any transmission of the instability of energy policies to the market for corn.

In sum, demand has been constantly growing across all commodities markets for more than a decade. This has led to a general fall in *stock-to-use ratios*, in particular for agricultural and soft commodities. Without significant investments in new technologies, questions remain over the ability of current supply to satisfy growing demand in the long term.

In line with the historical trend, commodities are a *volatile asset class* and price volatility is on average within a stable range in the long term. However, the growing interconnection between financial and non-financial assets, and between regional physical markets, has amplified the reaction to market shocks, such as the recent financial crisis and the global economic downturn, and thus created volatility peaks in the short term. As a consequence, short-term volatility remains above pre-crisis levels, in particular for agricultural commodities.

➤ **International trade and the interaction with the financial system**

The *expansion of international trade* across all commodities markets, supported by regional trade liberalisation and broader WTO commitments, has coincided with the economic expansion of emerging markets, such as China and Brazil, and their growing participation in these markets. The growth of domestic demand in the emerging economies has been an important driver of growth for commodities markets. Cross-border trade liberalisation has increased the effect of competition on commodities production costs and so made 'traditional' subsidy programmes ineffective and/or too costly. New developments on the supply side, such as new unconventional sources of natural gas or the new co-products of corn processing (e.g. biofuels), have also been stimulating cross-border trade in new markets.

Seaborne freight markets have become the backbone of international trade, but they can be subject to abrupt volatile trends when supply capacity has to adjust. In 2008, freight costs for iron ore shipped from Brazil went from roughly 200% to less than 20% of the commodity price in under six months.

Cross-border competition has come with the price of higher short-term volatility, though, which is coupled with the effects of *government subsidy programmes* that have supported artificial prices in several commodities and have increased incentives to invest in new more efficient technologies to reduce energy consumption in metal production or harvested areas for crops, for example. Growing links between commodities markets and international trade have intensified the effects of government actions such as export bans. Most notably, direct market interventions in an open market model with international trade are unable to create incentives to tackle underlying problems of market structure. When the fiscal capacity of a country is reduced, the market has to face sudden adjustments with highly volatile patterns. For instance, in agricultural and soft commodities markets, where the opportunity costs of the land use are high (e.g. US wheat farms) or too low (e.g. sugar plantations in Brazil), public investments in new technologies for innovative applications and infrastructures, respectively, might be a preferable alternative to subsidies. They might favour more efficient allocation of the land if the market itself is unable to rebalance due to such transaction costs.

The increasing interaction of commodities markets with the financial system over the last decade is commonly referred to as '*financialisation*'. Low costs of financing and lower opportunity costs (returns on alternative asset classes) have favoured storage of commodities (carry trades), especially those with a good 'store of value' properties, such as metals. These circumstances have increased the opportunities for financial participants to enter these markets and the opportunities for commodity trading houses to use financial leverage to expand their physical interests. As a result, returns from commodities are increasingly pooled with returns from pure financial assets (a 'pooling effect'). The process increases co-movements among asset classes that have historically been seen to be following opposite causal patterns. This situation is the result of the combined effects of multiple circumstances, including the growth of international trade and cross-border interaction among physical markets, reinforced by easier access to international finance and credit partly due to widespread expansionary monetary policies, a favourable regulatory framework with the deregulation in the US, and technological changes favouring electronic trading and promoting accessibility to futures markets from any remote location around the globe. In fact, empirical evidence suggests that a strong positive correlation between commodities prices and financial indices emerged in the early 2000s, when all of the factors mentioned above came together with renewed strength. Since then, the correlation has remained strongly positive across all commodities markets assessed by this CEPS-ECMI Task Force report. Overall, the financialisation process has increased pro-cyclicality, i.e. responsiveness to the economic cycle and vulnerability of commodities markets to short-term shocks also coming from the financial system. However, the latter has been instrumental to the growth of international commodities markets. Unless governments want to push back on international trade, financialisation is a natural outcome of the new environment we live in. Despite the growing interconnection, fundamentals remain key drivers of futures price formation.

Well before the financial crisis erupted in 2008, *commercial participants* (e.g. commodity producers and merchants) were responding to strong demand pressures by quickly expanding their physical business activities on a global level, so laying the path for the growth of futures markets and the entry of non-commercial participants (e.g. investment funds) who were attracted by high returns. Technological developments in trading (e.g. algorithmic trading), financial innovations (e.g. commodities indexes) and easy access to international finance, prompted by accommodating monetary policies, fuelled this expansion. The value of international trade in commodities futures has soared together with the size of commercial participants and their interests in futures markets, which have ultimately favoured the arrival of purely financial participants. The empirical analysis confirms that the expansion of commercial futures positions has been leading price formation in futures markets, through the steady increase in futures positions and OTC financial activities. Non-commercial futures positions have, in the meantime, become by far the biggest component of futures markets, though evidence still points to commercial participants leading price formation in futures markets.

Commodity trading houses with interests across different commodities markets and significant financial exposure have been boosted their physical holdings in international markets, and may

become 'too-physical-to-fail'. The use of financial leverage to increase physical holdings, through the easy access to international finance helped by accommodating monetary policies, may have systemic implications. Aggregate data on physical holdings, coupled with a minimum set of information confidentially disclosed to regulators, for example, may reduce risks of moral hazard for national governments that have to cope with the sheer size of these entities in case of trouble.

Technological developments have changed the infrastructure of commodities markets and prompted innovation and sophistication in risk management. While these changes provided tools for (some) *trading practices by non-commercial participants*, bundled in very high intra-day volumes, that can theoretically damage price formation in the short term through herding behaviours, the evidence in this report suggests that to date the *role of non-commercial participants* in commodities markets has been generally benign. The growth of index investments has not so far caused distortions in price formation. An indiscriminate ban of legitimate trading practices may result in liquidity losses at the expense of the efficiency of price formation, although this report does not perform an ex ante quantification. The actions of supervisors should target damaging trading practices, such as cornering attempts, rather than specific categories of traders. Proper surveillance mechanisms and supervision of exchanges policies are essential, in particular when it comes to dealing with complex algorithmic or pure high-frequency trading. More time and data (e.g. aggregate data on volumes by category of trader) are needed, however, to improve the analysis of trading practices in the short term and the long-term effects of financial participants on price formation.

➤ **Market organisation matters! The interaction between futures and spot markets**

Futures markets are an essential infrastructure to support risk management in physical markets and, therefore, their price formation. Futures markets have supported the development of international trade and the consolidation of commercial participants fuelled by the opening up of international trade. Transparent and stable futures markets promote healthy interaction between the physical and financial spheres of commodities markets, which today are inextricably linked. As a result of greater interconnectedness, *market infrastructure* also allows faster circulation of information by increasing accessibility and so the resilience of price formation mechanisms. However, as market infrastructure adapts to a more global and interconnected environment after demutualisation, exposure to global risks requires a sophisticated surveillance mechanism and more coordination between supervisory authorities at international level.

As the industry pushes for consolidation at regional and global level, a minimum set of requirements to ensure accessibility and interaction with competitors while preserving rights on key intellectual properties may be beneficial for the innovation around new products and services to attract liquidity and, ultimately, serve the interests of commodity users. The implications of financial reforms on the *market power* of market infrastructures operators should be carefully assessed.

Warehousing and delivery systems linked to futures exchanges are an important element of efficient price formation, which help the convergence of futures to spot (physical) prices. Both loading out capacity and locations of warehouses depend on the nature of the commodity. For example, industrial metal warehouses are typically needed close to net consumption areas, while for agricultural commodities a location close to net production areas is often preferable, as the product requires immediate storage and delivery. Expanding points of delivery and/or increasing delivery capacity should depend on the characteristics of the underlying physical markets, in order to limit supply bottlenecks (i.e. delivery queues) and improve the functioning of international benchmarks. Internal management of positions by the exchange, linked to the actual delivery capacity of the infrastructure, may also be helpful to avoid artificial shortages if significant positions suddenly take delivery, as occurred in 2010 when the Armajaro fund took delivery of roughly 5% of global yearly production of cocoa in just a few days, creating a supply shortage among the exchange's sponsored warehouses. This would require periodic assessment of the rules set by the infrastructure, whether they still fit structural developments in the underlying physical market.

Issues with the delivery system or liquidity problems with the underlying physical markets of the futures contracts that are *recognised international benchmark prices* can affect the functioning of commodities markets organisation and ultimately the convergence between futures (forward) and spot prices. Moreover, a well functioning delivery system provides an efficient tool to support supply

adjustments when disequilibrium between physical demand and supply emerges. For instance, problems with the physical delivery of LME aluminium forwards are increasing the reliance on more opaque regional premia assessments (on average more than 15% of the nominal LME price in 2012), which are partially compensating for the fall in price of the official benchmark following a period of oversupply. Excess or shortage of supply in the physical market of the futures contract can also increase reliance on regional premia. The West Texas Intermediate and the Brent futures contracts, for crude oil, have been suffering from (regional) supply excess and shortage, respectively, in their underlying physical markets. Tackling the underlying supply balance and delivery issues is crucial for price formation. There is therefore a risk that by adding financial layers (e.g. the use of derivatives) and price assessments as a substitute for prices formed with arm's length transactions or replacing transparent exchange-based price formation mechanisms with a pricing system reliant on assessed regional premia, the actual conditions of underlying physical markets may no longer be reflected. More broadly, a recognised international benchmark should i) have enough supply in the underlying reference physical market (supply security); ii) provide market access and an efficient price discovery system (demand security); and iii) promote competition in the upstream and downstream physical market, and where possible, develop secondary markets for underlying forward contracts. For markets such as crude oil, initiatives would need to be undertaken at the global level by the relevant forum to achieve these objectives.

Conflicts of interests in commodities markets can have harmful effects, with strong implications for physical flows and market competition. Therefore, rules for sponsored warehouses, for example, should be set by the exchange only once the interest of its shareholders (often represented in the Board of the exchange) in the external market infrastructure, e.g. ownership of sponsored warehouses, are properly disclosed and ultimately managed. Conflicts may arise, in particular, when financial and non-financial activities are combined in the same entity. Conflicts of interests between the ownership of market infrastructures and/or of physical/futures/other financial holdings of market participants therefore need to be appropriately identified, disclosed, and ultimately managed by the parties involved under the coordinated international supervision of competent authorities.

Finally, claims that the *size of futures markets* is many times larger than physical markets and thus may distort price formation based on underlying physical transactions cannot be proven, but also cannot be ruled out. Further data and analysis is required to substantiate such claims. When looking at liquidity curves in futures markets, the size of open interest is only a fraction of the corresponding physical markets size, with high peaks only for cocoa and coffee (respectively at around 80% and 210%). However, when looking at yearly volumes of contracts compared to yearly production, futures markets are many times larger than the corresponding physical production (up to nine times larger for the main corn futures contract). But the comparisons between volumes of transactions that are only carried out to exploit information about physical trades in the trading of different futures maturities (e.g. calendar spread) with the actual physical production (which is not a measure of the intensity of physical trade) may ultimately overestimate the weight of futures over physical markets. Physical production is an inaccurate and conservative proxy of underlying physical market transactions. Finally, this CEPS-ECMI Task Force Report estimates the total notional value of outstanding (open interest) over-the-counter and exchange-traded financial transactions in commodities (e.g. futures and options) at around \$5.58 trillion in 2012. Over-the-counter transactions make up roughly 38% of the total outstanding value (open interest).

➤ **How can policy actions be improved?**

Cross-border commodities trades involving rules set by a global market infrastructure operating in different jurisdictions with different legal entities and supervisory frameworks has created uncertainty for market participants that need to be addressed by supervisors. Greater coordination among competent national authorities in cross-border commodity transactions (e.g. supervision of rules governing the delivery system) would be highly beneficial for the functioning of key recognised benchmark futures contracts

More data on *futures volumes* aggregated by category of trader, as well as reliable aggregated information about underlying physical transactions, are needed for regulators and researchers to have a full understanding of short-term trading practices and their implications for commodities price formation. However, even if data is disclosed in aggregates, the transparency of underlying physical

markets at the global level may be still unreliable if there is no effective private (based on reputation) or public *enforcement* mechanism. It can be even counterproductive to undertake policy actions on the basis of information that cannot be considered reliable and can therefore be used with strategic intent by producing countries in particular. For instance, data on crude oil storage within international initiatives such as the Joint Oil Data Initiative (JODI) may amplify the strategic behaviours of producing countries that often provide false or misleading information to the market.

Full transparency of *methodologies and governance*, and accessibility to underlying market data, is a crucial aspect for regulators to ensure the smooth functioning of *price assessment services*. A regulatory framework designed around public accountability will most likely preserve voluntary reporting by commodities firms and the right of judgement for price assessment entities in illiquid market conditions. The objective is to support the reputational market while at the same time avoiding the creation of a legally binding price assessment process that would only increase the systemic effects of market failures.

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These recommendations reflect a general consensus reached by Task Force members, although not every member agrees with every aspect in each recommendation.
Refer to the Final Report for a full disclaimer.

The **full report** can be downloaded from the following CEPS webpage:
<http://www.ceps.eu/book/price-formation-commodities-markets-financialisation-and-beyond>