THE ECONOMICS OF COMMODITY TRADING FIRMS

I. THE BASICS OF COMMODITY TRADING

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INTRODUCTION

The trading of the basic commodities that are transformed into the foods we eat, the energy that fuels our transportation and heats and lights our homes, and the metals that are present in the myriad objects we employ in our daily lives is one of the oldest forms of economic activity. Yet, even though this activity traces its origins into prehistory, commodity trading is often widely misunderstood, and, as a consequence, it is often the subject of controversy. So too are the firms that engage in it.

This whitepaper is intended to help demystify the commodity trading business. It presents a combination of description and analysis: in it, I describe some salient features of the commodity trading business and commodity trading firms, and utilise a variety of economic concepts to analyze and explain them.

SUMMARY CONCLUSIONS

Several fundamental conclusions flow from the analysis:

• Commodity trading firms are all essentially in the business of transforming commodities in space (logistics), in time (storage), and in form (processing). Their basic function is to perform physical “arbitrages” which enhance value through these various transformations.

• Although all commodity traders engage in transformation activities, they are tremendously diverse. They vary in size, the commodities they trade and transform, the types of transformations they undertake, their financing, and their form of ownership.

• In engaging in these transformation activities, commodity traders face a wide array of risks, some of which can be managed by hedging, insurance, or diversification, but face others that must be borne by the firms’ owners.

• Crucially, most commodity trading firms do not speculate on movements in the levels of commodity prices. Instead, as a rule they hedge these “flat price” risks, and bear risks related to price differences and spreads—basis risks.

• Risk management is an integral part of the operations of commodity trading firms. Some major risks are transferred to the financial markets, through hedging in derivatives or the purchase of insurance. Other risks are mitigated by diversification across commodities traded, and across the kinds of transformations that firms undertake. Remaining risks are borne by equity holders, and controlled by policies, procedures, and managerial oversight.

• Commodity trading firms utilize a variety of means to fund their transformation activities. Different commodity traders use different funding strategies involving different mixes of types of debt and debt maturities, and these funding strategies are aligned with the types of transformations firms undertake, and the types of assets they use to undertake them. Short-term assets like inventories are funded with short-term debt, and long-term assets are funded with longer-term debt.

• Commodity trading firms provide various forms of financing and risk management services to their customers. Sometimes commodity marketing, financing, and risk management services are bundled in structured transactions with commodity trading firms’ customers. Offering these services to customers exploits trading firms’ expertise in merchandising and risk management, utilizes the information commodity trading firms have, and provides better incentives to customers.

• Some commodity trading firms are public companies, whereas some are private. The private ownership model is well-adapted to traditional, “asset light” transformation activities, but as economic forces are leading to increasing investments in physical assets by all types of trading firms, the private ownership model is coming under pressure. Some major traders have already gone public; others are considering it; and still others are implementing hybrid strategies that allow them to retain some of the benefits of private ownership while tapping the public capital markets (sometimes including the equity markets) to fund some investments.
Commodity trading firms exhibit considerable diversity in their investments in physical assets, with some firms being relatively asset intensive, and others being very asset light. These firms also exhibit diverse trends in asset intensity. Within both categories (asset heavy and asset light), some firms are becoming more asset intensive, and others less (or remaining relatively constant).

What economists refer to as “transactions costs economics” provides considerable insight on what kinds of assets commodity traders own, and why these ownership and investment patterns have changed over time. Most notably, these transactions costs economics considerations imply that commodity traders have strong reasons to own “midstream” assets including storage facilities and terminals. Changes in commodity trading patterns in the last decade have created needs for increased investments in such midstream assets, and commodity trading firms have responded by building them.

Although it has been suggested that commodity trading firms are potential sources of systemic risk, as are banks, and hence should be regulated in ways similar to banks, they are in fact unlikely to be a source of systemic risk. That is, commodity trading firms are not too big to fail. Not only are they substantially smaller than truly systemically risky financial institutions, they do not engage in the kinds of maturity transformations that make banks vulnerable to runs; nor are they highly leveraged; nor are they major sources of credit; and the assets of a firm that experiences financial distress can be transferred to others.

THE REMAINDER OF THIS PAPER IS ORGANIZED ASfollows: Section I discusses the basics of commodity trading, focusing on the three major transformations that commodity traders undertake. Section II summarizes the various risks that commodity trading firms face. Section III describes the risk management process at Trafigura. Section IV examines the financing of commodity trading firms, their ownership structure, and their provision of funding to their customers. Section V analyzes asset ownership by commodity firms. Section VI examines the question of whether commodity trading firms pose systemic risks. The paper concludes with a brief afterword.
I. THE BASICS OF COMMODITY TRADING

SUMMARY

Agricultural, energy and industrial commodities undergo a variety of processes to transform them into things we can consume. These can be categorized as transformations in space, time, and form.

Commodity trading firms (CTFs) add value by identifying and optimizing transformations in commodities that reconcile mismatches between supply and demand:

• in space - using logistics
• in time - through storage
• in form - with processing.

Physical and regulatory bottlenecks may act as constraints on these transformations.

CTFs undertake physical arbitrage activities, which involve the simultaneous purchase and sale of a commodity in different forms.

CTFs do not speculate on outright commodity price risk, but aim to profit on the differential between the untransformed and transformed commodity.

CTFs specialize in the production and analysis of information that identifies optimal transformations. They respond to price signals and invest in physical and human capital to perform these transformations.

There are many different types of CTF. They vary by size and by product specialization. Some are independent entities; others are subsidiaries of oil majors or banks. They may be privately owned or publicly listed.

A. COMMODITY TRANSFORMATIONS

Virtually all agricultural, energy, and industrial commodities must undergo a variety of processes to transform them into things that we can actually consume. These transformations can be roughly grouped into three categories: transformations in space, transformations in time, and transformations in form.

Spatial transformations involve the transportation of commodities from regions where they are produced (supply regions) to the places they are consumed. The resources where commodities can be efficiently produced, such as fertile land or mineral deposits, are almost always located away from, and often far away from, the locations where those who desire to consume them reside. Transportation—transformation in space—is necessary to bring commodities from where they are produced to where they are consumed.

Just as the locations of commodity production and consumption typically do not align, the timing of commodity production and consumption is often disjoint as well. This is most readily seen for agricultural commodities, which are often produced periodically (with a crop being harvested once a year for some commodities) but which are consumed continuously throughout the year. But temporal mismatches in production and consumption are not limited to seasonally produced agricultural products. Many commodities are produced at a relatively constant rate through time, but are subject to random fluctuations in demand due to a variety of factors. For instance, wells produce natural gas at a relatively steady rate over time, but there can be extreme fluctuations in the demand to consume gas due to random changes in the weather, with demand spiking during cold snaps and falling when winter weather turns unseasonably warm. Commodity demand can also fluctuate due to macroeconomic events, such as a financial crisis that causes economic activity to slow. Supply can also experience random changes, due to, for instance, a strike at a copper mine, or a hurricane that disrupts oil and gas production in the Gulf of Mexico.

These mismatches in the timing of production and consumption create a need to engage in temporal transformations, namely, the storage of commodities. Inventories can be accumulated when supply is unusually high or demand is unusually low, and can be drawn down upon when supply is unusually low or demand is unusually high. Storage is a way...
of smoothing out the effects of these shocks on prices, consumption, and production. Furthermore, the other transformations (in space and form) require time to complete. Thus, commodity trading inevitably involves a financing element.

Moreover, commodities often must undergo transformations in form to be suitable for final consumption, or for use as an input in a process further down the value chain. Soybeans must be crushed to produce oil and meal that can be consumed, or serves as the input for yet additional transformations, as when the meal is fed to livestock or the oil is used as an ingredient in a snack. Crude oil must be refined into gasoline, diesel, and other products that can be used as fuels. Though often overlooked, blending and mixing are important transformations in form. Consumers of a commodity (e.g., a copper smelter that uses copper concentrates as an input) frequently desire that it possess a particular combination of characteristics that may require the mixing or blending of different streams or lots of the commodity.

Most commodities undergo multiple transformations of all three types between the farm, plantation, mine or well, and the final consumer. Commodity trading firms are vital agents in this transformation process.

B. VALUE CREATION IN COMMODITY TRADING

Commodity trading is, in essence, the process of transforming commodities in space, time, and form. Firms that engage in commodities trading attempt to identify the most valuable transformations, undertake the transactions necessary to make these transformations, and engage in the physical and operational actions necessary to carry them out. The creation of value in commodities trading involves optimizing these transformations.

This is an inherently dynamic process because the values of the myriad possible transformations vary over time due to shocks to supply and demand. For instance, a good harvest of a commodity in one region will typically make it optimal to store additional quantities of that commodity, and to transport the additional output to consumption locations.

Developments in oil markets in North America illustrate how dynamic transformation opportunities can be. Prior to the dramatic increases in oil production in places like the Bakken, the Permian Basin, and the Eagle Ford, the Midcontinent of the United States was a deficit production region where the marginal barrel was imported to the Gulf Coast and transported to the Midcontinent via pipeline to supply refineries in the region. The unprecedented rise in oil output turned this situation on its head. Soon the Midcontinent became an area of supply surplus. This necessitated an increase in storage in the region, and a reversal of transportation patterns. There have also been knock-on effects, including the virtual elimination of light sweet crude imports into the United States and the redirection of Nigerian crude (for instance) to other markets. That is, a supply shock led to a complete change in the optimal pattern of transformation not just in the US, but around the world.

The process of making transformations is constrained by technology and available infrastructure. For instance, transportation technology and resources—ocean freight, rail, barge, truck, pipelines—determine the set of possible spatial transformations. Similarly, storage capacity determines the feasible intertemporal transformations.

Constraints on transformation possibilities can vary in severity over time. Severe constraints represent “bottlenecks”. One important function of commodity traders is to identify these bottlenecks, and to find ways to circumvent them. This can be achieved by finding alternative ways to make the transformation, and/or investing in additional infrastructure that alleviates the constraints. Developments in the North American oil market also illustrate these processes. The lack of pipelines capable of transporting oil from the Midcontinent and other regions in which production had spiked to refineries on the Gulf was a bottleneck that severely constrained the ability to move oil from where it was abundant to where it was scarce. In the short run, traders identified and utilized alternative means of transportation, including truck, barge and rail. Over a slightly longer time frame some existing pipelines were reversed and new pipelines were built. Within a period of roughly two years, the bottleneck had largely been eliminated.

Sometimes bottlenecks are not physical, but are instead the consequence of regulatory or legal restrictions. At present, the primary bottleneck that is impeding the movement of newly abundant North American crude to markets where it is scarcer is the US law that largely prohibits the export of crude oil. Even there, traders are finding ways to alleviate the constraint. For instance, market participants are investing in “splitters” (“mini-refineries”) that transform crude oil that cannot be exported, into refined products that can be sold abroad.
The primary role of commodity trading firms is to identify and optimize those transformations. An important determinant of the optimization process is the cost of making the transformations. These costs include transportation costs (for making spatial transformations), storage costs (including the cost of financing inventory), and processing/refining costs. These costs depend, in part, on constraints/bottlenecks in the transformation processes. All else equal, the tighter the constraints affecting a particular transformation process, the more expensive that transformation is.

Commodity traders characterize their role as finding and exploiting “arbitrages”. An arbitrage is said to exist when the value of a transformation, as indicated by the difference between the prices of the transformed and untransformed commodity, exceeds the cost of making the transformation.1

Consider a spatial transformation in grain. A firm can buy corn in Iowa for $5.00/bushel (bu) and finds a buyer in Taiwan willing to pay $6.25/bu. Making this transaction requires a trader to pay for elevations to load the corn on a barge, and from a barge to an oceangoing ship; to pay barge and ocean freight; to finance the cargo during its time in transit; and to insure the cargo against loss. The trader determines that these costs total $1.15/bu, leaving a margin of $0.10/bu. If this is sufficient to compensate for the risks and administrative costs incidental to the trade, the trader will make it.

This description of a typical commodity trade illustrates that the commodity traders are primarily concerned with price differentials, rather than the absolute level of commodity prices. Traders buy and sell physical commodities. The profitability of these activities depends on the difference between the prices of the transformed and untransformed commodities, rather than their level. As will be discussed in more detail subsequently, price levels affect the profitability of commodity trading primarily through their effect on the cost of financing transactions, and their association with the volume of transactions that are undertaken.

Although commodity trading firms use centralized auction markets (e.g., futures markets) primarily to manage price risks, their core activities of buying, selling, and transforming physical commodities takes place in what economists call bilateral “search” markets. Commodity trading firms search to identify potential sellers and potential buyers, and engage in bilateral face-to-face transactions with them.

This reflects the facts that auction trading on central markets is an efficient way to transact highly standardized instruments in large quantity, but is not well-adapted to trading things as diverse as physical commodities. Even a particular commodity—say corn, or crude oil—is extraordinarily diverse, in terms of location (of both producers and consumers) and physical characteristics. Moreover, consumers and producers often have highly idiosyncratic preferences. For instance, oil refineries are optimized to process particular types of crude oil, and different refineries are optimized differently. The trade of diverse physical commodities requires matching numerous producers and consumers with heterogeneous preferences. Centralized markets are not suited to this matching process. Instead, since time immemorial, traders have searched both sides of the market to find sellers and buyers, and matched them by buying from the former and selling to the latter in bilateral transactions, and added value by engaging in transformations.

To operate in these markets, commodity trading firms specialize in (1) the production and analysis of information buyers and sellers active in the market, supply and demand patterns, price structures (over space, time, and form), and transformation technologies, and (2) the utilization of this information to optimize transformations. In essence, commodity traders are the visible manifestation of the invisible hand, directing resources to their highest value uses in response to price signals. Given the complexity of the possible transformations, and the ever-changing conditions that affect the efficient set of transformations, this is an inherently dynamic, complex, and highly information-intensive task.

Trading firms also invest in the physical and human capital necessary to transform commodities. Commodity trading therefore involves the combination of the complementary activities of information gathering and analysis and the operational capabilities necessary to respond efficiently to this information by transforming commodities to maximize their value.

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1 This use of the term “arbitrage” is contrary to the strict academic usage in finance, i.e., a transaction that earns a positive profit with positive probability, but entails no risk of loss. Virtually all of the commodity trades referred to as “arbitrages” involve some risk of loss. The use of the term is therefore aspirational. It indicates that traders are attempting to identify and implement very low risk trades, and in particular, trades that are not at risk to changes in the general level of a commodity’s price.
Value creation opportunities in commodity trading depend on the economic environment. Volatile economic conditions increase value creation opportunities. Supply and demand shocks can cause geographic imbalances that create spatial arbitrage opportunities for traders. Greater volatility also makes storage more valuable, thereby creating intertemporal arbitrage opportunities. Greater economic volatility is also associated with greater volatility in relative prices, and in particular in temporary mispricings that create trading opportunities.

Moreover, major secular economic shifts can create imbalances that drive trade and increase arbitrage opportunities. The dramatic growth of China in the past 20 years, and particularly in the last decade, is an example of this.

These factors explain why the profitability of commodity trading has tended to be greatest during periods of economic volatility, such as the Iranian Revolution, the Gulf War, and the collapse of the Soviet Union, and during periods of rapid growth concentrated in a particular country or region.

In summary, commodity trading firms are in the business of making transformations. In doing so, they respond to price signals to move commodities to their highest value uses. This improves the efficiency of resource allocation. Indeed, as Adam Smith noted centuries ago, making these transformations more efficiently can be a matter of life and death. 2

C. COMMODITY TRADING FIRMS

A large and diverse set of firms engages in commodity trading. 3 Indeed, the diversity is so extensive, and occurs along so many dimensions, that it is difficult to make generalizations.

Some commodity trading firms are stand-alone entities that specialize in that activity. For instance, well-known trading firms such as Trafigura and Vitol are independent and engage almost exclusively in commodity transformation activities.

Other commodity traders are subsidiaries or affiliates of other kinds of firms.

For instance, many banks have (or had) commodity trading operations. Prominent examples include J. Aron (part of Goldman Sachs since 1981), Phibro (once part of Citigroup and before that Salomon Brothers, though it is now not affiliated with a bank), and the commodity trading divisions of Morgan Stanley, J. P. Morgan Chase, and Barclays (to name some of the most prominent).

Other commodity trading entities are affiliated with larger industrial enterprises. Most notably, many "supermajor" oil companies (such as Shell, BP, and Total) have large energy trading operations (though some, notably Exxon, do not). Pipeline and storage operators ("midstream" firms such as Kinder Morgan and ETP in the United States) in energy often engage in trading as well.

Commodity trading firms also differ by the breadth of the commodities they trade. Some are relatively specialized, trading one or a few commodities. Others trade a broader set of commodities but within a particular sector. For instance, the traditional "ABCD" firms-ADM, Bunge, Cargill, and Louis Dreyfus-concentrate in agricultural commodities, with lesser or no involvement in the other major commodity segments (although Cargill does have a sizable energy trading operation). As another example, some of the largest trading firms such as Vitol, and Mercuria, and the energy trading-affiliates of the oil supermajors, focus on energy commodities, with smaller or no presence in other commodity segments. One major trading firm, Glencore, participates in all major commodity segments, but has a stronger presence in non-ferrous metals, coal, and oil. Another, Trafigura, is a major energy and non-ferrous metals trader.

Firms with a presence in a particular sector (e.g., agriculture) also vary in the diversity of commodities they trade. For instance, whereas Olam participates in 18 distinct agricultural segments, Bunge focuses on two and other major firms are active in between three and seven different segments.

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2 Adam Smith, *The Wealth of Nations* (1776). In Chapter V of Book IV, titled "Digression Concerning the Corn Trade and Corn Laws," Smith describes how by engaging in transformations in space and transformations in time grain traders ("corn dealers") were invaluable in preventing local shortages from causing famines. He further noted that even though traders perform their most valuable service precisely when supplies are short and prices high, this is also when they are subject to the heaviest criticism.

3 I will use the term "commodity trading" to mean the process of purchasing, selling, and transforming physical commodities.
Furthermore, firms in a particular segment differ in their involvement along the marketing chain. Some firms participate upstream (e.g., mineral production or land/farm ownership), midstream (e.g., transportation and storage), and downstream (e.g., processing into final products or even retailing). Others concentrate on a subset of links in the marketing chain. (This is discussed in more detail in Section V.)

Commodity trading firms also vary substantially in size. There are large numbers of small firms that tend to trade a single commodity and have revenues in the millions of dollars. At the other end of the spectrum, the largest traders participate in many markets and have revenues well over $100 billion.

Firms that engage in commodity trading also exhibit diverse organizational forms. Some, including many of the most prominent (Cargill, Louis Dreyfus, Koch Industries) are privately owned. Some of these non-public traders are funded by private equity investors: TrailStone (Riverstone Holdings) and Freepoint Commodities (Stone Point Capital) are well-known examples. Others (e.g., ADM and Bunge) are publicly traded corporations. Some are affiliates or subsidiaries of publicly traded firms. Yet others are organized as master limited partnerships with interests traded on stock exchanges: Kinder Morgan, ETP, and Plains All American are examples of this.