The impact of speculative trading in commodity markets – a review of the evidence

September 2011

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Glossary

Item	Description
Co-movement	Correlated or similar movement of two entities
CFTC	Commodity Futures Trading Commission; independent agency of the United States government that regulates futures and options markets
EMH	Efficient Market Hypothesis; this hypothesis claims that prices of traded assets reflect all publicly available information
FOA	Futures and Options Association
Futures contract	Standardised contract between two parties to exchange a specified asset of standardised quantity and quality for a price agreed today with delivery occurring at a specified date in the future
Futures market	Financial exchange where futures contracts are traded
Granger-Causality	Statistical test for determining whether one time series is useful in forecasting another i.e. to determine whether trader positions are useful in forecasting commodity prices. It is important to note that Granger-Causality does not imply true causality
Hedge	An investment position designed to offset potential losses that may be incurred by a companion investment; for example, a futures contract can offset the potential loss associated with a drop in the price of wheat for a wheat farmer
Index fund	Collective investment scheme that aims to replicate the movements of a specific financial market; for example, the S&PGSCI is an index fund that aims to replicate the movements of commodities markets
Liquidity	Assetôs ability to be bought or sold without causing a significant movement in the price and with minimum loss of value
Long position	In commodity derivatives, a position where the holder obtains a future right to buy a commodity at a price determined in advance, thereby profiting if the spot value of the commodity increases in the interim. Commodity derivative positions can generally be cash settled and do not necessarily require physical delivery.
NGO	Non-Governmental Organization; legally constituted organization that operates independently from any government
Open interest	The total number of derivatives contracts (i.e. futures, options) that remain open/unsettled in a given contract; open interest is a useful proxy for the level of liquidity in derivatives markets
OTC market	Over-the-counter market; a decentralised market of securities not listed on an exchange where market participants trade non-

	standard financial products
Short position	In commodity derivatives, a position where the holder obtains a future right to sell a commodity at a price determined in advance, thereby profiting if the spot value of the commodity decreases in the interim. Commodity derivative positions can generally be cash settled and do not necessarily require physical delivery.
Spot market	The period in which assets are traded for immediate payment and delivery
S&PGSCI	Standard & Poors Goldman Sachs Commodity Index; a benchmark for investment in the commodity markets and a measure of commodity performance over time
Spot price	Price that is quoted for immediate settlement (payment and delivery) for a specified asset
Swap Dealer	A financial institution that markets swaps (the exchange of one asset or liability for a similar asset or liability for the purpose of lengthening or shortening maturities or shifting risks) to end users; these are often index funds
UNCTAD	United Nations Conference on Trade and Development

Executive Summary

1. The issue of what drives commodity prices and whether their price volatility is excessive has always been of interest to policy makers. The balance between ñrealò economic factors that affect supply and demand and ñfinancialòfactors, especially in futures markets, which act separately of any physical trades taking place and which some feel distort prices in the ñwrongòway has been constantly debated.

2. Speculation is in fact difficult to define and isolate in the data and this is one of the problems in determining the effect of speculation in commodity markets.

3. The debate over the role and impact of speculation has become more intense in recent years as the prices of many commodities have both increased sharply and at times have become very volatile. This is especially true in the past decade.

4. It is not surprising that observers have been looking for the cause of the recent surge in prices and price volatility, nor that many lay observers have pointed the finger at speculators as they are an easy and obvious target. During the past decade investment in commodity markets has increased substantially. This rise in investment has also coincided with the surge in commodity prices and their increasing price volatility so naturally some observers have tried to make a connection there.

5. The academic literature has tried to get a more formal handle on these issues. It is faced not only with data and methodological issues but with conceptual ones as well. The many complexities in this area make evaluation and interpretation particularly difficult.

6. One way to measure the impact of speculation is to estimate what the price ought to be given the fundamentals of supply and demand and compare it to what the price actually was. Another approach is to examine speculative flows and the price to establish whether one causes the other. However just because two data series move together does not prove that one causes the other.

7. In general, the academic literature reviewed in this study finds little causation between speculative positions and prices and certainly not over a prolonged period.

8. There was a massive increase in ðfinancialisationò in recent decades but there is little evidence that it has been an important driver of price behaviour - although it may have made markets respond quicker to news (or expectations) which some consider a good, and others a bad outcome.

9. 2006-8 was a key period when prices soared and fell. Most analysis sees the bulk of this as being about fundamentals ï even the most sceptical sees òonlyò 25% of the price levels being due to speculation.

10. There is clearly a case that price volatility is increased by speculation but also strong evidence that the causation goes the other way not least as speculation brings information quicker to the price formation process. Also, research looking at commodities without futures markets tends to find as much, if not more, price volatility.

11. Irrespective of action on speculation policy makers need to focus on getting to the root cause of many of the problems of production and consumption. These are difficult, require complex international and other types of coordination and in many cases will take a long time. But all academics would agree that they lie at the heart of the issues of prices for commodities[1].

12. Policy makers in general want to make decisions based on the best evidence of the nature of the problem, and of the consequences of the various possible policy responses. They are operating, however, in a world where public pressure plays a role and there will always be a temptation to give in to populism. The decisions they make are for them to take and defend but they should at least be aware of the facts as far as the best academics have managed to assess them, before devising and implementing a policy decision.

13. Transparency is almost always good for markets - unless there are major commercial confidentiality issues - as it helps to provide market confidence that no market manipulation is happening and allows everyone to see what is going on so

[1] See for instance the ideas in Annex C of ñPrice volatility in food and agricultural markets: policy responsesò Policy Report including contributions by FAO, IFAD, IMF,OECD, UNCTAD, WFP, the World Bank, the WTO, IFPRI and the UN HLTF, 2 June 2011

that decisions are made as much as possible on hard data not conjecture and rumour. Cleary there are compliance costs issues here but the main problem is in getting the right information ï plus the risk that regulators may interpret the data incorrectly, generating an ineffective response in order to deal with the issue or, worse still, a response which damages market functionality.

1 Introduction

Introduction to assignment

1.1 The Futures and Options Association (ñFOAò) has engaged FTI Consulting to produce a literature review of papers on the impact of speculation in commodity markets. A list of 20 papers that FTI felt represented a reasonable spread of the literature was agreed with FOA and the scope of the report was discussed at a meeting with FOA and several exchanges.

Summary of paper

In summary:

- we conclude from the literature review that, while some of studies find links between speculative activity and price levels and price volatility, these are often at best correlations and which do not prove causation;
- most academic studies find it very hard to find any formal causality from speculative flows on price levels or price volatility;
- policy responses aimed at reducing speculation in commodity markets need to understand that they are different from the markets in financial products in that they provide producer and consumer price signals and there is a link to a real object which has, in most cases, a finite life; and
- therefore, policy makers must balance any possible benefits against the probable costs in terms of reducing liquidity and hedging and hindering the price formation process. Policy intervention without serious evidence should be avoided.

Content of this report

1.2 This report is set out as follows:

- Section 2 considers the background to this issue and how the current debate has developed over time;
- Section 3 sets out the reasons that futures markets and hence speculation exists and the theory of why speculation may be a market good or ill;
- Section 4 describes some of the methods adopted in the literature to examine this issue;

- Section 5 sets out the main findings and issues arising from the literature (while Appendix 2 gives fuller summaries); and
- Section 6 describes some of the difficulties in determining the effect speculation has in commodity markets and the considerations that need to be taken into account in any policy discussions.

2 Background and context

Introduction

2.1 The price and the price volatility of basic commodities matter enormously to economies and to populations all over the world. Energy prices ï often linked to oil prices ï are a major element of most economies. They are also a major part of the household budget in both developed and developing countries. The prices of basic foodstuffs from wheat to corn are crucial not only to budgets in developed countries where they average about 10% of household spending but, in particular, to millions in developing countries where they can be all about survival and account for as much as 80% of household spending[2]. Base metals like copper, aluminium and iron are key inputs to many industries and thus critically important to both developing and developed countries alike.

2.2 Such prices matter not only to those who consume these products ï either directly or as an input to other production- but also to those who have to decide whether to invest in exploring for more oil or in alternatives to oil or to plant more of a particular product next year and gear up to grow more the year after, and how much to invest in different approaches to production depending on relative prices.

2.3 The issue of what drives such prices and whether their price volatility is excessive has therefore always been of interest to policy makers, to Non-Governmental Organizations (ñNGOsò), to business and to those working in financial markets. It seems that market observers hold two views of the type of factors that influence such prices. The first are ñrealò or ñfundamentalò economic factors that affect supply and demand and the balance between them and which everyone agrees influence prices (see Figure 2.1 for an outline of these). The second are ñfinancialò factors, especially in futures markets, which act separately of any physical trades taking place and which some feel distort prices in the ñwrongò way. The balance between these has been regularly debated in recent years and the economic

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2 World Economic Outlook: Financial Stress, Downturns, and Recoveries, IMF, October 2008: Figure 3.9 and Urgent steps needed to curb rising food and other commodity prices, UN warns, UN News service, 31 January 2011

justification, especially of the latter and the factors that underlie it, have been areas of disagreement.

Figure 2.1 Some factors that affect fundamentals of supply and demand

Supply and demand factors are the underlying determinants of prices. These can be affected by numerous factors so the price determination process is complex. A few of them are:

- government policies in the area of strategic reserves, taxation, planning, climate change, production and consumption subsidies and trade barriers;
- pace and potential for investment in production: very difficult to achieve in foodstuffs, and requiring a very positive investment climate because of the high cost of production in energy
- natural disasters and other shocks that affect supply and demand in unanticipated ways
- severe climate shocks that cannot be addressed through normal risk management processes;
- geopolitical and legal instability in producer countries;
- supply and demand cycles especially in agriculture, both through the year and between regions; and
- the supply policy of producer groups (OPEC etc).

What is speculation?

2.4 Speculation is difficult to define and indeed this is one of the problems in determining the effect of speculation in commodity markets. The Commodity Futures Trading Commission in the US (ñCFTCò) defines a speculator as: ña trader who does not hedge, but who trades with the objective of achieving profits through the successful anticipation of price movementsò[3]. In addition, the CFTC identifies four categories of traders in its *Disaggregated Commitments of Traders* reports: producers/merchants/processors/users; swap dealers; managed money; and other reportables[4]. Using the definition and categories above, the CFTC considers speculation to include swap dealers, managed money and other reportables who do not trade for the sole purpose of hedging. In contrast, producers/merchants/processors/users are hedgers which the CFTC defines as:

3 CFTC Glossary, US Commodity Futures Trading Commission, http://www.cftc.gov/ConsumerProtection/EducationCenter/CFTCGlossary/glossary_s.html, as accessed on 28 June 2011

4 Disaggregated Commitments of Traders Report: Explanatory Notes, CFTC, http://www.cftc.gov/ucm/groups/public/@commitmentsoftraders/documents/file/disaggregatedcotexplanatorynot.pdf, as accessed on 28 June 2011

"A trader who enters into positions in a futures market opposite to positions held in the cash market to minimize the risk of financial loss from an adverse price change; or who purchases or sells futures as a temporary substitute for a cash transaction that will occur later. One can hedge either a long cash market position (e.g., one owns the cash commodity) or a short cash market position (e.g., one plans on buying the cash commodity in the future)"[5].

2.5 In defining speculation it is also helpful to consider what it is not. Speculation is a lawful and indeed necessary aspect of futures markets and is quite distinct from market manipulation which is destructive to markets and is therefore illegal. Market manipulation refers to a deliberate attempt to interfere with the free and fair operation of the market. In commodity markets this may be achieved by taking a long futures position while controlling the physical supply of the commodity, either by directly buying the underlying physical product or impeding physical delivery. This will increase the cost of, or make impossible, delivery against the futures contract by the short position holders around the delivery date and thereby artificially inflate the value of the long futures position. This practice of "cornering" a physical market is against market and clearing house rules and, as such, we do not include it in the definition of speculation.

2.6 We therefore use the definition of speculation adopted by the CFTC keeping in mind that this does not include market manipulation. Namely, for the purposes of our work a speculator is a trader who does not hedge but who lawfully trades with the objective of achieving profits.

2.7 However, we note that these definitions are not universally agreed upon and there are many shades of grey between speculation and hedging. For example, many commentators assume that all financial participants in commodity markets are there for speculative reasons, yet many financial traders deal in commodities in order to hedge investment portfolios or to invest (as opposed to speculate) in a particular commodity, which may exclude them from the definition of speculator as the CFTC uses the term. Moreover, the majority of firms – both commercial and

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5 CFTC Glossary, US Commodity Futures Trading Commission, http://www.cftc.gov/ConsumerProtection/EducationCenter/CFTCGlossary/glossary_h.html, as accessed on 28 June 2011

non-commercial - trade in commodity markets for speculative, investment and hedging reasons, reflecting the mixed nature of their portfolios and asset bases, and are rarely purely speculators or purely hedgers as defined by the CFTC above.

2.8 Even within speculation, there are many different types of participants with varying motives and vastly different time scales. For example, index funds, collective investment schemes that aim to replicate the movements of commodities markets, tend to hold long positions for very long time periods whereas some managed money participants seek profit by holding positions for mere minutes. Figure 2.2 below provides a graphical representation of speculators versus hedgers in physical and financial markets. It is important to note that there has been no evidence of commodity hoarding during recent price increases and that market manipulation is illegal.

2.9 Index funds and other financial flows have been increasing over time. Some feel that there must be an impact from these major flows into prices since long-only commodity futures investment has risen from less than $5 billion in 2000 to more than $375 billion today[6]. The counter argument asks how the way investors decide to invest could be ñdrivingò prices. Such long-only diversified commodity futures for instance typically invest in a broad portfolio of commodities for their clients in a fairly non-active way rather than basing them on beliefs about short term movements (in Greshamôs case for instance clients have exposure to a broadly diversified 30-commodity basket of commodity futures contracts recalibrated only once a year - every January). There is indeed a debate as to whether such investors really are speculators even though the CFTC says any market participant that does not use futures to hedge commercial exposure to price movements in a physical commodity is a speculator.

2.10 Most investment funds (hedge funds, pension funds) take positions as part of a long term investment strategy ï far removed from what people normally think of as the behaviour of speculators who focus on short term returns. Pension funds for

6 The Commodity Investor: Shock of the East, Barclays Capital, February 2011

example use commodity indices with the aim that the growth of their retirement funds is in line with increasing cost of commodities

Figure 2.2 Speculation versus hedging in physical and financial markets

	Hedgers	Speculators
Physical	- Producers/consumers - Traders - Banks	- Holding inventories (e.g. hoarding) - Keeping resources in the ground (e.g. OPEC) - Market manipulation (e.g. cornering the market)
Financial	- Producers/consumers - Traders - Banks	- Investment funds (e.g. Pension funds, sovereign wealth funds) - Investment and diversification instruments (e.g. CTAs, hedge funds) - Market manipulation (e.g. cornering the Market)

Source: Placing the 2006/08 Commodity Price Boom into Perspective, John Baffes and Tassos Haniotis, The World Bank Development Prospects Group, July 2010: reproduction of Table A1.

2.11 At this point it is useful to define another term which is often used in this debate: financialisation. Commentators and academics alike refer to the ñfinancialisation of commodity marketsò In this instance, financialisation refers to the increasing role of financial motives, financial markets and financial actors in the operation of commodity markets[7].

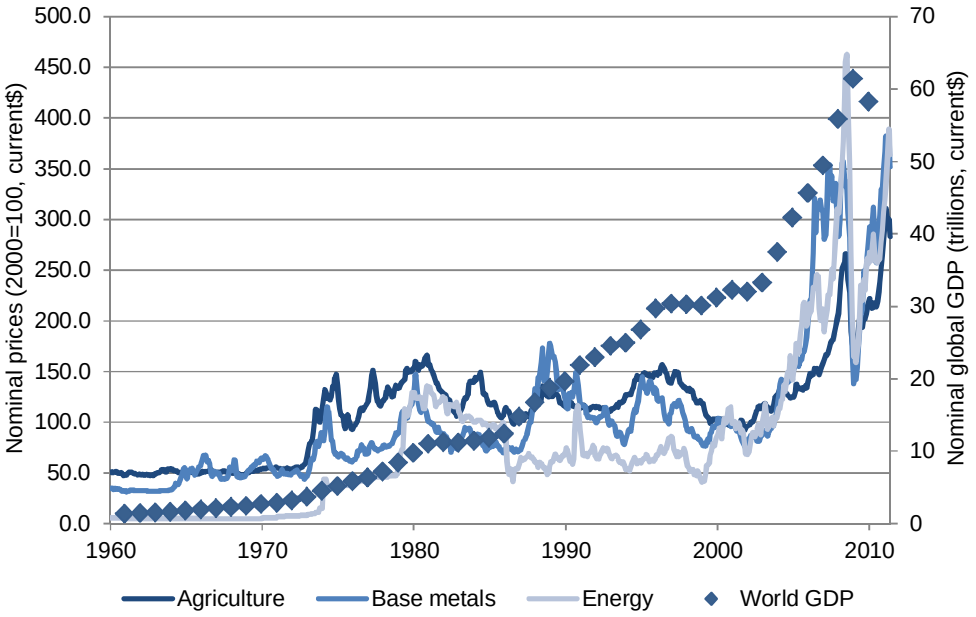
Current debate

2.12 The debate over the role and impact of speculation has become more intense in recent years as prices of many commodities have both increased sharply and at times have become very volatile. This is especially true in the past decade.

2.13 As Figure 2.3 shows, nominal commodity prices have been on a secular increase during the past 50 years with some sharp increases in certain phases like the 1970s and the late 1980s. Some commodity price movements can be largely explained by movements in GDP. For example, the price decreases observed during the early 2000s corresponded with a global recessionary period.

[7] Price formation in financialised commodity markets: the role of information, UNCTAD, 5 June 2011: p13

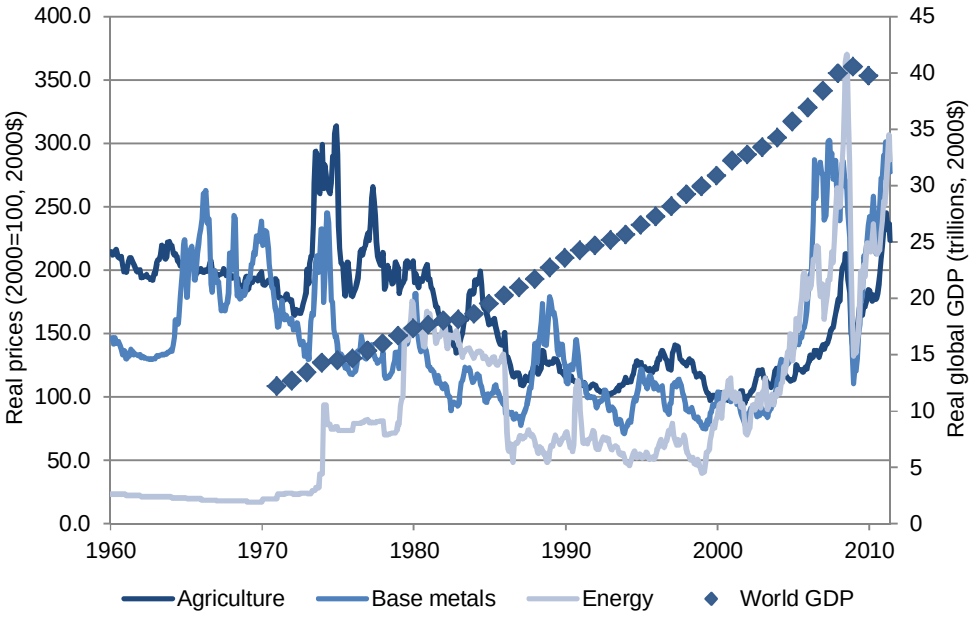
Figure 2.3 Nominal commodity prices and global GDP (1960-2011)



Source: Global Economic Monitor (GEM) Commodities, World Bank, http://databank.worldbank.org/ddp/home.do?Step=1&id=4, as accessed 21 June 2011

2.14 Figure 2.4 shows real commodity prices have decreased or remained flat from the mid 1970s to the early 2000s whereas real GDP has increased substantially during the same period. However, during the 2000s real commodity prices have risen much faster than GDP and lately have become much more volatile.

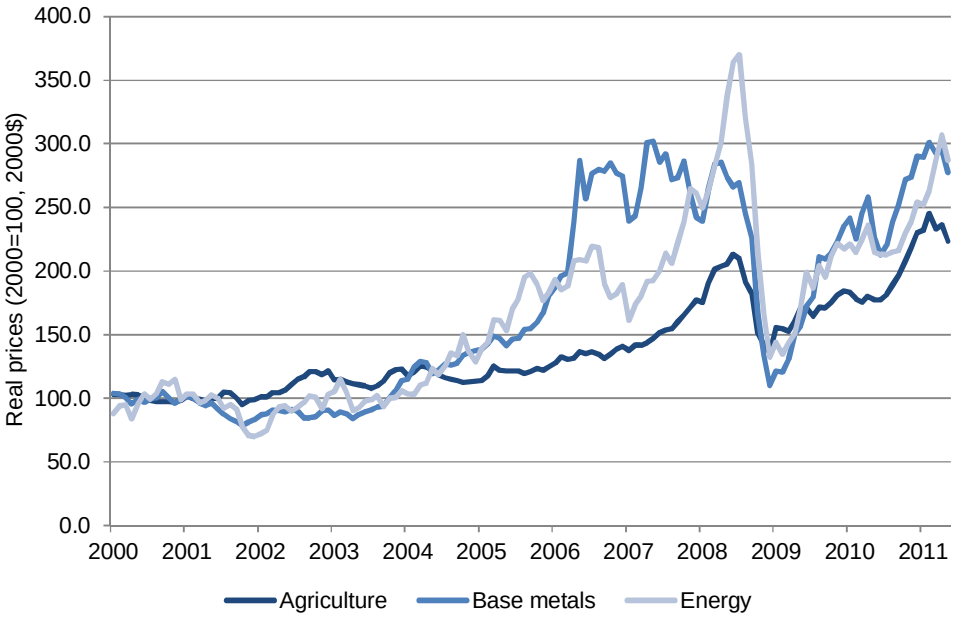
Figure 2.4 Real commodity prices and global GDP (1960-2011)



Source: Global Economic Monitor (GEM) Commodities, World Bank, http://databank.worldbank.org/ddp/home.do?Step=1&id=4, as accessed 21 June 2011

2.15 During the past decade real commodity prices increased substantially before reaching a peak in 2008 ï just before the crash of Lehman Brothers. Following the financial crisis, commodity prices fell precipitously before resuming their increase to levels at or near their pre-financial crisis peak as Figure 2.5 shows very clearly. The dramatic movements in commodity prices observed in the past decade, and in particular during the run up to 2008 and since, are the primary impetus for the current debate.

Figure 2.5 Real commodity prices (2000-2011)



Source: Global Economic Monitor (GEM) Commodities, World Bank, http://databank.worldbank.org/ddp/home.do?Step=1&id=4, as accessed 21 June 2011

The search for explanations

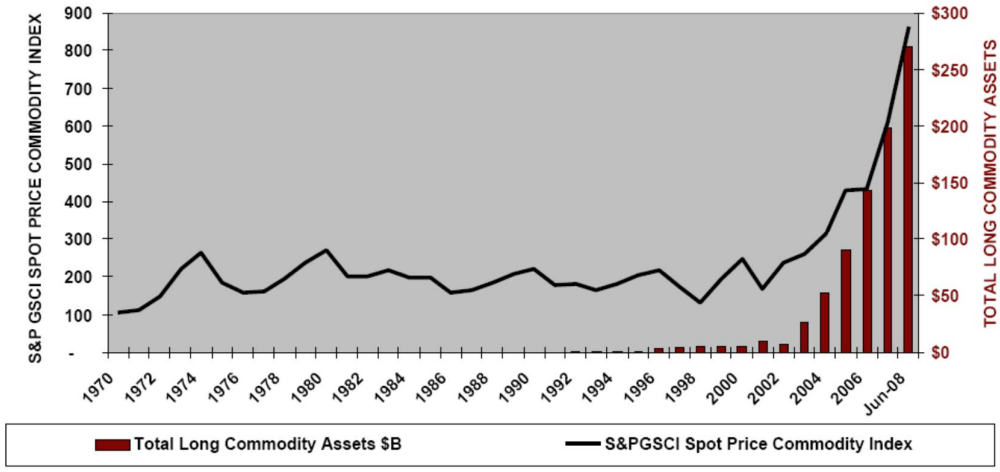
2.16 It is not surprising that observers have been looking for the cause of the recent surge in prices and price volatility. And it is maybe also not surprising that many lay observers have pointed the finger at speculators as they are an easy and popular target. Indeed, speculation in futures markets has been blamed for sharp price increases throughout history from the DØjima rice market in Japan in the 1730s to the trading of futures contracts for onions in the US which was, and still is, prohibited[8]. This tendency has perhaps been even stronger recently since, following the recent financial crisis, commodity futures markets activity has got caught up in the public mind with the suspicion that surrounds all financial markets.

2.17 During the past decade investment in commodity markets has increased substantially. This rise in investment has also coincided with the surge in

8 Placing the 2006/08 Commodity Price Boom into Perspective, John Baffes and Tassos Haniotis, The World Bank Development Prospects Group, July 2010: p36

commodity prices and their increasing volatility so naturally some observers have tried to make a causal connection there. This investment can be broadly divided into two categories: index investment and managed money. Figure 2.6 compares the total long commodity assets (mostly index investors) with the spot price of the Standard & Poors Goldman Sachs Commodity Index (ñS&PGSCIò) from 1970 to June 2008.

Figure 2.6 Commodity index investment assets compared to S&P GSCI



Source: The Relationship Between Commodity Futures Trading and Physical Commodity Prices, Lecture given by Dr. Henry G. Jarecki on 5 April 2011, http://www.futuresmag.com/Issues/2011/May-2011/Documents/Jarecki-Lecture-Commodity.pdf, accessed on 4 July 2011

2.18 But while the issues of causation may seem clear at a casual glance an analysis of the data demonstrates the complexity of this issue, and therefore we should not be taken aback if academic work tends not to deliver conclusions that confirm popular perceptions.

2.19 Policy makers in general do want to make decisions based on the best evidence of the nature of the problem, and of the consequences of the various possible policy responses. Hence the recognition of the importance of acting in accordance with market and cost-benefit analysis. However, they are also operating in a world where public pressure plays a role and there will always be a temptation to give in to populism. Sometimes too, a stress on factors like speculation will be used as an

excuse for not trying to tackle the much harder underlying fundamental issues that affect many of these markets[9]. These include things ranging from regulation, taxation and trade barriers to political instability and restrictions on production (see Figure 2.2).

2.20 The decisions policy makers make are for them to take and defend but they should at least be aware of the facts as far as the best academics have managed to assess them, before devising and implementing a policy decision.

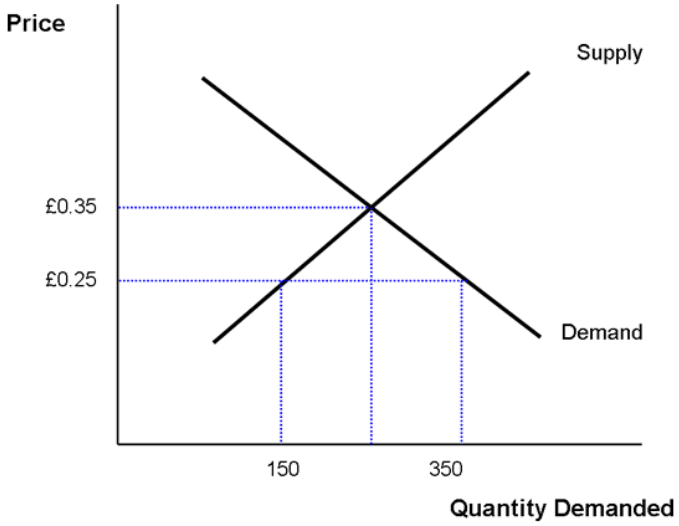
9 For instance the Medium Term Oil Market report of the International Energy Agency (1/7/08), in reviewing the increases in oil prices, noted that global demand had outpaced supply every quarter since the end of 2006 and that there had been no ñunusual building of oil stocksò It added that ñBlaming speculation is an easy solution that avoids taking the unnecessary steps to improve supply-side access and investment or to implement measures to improve energy efficiencyò

3 Why do we have speculation in commodity markets?

Introduction

3.1 Commodity markets are governed by the same forces as most other markets: supply and demand. Figure 3.1 is a graphical representation of supply and demand in a particular market, for example, the wheat market. The supply curve represents the amount of wheat that producers are willing and able to supply at various prices. Figure 3.1 shows producers are willing and able to supply 150 units of wheat at a price of £0.25 per unit. The demand curve represents the amount of wheat that buyers are willing and able to purchase at various prices; in our example buyers are willing to purchase 350 units of wheat at a price of £0.25 per unit.

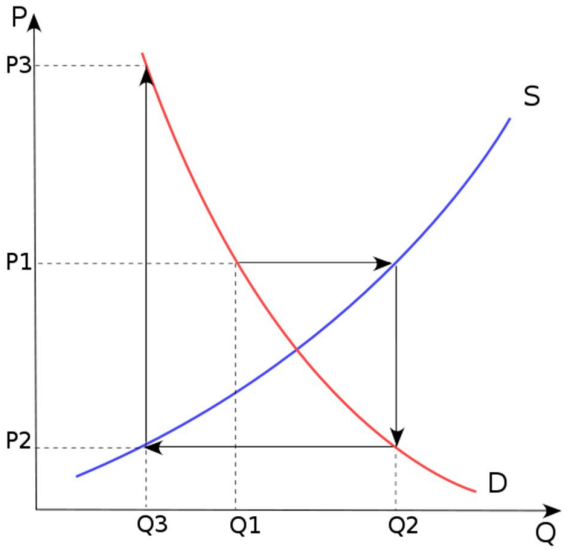
Figure 3.1 Supply and demand in the wheat market



3.2 The point where the supply and demand curves meet is called the equilibrium i.e. the price at which the quantity demanded is equal to the quantity supplied. In our example the equilibrium price is £0.35 per unit of wheat. The equilibrium price functions as a signal to buyers and producers; rising prices will signal producers to increase supply and buyers to reduce demand while falling prices will have the opposite effect. If the price were below this, at £0.25, the demand at 350 would be much higher than the supply being offered at 150. So the price would go up which would bring forward more supply and we would end up where we should have been which is at the equilibrium.

3.3 Unfortunately in many markets this process may not work smoothly as Figure 3.2 illustrates. With prices at P1 (say for oil) we have more supply than demand. But supply cannot adjust instantly so price falls to P2 with quantity at Q2. This causes suppliers to pull back in what they plan for the next period to Q3 at which point demand vastly exceeds supply and the price soars (to P3). And the process in theory can carry on. This stylised example ï creating the ócobwebôpattern - shows how one can get a very volatile price in such markets. The argument for futures markets and speculation therefore becomes that, in anticipating future price movements, they can actually prevent such massive swings caused by the inability of supply to move as quickly as prices. The net result is that speculation can reduce, not increase, price volatility.

Figure 3.2 Cobweb diagram



3.4 Commodity exchanges can be split into physical spot and forward markets, and futures markets. In the physical spot market a commodity can be traded for immediate delivery at the current price; whereas in the futures market, contracts can be traded to buy a commodity at a future date for a specified price. The key difference between a commodity physical forward and a futures contract is that, in the former case, the parties intend to make or take delivery of the underlying commodity and the option of cash settlement is restricted to where the contract is frustrated by an event outside the control of the parties.

3.5 Futures markets primary function is to facilitate the transfer of risk. For example, if a farmer does not want to bear the risk of selling his wheat at the prevailing spot price after harvest he may enter into a futures contract wherein the farmer agrees to sell his wheat at a specified price and date in the future. He is "hedging" his risk by fixing his budgeted trade price. The farmer has then transferred the risk of a fall (but also the benefit of an unanticipated rise) in the spot price between today and the specified future date. Of course to make this happen, someone else has to be prepared to take that risk. Speculators, among others, play the vital role of bearing this risk[10], precisely because of the fundamental difference in trading motivation between these two groups of market participants.

3.6 In addition to bearing risk, speculators increase liquidity in commodity markets and aid in the price discovery process by incorporating information about future shifts in supply and demand into futures markets. Liquidity is the ability of an asset to be bought or sold without causing a significant movement in price and with minimum loss of value; this is an essential feature of well functioning commodity markets. Speculators and futures markets have been performing these functions for hundreds of years.

3.7 Commodities markets have always been volatile. Harvests are dependent on the weather and short-term changes in demand operate on a different time scale from the long-term investments needed to boost supplies of food, metals and oil.

3.8 But while there has always been financial trading around commodities, what is new in recent years is the scale of this activity, which, while it has generated concerns over the power of such participants to affect pricing, largely reflects the general growth of financial flows overall in an increasingly global marketplace. Figure 3.3 and Figure 3.4 below show the evolution of open interest, a measure of trading activity in futures and options markets, in the crude oil market for commercial and non-commercial participants from 2003 to 2008. This clearly illustrates the growth that has taken place in hedge fund activity as well as commercial participants like commodity swap dealers.

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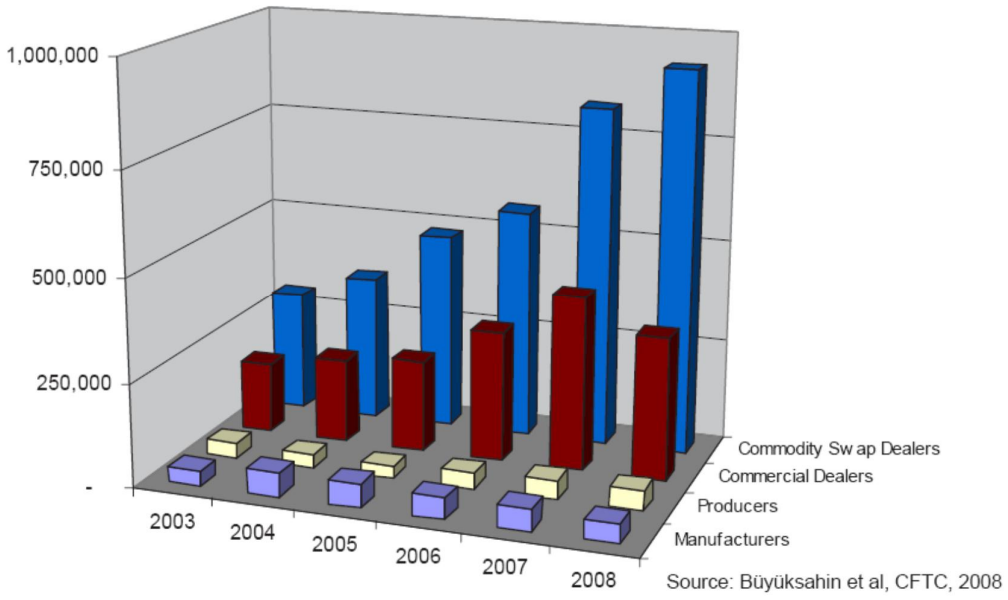
10 It is important to note that speculators do not typically take delivery of the commodity but rather, they "rollover" their position into other futures contracts

3.9 At times the scale of long-only commodity investment is debated. Relative to futures trading it represents only a very small fraction of total commodity futures trading. According to Jarecki, in 2010, for example:

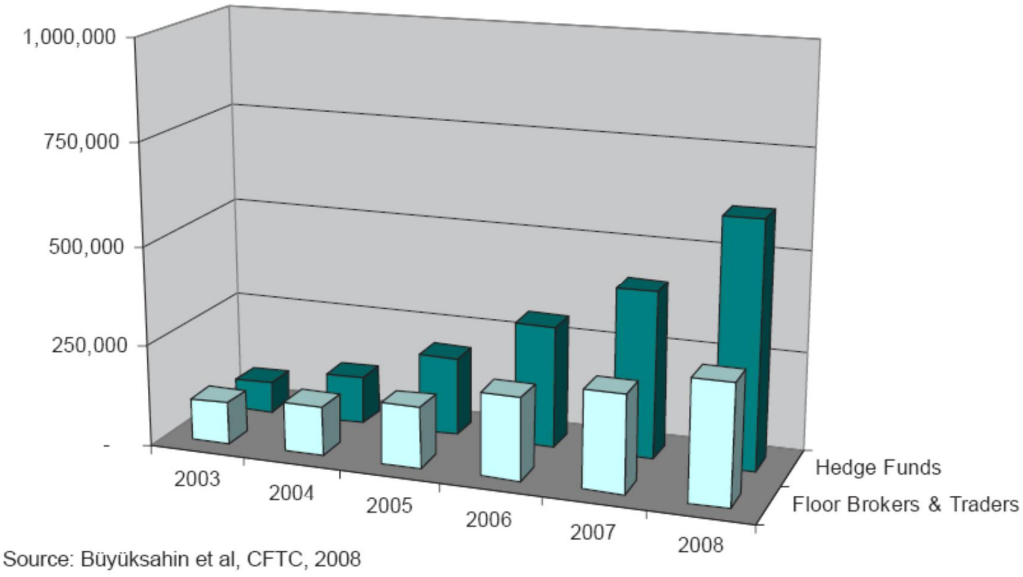
> *"the total trading in liquid commodity futures had a notional value greater than $63 trillion, but trading related to the $260 billion in commodity futures based index investments was less than $2.0 trillion, or only 3% of the total. The commodity futures markets are dominated by commercial traders whose activity dwarfs the methodical trading of index investors".*

Figure 3.3 WTI crude oil open interest by commercial participants 2003-2008



Source: Interim Report on Crude Oil, Interagency Task Force on Commodity Markets, July 2008: p22

Figure 3.4 WTI crude oil open interest by non-commercial participants 2003-2008



Source: Interim Report on Crude Oil, Interagency Task Force on Commodity Markets, July 2008: p21

Why speculation might be a market good

3.10 The benefits of speculation are fourfold:

- aid in price discovery;
- facilitate risk transfer;
- increase liquidity; and
- smooth out pricing anomalies in correlated markets.

3.11 Almost all academics agree that futures markets aid in the discovery of prices by making sure that all information about supply and demand and possible future moves in supply and demand become absorbed in the price. The search for new and reliable information is a positive good. Prices quickly reflect new information, and so the correct signals are given to the market.

3.12 Speculation also facilitates risk transfer and increases liquidity.

> *"The speculator is a necessary component of the futures market. He is the natural long who provides liquidity to the commercial hedger who uses the futures market to protect his business by selling some of his anticipated*

future production short. … Without speculators, hedgers could sell only to other hedgers, and, as Keynes showed, they would need to encourage the prospective longs to buy by continually lowering the prices at which they are willing to sell. This would make hedging far less economical and would inevitably cause markets to be far more volatile and lead to higher prices for consumers"[11].

3.13 In this scenario, recent price levels and price volatility reflect genuine supply and demand factors and expected future price movements and are not simply the consequence of irrational herd-like behaviour. Certainly the activity of financial traders in the futures markets is motivated by making profits but this does not mean that the activity is intrinsically harmful or should lead prices away for any length of time from their õcorrectòtrajectory.

3.14 Indeed there is at least an argument that the period from the mid 1990s to the mid 2000s was one where there was not enough price volatility and that prices were unnaturally low and fell behind GDP. In that scenario recent rapid price increases would be at least partly a correction of that and the current higher prices (after the fall in response to the real factor of the world recession) are the realistic global market prices for certain commodities as markets now respond more efficiently to information from a wider range of international sources.

Why speculation might be a market ill

3.15 The downside of speculation is that it:

- can amplify pricing trends (both up or down); and
- can generate short-term pricing bubbles.

3.16 In general, as the discussion above shows, the existence of lawful financial activity in futures and related markets (some of which is often termed speculation) is not in itself a market ill. But the argument is that in practice speculation does not really take place on the basis of real, firmly grounded expectations of supply and

[11] The Relationship Between Commodity Futures Trading and Physical Commodity Prices, Lecture given by Dr. Henry G. Jarecki on 5 April 2011, http://www.futuresmag.com/Issues/2011/May-2011/Documents/Jarecki-Lecture-Commodity.pdf, accessed on 4 July 2011

demand. Instead speculators try to guess where everyone is heading, following Keynesô famous description of rational agents trying to predict the winner of a beauty contest:

> *"It is not a case of choosing those* [faces] *that, to the best of one's judgment, are really the prettiest, nor even those that average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be. And there are some, I believe, who practice the fourth, fifth and higher degrees"*[12].

3.17 The net result, it is argued, can be the occurrence of short-lived price bubbles, some of which can be excessive and which can also be more than transitory ï as with the asset price financial bubble of the 2000s. That means that speculation could lead prices away from their equilibrium. So, far from prices being the correct guide to both supply and demand responses, they entice the wrong behaviour, which is not only inefficient but has feedback effects which keep prices away from the ñcorrectò equilibrium. In this model speculators would make money but play no useful role ï or, for some, a positively harmful one.

Some complexities

3.18 There are many complexities in this area that make evaluation and interpretation particularly difficult. We touch on a few here.

3.19 There is in effect a dual nature of commodity prices ï the physical market and the futures market ï and the interaction between them is not always clear. Futures prices are an assessment of future spot prices, but they also have an influence on existing spot prices. The reverse may also be true.

3.20 The markets for speculators and hedgers are often discussed as though they are separate. In fact not only do they interact greatly but, as mentioned earlier, speculators are needed to allow hedging and many participants engage in both

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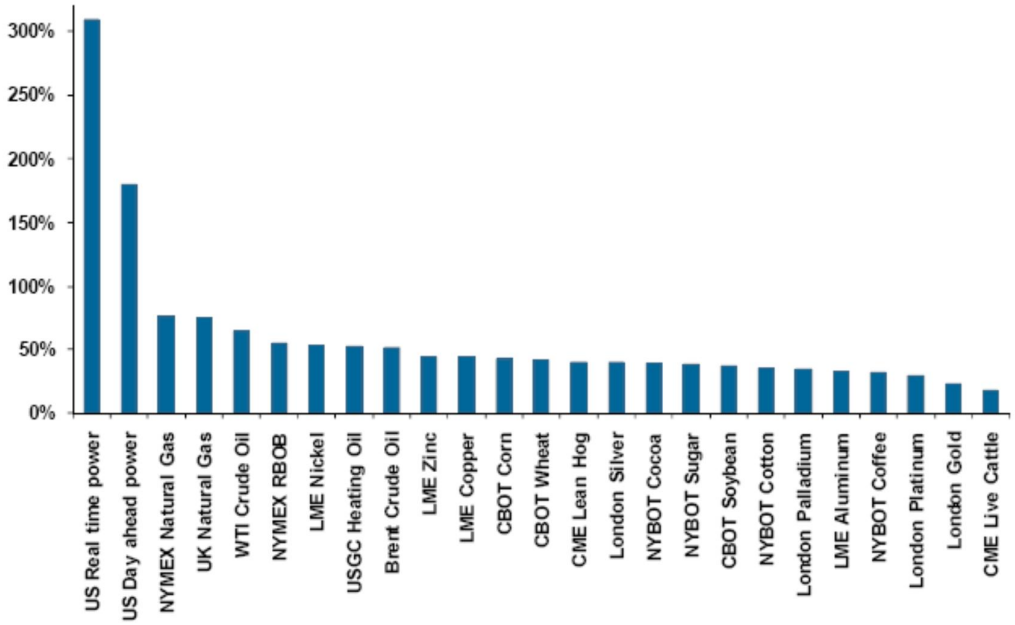
12 General Theory of Employment Interest and Money, John Maynard Keynes, 1936

activities. So it is misleading to see them as distinct, albeit related, markets, rather there is one market with different participants engaged in a range of activities.

3.21 Many commodity markets are also quite different from markets where you can store assets indefinitely (i.e. in the end the wheat must be consumed unlike a share in BP). This means that futures contracts cannot be held indefinitely. In addition, there are fundamental differences within groups of commodities, i.e. some goods are perishable (e.g. agricultural), some cannot be stored (e.g. electricity) and some are exhaustible (e.g. oil). As Figure 3.5 shows the inherent problems of storage does in itself have an independent effect on price volatility.

Figure 3.5 Commodities that are more difficult to store are more volatile, 1 year realised volatility



Source: Commodity Prices and Volatility: Old Answers to New Questions, Global Economics Paper No: 194, Jeffrey Currie, Allison Nathan, David Greely and Damien Courvalin, Goldman Sachs, 30 March 2010: Exhibit 6 (NB – NYBOT has been ICE since 2007)

3.22 The emergence of commodity index funds and their potential impact is not straightforward either. Fund managers, who allocated very little to commodities a

few years ago, now put up to 5% of their cash into them[13]. They do this primarily because commodities help diversify portfolios since, in general it seems that price moves are not much correlated with shares and bonds. They also act as a hedge against inflation. However the issue of whether they can directly drive prices is hotly debated. How should the impact of speculation on commodity markets be measured?

[13] Dr Evil or drivel? The charge sheet against commodity speculators is flimsy, The Economist, November 11 2010

4 Overview

4.1 The process of trying to test the degree to which speculation in commodity markets drives prices in ways unrelated to fundamentals (i.e. genuine supply and demand factors) is not simple for numerous reasons. Some are conceptual. What is speculation? What would prove causation? Some are practical. What data do we have? Does the past tell us much about the future?

Equilibrium and/or long run price

4.2 One way in principle to measure the impact of speculation is to estimate what the price ought to be given the fundamentals of supply and demand and compare it to what the price actually was. To some extent the difference may be ascribed to ñspeculationò. This, broadly, is the approach taken in a number of academic studies.

4.3 A key challenge is how to estimate the price absent speculation ï often known as the equilibrium price. This issue has been tackled at length in the literature on exchange rate determination ï from the early work by Dornbusch that showed why we were likely to get exchange rate over (and under) shooting[14]. It is also an approach used to try to work out what the underlying equilibrium exchange rate should be[15]. However, this is extremely difficult since so many factors could be included in the determination of what this equilibrium price should be. Even if one can estimate the equilibrium price, a further problem is whether all the ñextraò can be ascribed to speculation itself.

4.4 A variant on this methodology is to decompose commodity prices into a structural and cyclical component. The structural component is mainly determined by the long term supply curve or marginal cost of production whereas the cyclical component is largely determined by short term fundamentals expressed as

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14 Expectations and Exchange Rate Dynamics, Rudiger Dornbusch, Journal of Political Economy 84 (6): 1161ï 1176

15 See for instance Evaluating the UKs choice of entry rate into the ERM Simon Wren-Lewis, Peter Westaway, Soterios Soteri and Ray Barrell, September 1991, The Manchester School, Volume 59, Issue S1

inventory levels. This method is used by some of the papers we review here including that by Currie et al.

Cause and effect problems

4.5 Another approach is to examine speculative flows and the price to establish whether one causes the other. This is important because it is so easy to confuse correlation with causation. Just because two data series move together does not prove that one causes the other. This is perhaps best illustrated by a simple example; it has been observed that ice cream sales and the rate of drowning deaths are strongly correlated. However, this does not imply that ice cream causes drowning, rather, warm temperatures are the underlying cause of both.

4.6 This danger of confusing correlation with causation applies in many parts of the speculation and financialisation research agenda. Take investment in commodity index funds. Rising commodity prices of course mean that there will be an increase in the value of all commodity index investments taken together: but that is a mathematical identity not a causal process. So while Figure 2.6 is taken by some to show index funds driving prices ï it can equally well be showing the opposite.

4.7 Economic statistical techniques (econometrics) try to establish causation but in practice typically only work out the order in time (did one precede the other) rather than ultimately prove causation. There is a more subtle approach used in econometrics called Granger-Causality which gets us closer to what common usage means. However even here the statistical test in fact just determines whether one time series is useful in forecasting another; it is important to note that Granger-Causality does not claim to imply ñtrueò causality.

4.8 There are also conceptual issues at work here. One argument is that activity in financial markets cannot really ever cause the physical spot price to move since it is rare for investors to take physical delivery of commodities. Consequently, since no raw materials are removed from the supply chain it can be argued that investors are unlikely to affect spot prices.

4.9 Other concerns centre on the determining factors of futures prices. Some of the strongest critiques of the idea that speculation does not move prices come from those who claim that the price often moves even before a demand shift or supply shift is apparent. For instance UNCTAD argues that:

"Under such circumstances, steadily rising prices of commodities, even ahead of the rebound of stock market indices, appear to be related more to an anticipation of a future revival of demand than to a response to actually rising demand"[16].

4.10 But of course traders are trying to predict what is going to happen to prices ï so the argument is not as strong as its advocates think. Futures, by their very name, are forward looking instruments and so react not just to current supply and demand conditions but to future expected supply and demand conditions. Thus, if a future shortage is anticipated, the nearby market will also rise to curtail current consumption even before there is a shortage so that more of the commodity can be carried into the future to help alleviate the expected shortage.

Data issues

4.11 Even when the conceptual issues and methodological approach to trying to prove causation have been sorted there are problems with amassing the correct and consistent data. This is less the case with the data on price ï which can be observed and extracted ï but more an issue with all the other factors that might be relevant and which help us to measure demand and supply. For example, data on physical inventories is absolutely crucial in determining commodity prices yet consistent and reliable sources for global inventory data do not yet exist.

4.12 In addition there are major issues surrounding working out the correct series for speculation which revolve around definition as well as consistent data collection

Time periods

4.13 In econometrics the longer the time period over which we have data the better. However this is not always the case in practice and the data is not always consistent over too long a period.

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16 Price formation in financialised commodity markets: the role of information, UNCTAD, 5 June 2011: page 36

4.14 In addition one has to consider whether older analysis is relevant to today or whether the increase in the flows and the introduction of factors such as index funds makes them less relevant.

Different products

4.15 There is no *a priori* reason to believe that the way prices are determined and their links to financial speculative flows is the same for all products. This is partly because of their supply and demand fundamentals (so oil supply is very concentrated and to some extent influenced by government, while this is much less so in base metals). It also reflects the scale of trading and the global nature of that trading.

4.16 In addition some of these products are thought of as better hedges (e.g. against inflation) than others.

5 Summary of findings

5.1 Our review of the literature suggests fundamentals are the key driver of both the spot and futures markets and, by reason of their close linkage, current supply and demand conditions as well as expectations of future supply and demand conditions determine spot and futures prices. French President Nicolas Sarkozy, one of the most vocal advocates of commodity regulation, nevertheless drew attention to this basic point in a recent speech at the European Commission conference on commodities and raw materials:

> *"The world has long followed a mistaken belief: that its wealth of raw materials could be spent at will. Yet the world knows now that raw materials are finite resources, whether precious metals, energy or farming land. These resources are and will be increasingly scarce at precisely the time when they are required on a vast scale, in particular by emerging economies' industries. There, in a nutshell, is the cataclysmic vice the world is caught in. Scarce and increasingly scarce raw materials and growing world needs."*[17]

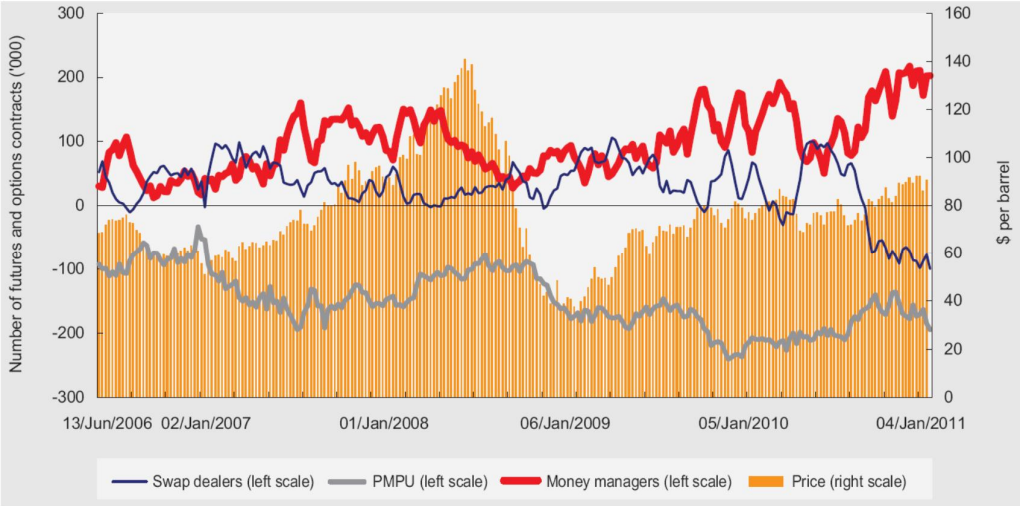
5.2 Speculation exists primarily in futures markets although it can affect spot prices due to the close link between spot and futures prices. Our review of the literature suggests speculation may at times exacerbate price movements and thus introduce misleading price signals into the market which may encourage other investors to reinforce those price movements. However, this is only likely to occur in the short term and there is little evidence that it is likely to significantly affect supply and demand decisions.

5.3 Figure 5.1 shows crude oil prices and net long financial positions by trader category from June 2006 to February 2011. It divides the latter into swap dealers (black line), producers, merchants, processors and users (gray line) and money managers (red line) with crude oil prices shown by the orange bars. This figure shows both: (i) that producers, merchants, processors and users tend to take short positions (i.e. to hedge risk) while financial investors tend to take long positions

[17] Speech by Nicolas Sarkozy, President of the Republic, at the European Commission conference on commodities and raw materials, Brussels, 14 June 2011

(i.e. bearing risk); and (ii) there is no clear relationship of any long-running relationship between price and the trading positions of any group.

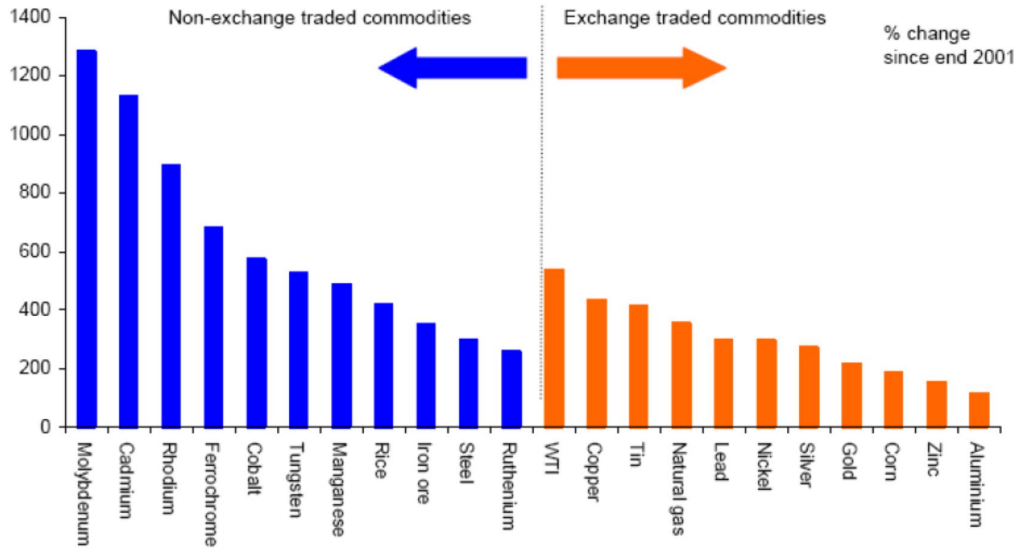
Figure 5.1 Crude oil prices and net long financial positions by trader category, June 2006 to February 2011



Source: Price formation in financialised commodity markets, UNCTAD, June 2011: Figure 13
Note: PMPU = Producers, Merchants, Processors and Users; Note: "PMPU" refers to producers, merchants, processors and users.

5.4 It is important to note that commodities without futures markets have exhibited equal if not greater price volatility during the last decade. Figure 5.2 below sets out the price appreciation from 2001 to 2008 for various exchange and non-exchange traded commodities. It shows that some non-traded commodities have moved even more than traded ones ï probably for a variety of reasons.

Figure 5.2 Price appreciation from 2001 to 2008 for exchange and non-exchange traded commodities



Source: Oil Market Dynamics through the Lens of the 2002-2009 Pricy Cycle, Bassam Fattouh, Oxford Institute for Energy Studies, January 2010: Figure 17 (underlying source: Commodities Weekly, Deutsche Bank, 14 August 2009); Note: "WTI" refers to West Texas Intermediate crude oil used as a benchmark in oil pricing

5.5 Other commodities that have seen sharp rises and do not have related futures exchanges include, for the period discussed, steel and coal[18].

5.6 Increased speculation has increased the tendency for commodities to move in line with other financial markets (i.e. the stock market) and with other commodities. However, since commodity prices are partly determined by the expectations of future supply and demand this may be expected even if it is contrary to the historical behaviour of commodity prices.

[18] These things do change over time. Steel for instance has since become exchange listed on the LME.

5.7 Table 5.1 summarises the findings. We also give comments on them. As can be seen there are a lot of interesting themes that emerge from this review of the academic literature but in the main it raises questions rather than answers them.

Table 5.1 Summary of findings

Theme	Comments
Data	
To test the effect speculation has on commodity prices it is crucial to have data that is sufficiently detailed to identify speculative positions. At that point, decisions have to be made about what to correlate with what. In general, little causation between speculative positions and prices has been found	The correlation and causation issue may never be solved.
There are likely to be differences amongst commodities, firstly between agriculture overall and oil but also between different agricultural products. This partly reflects the degree of trading and futures activity but also different degrees to which storage is possible. In addition, oil is more immediately susceptible to factors such as immediate political actions than are world agricultural prices.	Each commodity probably has to be looked at on its own.
The conundrum that someone needs to take an opposing position (or a bet the other way) if speculators are to be able to act (especially to push up prices) remains and is not satisfactorily addressed in the literature from those who feel speculators have a major impact.	This is an important practical (and theoretical) point.
Co-movements	
There was a massive increase in 'financialisation' in recent decades but unclear if that was an important driver of price behaviour - although it may have made markets respond quicker to news (or expectations) which some consider a good thing and others a bad.	Greater financial flows are unlikely to be bad in themselves unless they are driving prices away from where fundamentals would take them.
Correlations of futures prices with GDP are taken by some to show that they are not following the fundamentals of supply and demand for their particular product. Others feel that it would be surprising if most commodities did not move in respond to news about such fundamental factors.	Such correlations are really not proof of speculation, and not fundamentals, driving prices – even if the degree may be queried.
Causation	

Theme	Comments
Speculation is likely to be responding to market conditions and shocks and is likely only rarely - if ever ï to be the cause of them	It is very difficult, if not impossible, to prove causation.
2006-8 was a key period when prices soared and fell. Most analysis sees the bulk of this as being about fundamentals ï even the most sceptical sees òonlyò 25% of the price levels being due to speculation.	Much recent debate revolves around this period. It may be that this has been misleading or tells us about things in a peculiar period. Time will tell.
The rise in index funds is often looked to as having affected prices not least through encouraging ñherdò behaviour but theoretically it is hard to see why the strategies they appear to follow should imply this nor whether the rise in index funds drives or reflects price movement.	Index funds are unlikely to drive prices although they may play no useful role in price discovery.
Speculation may contribute to short and sharp price bubbles but the nature of commodity markets means that they are usually unlikely to be that large or last that long.	Some estimates do see speculation as making a reasonable contribution to price movements but even in these cases they are not usually prolonged enough to significantly affect supply and demand decisions.
At times it is possible for a single trader to have an impact on the markets ï as with any market. However, the distinction should be noted between legal and illegal activity.	Market manipulation must be avoided as it destroys confidence in markets
There is clearly a case that price volatility is increased by speculation but also strong evidence that the causation goes the other way not least as speculation brings information quicker to the price formation process. Also, research looking at commodities without futures markets tends to find as much, if not more, price volatility.	The research into onions and other markets that do not have futures markets is powerful and tends not to be rebutted by those who see major problems caused by speculation.
Regulation	

Theme	Comments
Speculation is, to some degree, a necessary counterpart to hedging which, it is generally agreed, does have economic value. It is hard however, to work out when we have speculation ñbeyondòthat.	This can never be totally solved but recent data availability has probably made things better.
The liquidity gains of speculation are recognised to be large but there are few ideas of how to control the latter without damaging the former.	The onus seems to be on those with solutions that they think solve this problem.
Transparency is almost always good for markets - unless there are major commercial confidentiality issues - as it helps to give market users confidence that no market manipulation is happening and allows everyone to see what is going on so that decisions are made as much as possible on hard data not conjecture and gossip. The problem is in getting the right information ï plus fears that regulators may use the data incorrectly.	Some proposals assume that government can get hold of the right data and use it sensibly. This may not be the case. The costs of compliance also need to be recognised.

Source: FTI analysis

6 Some issues that arise from the analysis

Problems of getting to a definitive answer

6.1 As the summary above shows, the academic literature is not able to provide a conclusive answer to the question of how much commodity speculation affects prices. Overall it seems to evidence a substantially lower impact on commodity pricing and price volatility than is attributed to it by the more populist view. The need for clear data is paramount if the action to be taken in this area is to be proportionate, deliverable, market-sensitive, appropriate and avoid the risk of distorting price volatility or prices in artificial directions.

6.2 The ultimate controlled experiment would be of course to run prices through the same period of time with and without speculation. The impossibility of doing this is why we end up with economists using theories and econometric techniques to try to get a deeper understanding of the forces at play.

6.3 However, most academics are also unclear how one could get a much better handle on the issue. One of the major sources of difficulty is the many factors that determine commodity prices and the lack of comparables. Commodity prices are determined by both current supply and demand and expectations of supply and demand in the future. For example, it is very difficult to determine whether a rise in the price of oil is due to a disruption in the supply chain in Libya (short-term supply), an increase in petrol demand in India (short-term demand), an increase in the expected growth of the Chinese economy (long-term demand), a decrease in the expectations of global oil reserves (long-term supply) or another factor (i.e. speculation). Additionally, in contrast to the equity markets, where the valuation of peer companies can give some indication of the value of the company in question, there are no comparables to many commodities.

6.4 More high quality data may be helpful in determining the fundamental factors affecting short-term prices, but may be less helpful in illuminating long-term fundamentals. For example, more high quality data will not help us determine when or if a viable alternative to oil is going to be developed which will obviously have an enormous impact on the price of oil.

Issues surrounding policies to reduce speculation

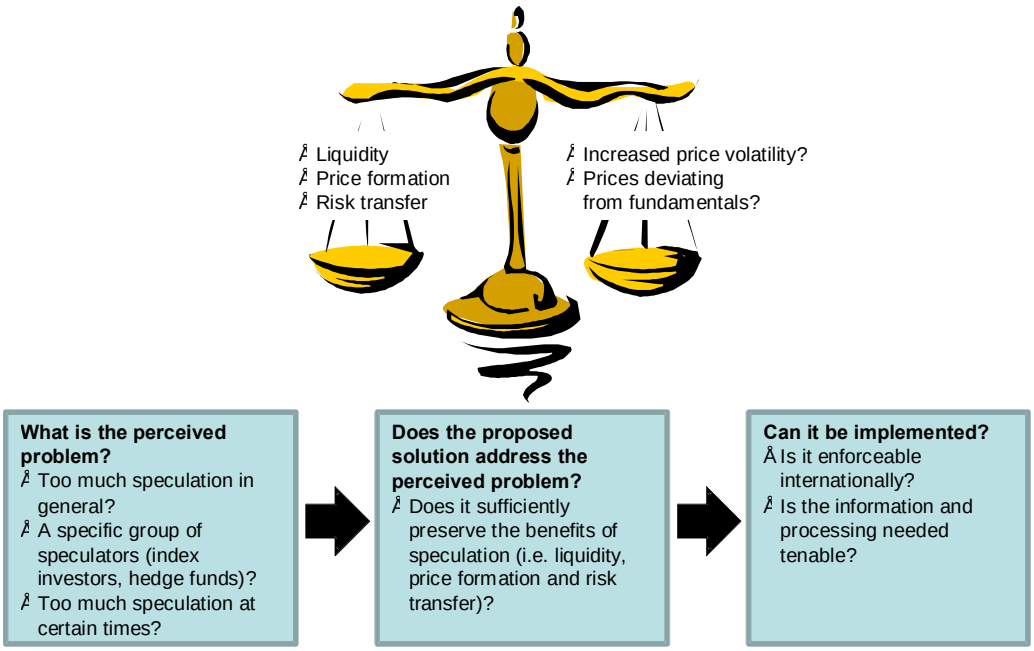
6.5 A more promising way of making decisions about whether it is worth doing anything in policy or regulatory terms about speculation is therefore to focus on the downside of cutting back on speculation and then to try to balance it against the potential costs of speculation itself.

6.6 The benefits of commodity speculation outlined in the literature mainly include facilitating the transfer of risk, increasing market liquidity and aiding price discovery. Policy makers need to have in mind the costs of intervention as they think through possible moves. Figure 6.1 below gives a flavour of the way these thought processes need to go as a sort of criteria for intervention.

6.7 In the first place the balance between the hoped for gains from any policy that aims to reduce speculation needs to be traded against the loss from having less activity in futures markets if the policy were to work.

6.8 Policy makers need to be quite clear which perceived problem they are trying to solve and whether the instrument suggested is appropriate; whether the proposed policy can achieve what is hoped for; and whether it is fact operable and enforceable.

Figure 6.1 Policy response flow diagram



Source: FTI analysis

Proposed policies

6.9 If policy makers were to make the decision to limit speculation in commodity markets, there are many practical considerations that would have to be taken into account in determining which policy to implement and in the actual implementation. As described above, there are many benefits to speculation including transferring risk, increasing market liquidity and aiding in price discovery and any chosen policy should not impair these functions. Speculation is necessary for futures markets, including hedging, to function. Thus, policy makers would have to determine an optimal level of speculation which would be difficult if not impossible.

6.10 Further, policy makers would need to consider the many groups of traders housed under ñspeculationòincluding: index investors, money managers, swap dealers and many more. There are positives and negatives associated with each group which would need to be weighed against each other.

6.11 The various interventions suggested come in several forms. Some aim to reduce the amount of transactions in financial derivatives and other futures. They can

either be by price (some kind of transactions tax) or by quantitative controls (for instance limits to ratios of financial to õrealòtransactions).

6.12 Others are to be triggered only when trading is in some way pushing the price or amounts being traded beyond certain points and put a potential halt to this.

6.13 In this case these can be automatic or can give freedom to regulators to intervene when they think that things are going awry and so rely on lots of transparency and information to the regulators so that they can decide when this is the case[19]. In addition some proposals focus purely on increased information and transparency (including bringing more transactions away from over-the-counter) in the belief that this will improve the way that markets work (although sometimes with an extra intention of giving regulators information that they can act on if necessary).

[19] Note that this is different from õshort term haltsòon trading which are usually introduced in response to rapid price movements in a short period of time (seconds or less). They are sometimes used to prevent algorithms from distorting a market when prices begin to shift.

Appendix 1 Sources of information

- World Economic Outlook: Financial Stress, Downturns, and Recoveries, IMF, October 2008;
- CFTC Glossary, US Commodity Futures Trading Commission, http://www.cftc.gov/ConsumerProtection/EducationCenter/CFTCGlossary/glossary_s.html, as accessed on 28 June 2011;
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- Price formation in financialised commodity markets: the role of information, UNCTAD, 5 June 2011;
- Global Economic Monitor (GEM) Commodities, World Bank, http://databank.worldbank.org/ddp/home.do?Step=1&id=4, as accessed 21 June 2011;
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- Interim Report on Crude Oil, Interagency Task Force on Commodity Markets, July 2008;
- Urgent steps needed to curb rising food and other commodity prices, UN warns, UN News service, 31 January 2011;
- Speech by Nicolas Sarkozy, President of the Republic, at the European Commission conference on commodities and raw materials, Brussels, 14 June 2011;
- Medium Term Oil Market Report, International Energy Agency, 1 July 2008;
- Dr Evil or drivel? The charge sheet against commodity speculators is flimsy, The Economist, November 11 2010;
- Price volatility in food and agricultural markets: policy responses, Policy Report including contributions by FAO, IFAD, IMF, OECD, UNCTAD, WFP, the World Bank, the WTO, IFPRI and the UN HLTF, 2 June 2011.

Appendix 2 Detailed summaries of literature reviewed

1 Price Formation in Financialised Commodity Markets: the Role of Information

Author(s): UNCTAD

Published: 5 June 2011

Commodities: crude oil, barley, cocoa, corn, sugar and wheat

Time period: 2000-2010

Summary: The focus of this paper is recent developments in the functioning of commodity markets and, in particular, the information flows that affect trading decisions. To that end, UNCTAD briefly summarises recent developments and trends in fundamentals on both the supply and demand side before turning to the focus of the paper: speculation.

UNCTAD reviews the increase in financial investments in commodity derivatives markets observed since 2004 and argues that as a result, the nature of information that drives commodity price formation has changed. UNCTAD argues that the increasing number of financial investors (i.e. index investors) in commodity markets who do not base their trading decisions purely on the fundamentals of supply and demand introduce misleading price signals into the market and deviate from the assumptions of the Efficient Market Hypothesis (ñEMHò). UNCTAD cites the desire to diversify an investment portfolio as a possible motivation for investing in commodities derivatives which is not related to fundamentals. In addition, UNCTAD relies on academic literature to support its conclusions that: i) cross-market correlations have increased (e.g. between commodity markets and currency markets); ii) commodity markets increasingly respond to information flows in other financial markets and economic indicators; and iii) commodity markets behaviour over the business cycle has changed; in particular, commodity prices increased on the expectation of an increase in demand. UNCTAD uses these conclusions to support its ultimate conclusion that commodity prices are not based solely on supply and demand fundamentals and that speculation has a large affect.

Further, UNCTAD argues market participants exhibit herd behaviour which, in combination with the misleading price signals discussed above, increases the risk of large deviations from equilibrium prices in the short term. UNCTAD primarily

relies upon 2 academic articles (ñSpeculative influences on commodity futures prices 2006-2008ò by CL Gilbert and ñIndex investment and financialization of commoditiesò by Tang and Xiong the latter of which is included in this literature review) to support its conclusion that speculation has a substantial impact on commodity prices. The Gilbert article finds that index investors accounted for as much as 20-25% of the oil price in the first half of 2008 by amplifying fundamentally-driven price movements. Further, UNCTAD finds a correlation coefficient of 0.81 between price changes in oil and managed money positions from July 2009 to February 2011. Finally, UNCTAD relies on interviews with 22 market participants to support their conclusions.

UNCTAD proposes many potential policy responses to improve the functioning of the commodity markets including: increasing transparency of fundamentals and trading activity, imposing position limits or points on speculative trading, prohibiting proprietary trading arising from conflicts of interest, establishing government administered virtual reserve mechanisms and introducing a transaction tax system.

Comments: The central pillar of the UNCTAD paper is that a substantial portion of financial investors do not base their trading decisions purely on the fundamentals of supply and demand. However, the link between the evidence UNCTAD cites and their conclusion is not clear. Contrary to UNCTADôs conclusions, it is entirely possible that cross-market correlations are justified by supply and demand fundamentals in an increasingly interconnected global economy and futures markets may, and indeed should, react to anticipated increases in demand. Additionally, UNCTAD is selective in its use of the academic literature by only citing articles that find evidence that speculation increases prices and/or price volatility while ignoring many studies that find no evidence of the phenomenon.

Further, UNCTAD largely ignores the benefits of financial investment in commodity markets. However, the commodity traders interviewed by UNCTAD make a more balanced assessment. UNCTAD writes:

> *"Nevertheless, the overall assessment of financial players' presence in commodity markets was ambiguous. Most traders also saw benefits. They emphasized that speculators of financial investors provide liquidity which is indispensable for hedging. An oil trader emphasized that one advantage of*

the presence of financial players in commodity markets is the availability of more sophisticated derivatives."

Therefore, contrary to UNCTADõs conclusion and thus policy recommendations, on balance commodity traders do not appear to be in favour of limiting financial investment in commodity markets.

2 Index Investment and Financialization of Commodities

Author(s): Ke Tang and Wei Xiong

Published: March 2011

Commodities: crude oil, natural gas, corn, wheat, soybeans, cotton, lean hogs and copper among others.

Time period: 1990-2009

Methodology: The primary objective of this paper is to determine the effect growing index investment in commodity futures markets has had on commodity price co-movements. To do this, the authors examine the increasing return correlations of various commodities, discuss and evaluate several economic mechanisms, including increased index investment, which may explain the increased co-movements and, lastly, the authors discuss any price volatility õspill-overò caused by the increased co-movements. The authorsôdataset contains daily futures prices and open interests for 28 commodities spanning the energy, grains, softs, livestock and metals sectors from approximately 1990-2009.

To examine the return correlations of various commodities the authors perform several regressions. First, the authors plot one-year rolling futures return correlations from 1985 to 2009 between oil and a selected commodity from each of the four non-energy sectors: soybeans from the grain sector, cotton from the soft sector, live cattle from the livestock sector and copper from the metal sector. Second, the authors construct two return indices in each sector, indexed and off-index, and calculate the one-year rolling futures return correlations from 1972 to 2009.

To evaluate the economic mechanisms identified as possible reasons for the increased co-movements (financialisation of commodities, rapid growth of emerging economies, the financial crisis, inflation and the adoption of biofuels) the authors first analyse SPGSCI returns and then price co-movements of non-energy

commodities with oil including various economic and market indicators. Finally, the authors examine one effect of the increased co-movements (price volatility spillover) by analysing the difference between return volatility of indexed and off-index non-energy commodities from 1998 to 2009.

Summary: This paper finds empirical evidence that concurrent with the increase in index investment observed since the early 2000s futures prices of non-energy commodities have become increasingly correlated with oil and this trend was significantly more pronounced for commodities included in the two most popular commodity indices (SPGSCI and DJUBS) after controlling for a set of alternative arguments.

The authors refer to policies designed to impose tighter limits on speculation and warn against over-interpreting their results. The authors note the necessary task of accurately weighing the pros and cons of increased index investment before imposing any stringent limits on financial investors. The authors also note that the increased co-movements in commodity markets may reduce index investment in the future as commodities are no longer effective diversification and increasing awareness of this may be an effective policy response.

Comments: The authorsôresults could be affected by their selection of representative commodities i.e. soybeans for the grain sector, cotton for the soft sector, live cattle for the livestock sector and copper for the metal sector. Further, the authorsôresults could also be affected by their construction of the ñindexedò and ñoff-indexòindices. Finally, one would expect some degree of co-movement among commodities in different sectors (as most are affected by economic growth) and, indeed, one might expect this co-movement to increase over time as economies become increasingly interconnected.

3 Placing the 2006/08 Commodity Price Boom into Perspective

Author(s): John Baffes and Tassos Haniotis
Published: The World Bank Development Prospects Group, July 2010
Commodities: rice, wheat, maize and oil
Time period: 2006-2008

Summary: The main objective of this paper is to analyse three controversial and potentially key factors behind recent commodity price increases: excess liquidity

and speculation, increasing food demand by emerging economies and the use of some food commodities for biofuel production. Additionally, the authors assess whether these factors are likely to persist and they attempt to place recent commodity price increases into perspective by examining the long-term trends and characteristics of commodity prices.

The authors conclude that speculation (in particular index fund activity) played a key role during the 2008 price spike whereas the use of some food commodities for biofuel production played a small role and the increase in food demand by emerging economies played no discernible role. The authors appear to rely upon a survey of the conclusions of prominent individuals in the press and in testimony in combination with academic articles to support their conclusion that the increasing flow of index funds into commodity markets can exacerbate price volatility. With respect to biofuels, the authors conclude that the overall effect of increasing biofuel production is likely to be limited given biofuels account for only 1.5 per cent of the area under grains/oilseeds. The authors find no evidence that alleged stronger food demand by emerging economies had any effect on world prices. Supporting this conclusion are periods of decreasing demand in India and China corresponding with agriculture commodity price increases.

Finally, the authors use a simple econometric model to reveal a strong link between energy and non-energy commodities in addition to corresponding price movements among food commodities i.e. when the price of wheat goes up the price of corn also goes up. The authors argue that these corresponding price movements are likely to be the dominant influence on commodity prices in the future. Additionally, the econometric analysis supports the thesis that price variability overwhelms price trends (i.e. prices exhibit non-stationary behaviour).

Comments: An examination of the role of investment funds in commodity markets requires a careful identification of the time period due to the non-stationary behaviour (NB: Ditto) of commodity prices. Further, while the authors concede that there is no consensus among the academic community on the effect speculation has on both prices and price volatility, the authors conclude that ñindex fund activity (one type of ñspeculativeò activity among the many that the literature refers to) played a key role during the 2008 price spikeòdespite having not performed an econometric analysis of their own with respect to this issue.

4 The Role of Inventories and Speculative Trading in the Global Market for Crude Oil

Author(s): Lutz Kilian and Dan Murphy

Published: 16 March 2010

Commodities: oil

Time period: 2003-2008

Methodology: The authors develop a structural vector autoregressive (VAR) model of the global oil market which, for the first time, allows for shocks to the speculative demand for oil as well as shocks to the flow of supply and demand. The authors use data on crude oil inventories in combination with sophisticated econometrics to identify the forward-looking element of the real price of oil. Using the authorsômodel it is possible to separate the speculative component from the components driven by supply and demand flows both with respect to real oil prices and changes in inventories. The authors then use this model to determine the role speculation has played in oil markets from 1973 to 2009.

The authorsômodel consists of a four-variable dynamic simultaneous equation in the form of a structural VAR. This model captures the evolution and the interdependencies between multiple time series, generalising a random process. The authors use seasonally adjusted monthly data from 1973 to 2009.

Summary: The authorsômodel suggests that the increase in oil prices observed from 2003 to 2008 was caused by fluctuations in the flow demand for oil driven by the global business cycle. In addition, the model rules out explanations based on unexpectedly diminishing oil supplies and speculative trading. However, the model suggests speculative trading played an important role during oil price shocks observed in 1979, 1986 and 1990.

Additionally, the model implies a price-elasticity far greater than previously estimated. Previous articles have relied upon a price-elasticity near zero to support their conclusion that speculative trading could affect oil prices without affecting inventories. However, the authors argue, based on their model, that the price-elasticity is far greater than zero and thus invalidate the arguments of previous articles.

The authors argue that these results, in combination, prove that speculation was not the cause of the oil price surge observed from 2003 to 2008.

Comments: The results generated by this model are genuinely true however, the model has many restrictions. Specifically, attention has been drawn to the greater impact of oil supply shocks implied by this model. Moreover, the presence of two oil demand shocks in the model has some unrealistic implications (i.e. identical elasticities).

5 Speculative Influences On Commodity Futures Prices 2006-2008

Author(s): Christopher Gilbert
Published: UNCTAD, March 2010
Commodities: crude oil, aluminium, copper, nickel, wheat, corn and soybeans
Time period: 2006-2008

Methodology: In this paper the author attempts to quantify the effect of ñbubble behaviourò, possibly resulting from extrapolative expectations, and index-based investment on commodity futures prices between 2006 and 2008. To perform this analysis the author relies upon IMF data on returns from 2000 to 2009 and CFTC data on trader positions from 2006 to 2009.

With respect to bubble behaviour, the author hypothesizes that trend-following behaviour in combination with short-term reporting horizons for informed professional investors (i.e. hedge funds) has the potential to generate ñexplosiveò behaviour. The author tests this theory using relatively new econometric procedures which identify explosive periods. The fundamental idea behind this approach is that if trend-following behaviour is significant, then an upward movement in prices will tend to be extrapolated. Given that these tests are relatively new, the author identifies a number of methodological issues which remain to be solved.

With respect to index investments, the author performs Granger-Causality tests to determine whether index positions are useful in forecasting commodity returns. However, the author only has access to index positions for US agricultural markets from the CFTC. Therefore, the author creates an index of total net index-related futures positions in agricultural markets (ñCorazzolla indexò) as a proxy for index positions in all futures markets (i.e. energy, metals and agriculture). The author

then performs Granger-Causality tests using this index and commodity futures returns to determine the effect of index-based investments on commodity futures prices.

Summary: The author concludes that both bubble behaviour and index investments have had a substantial impact on commodity futures prices. Regarding bubble behaviour, the tests the author employs find strong evidence of speculative bubbles in the copper market and some evidence of bubble behaviour in the soybeans market between 2006 and 2008. With respect to index-based investment, the author finds index-based investment Granger-Causes permanent price changes. The estimated price impact of index-based investment on energy and metals prices is approximately 3-10% in 2006-2007 and 20-25% in the first half of 2008. The impact on grains prices was approximately half that on oil and metals. Nevertheless, the author cautions that it would be incorrect to argue that high oil, metals and grains prices were driven by index-based investment, rather index investors appear to have amplified fundamentally-driven price movements.

Comments: The author identifies a number of methodological issues with the ñbubble behaviourò tests relied upon which remain to be addressed. In addition, the author notes that the start and end dates chosen for these tests are subjective and the test outcomes can depend on data frequency and the amount of ñpre-bubbleò data included in the sample. Further, with respect to index investment, the proxy for index positions the author uses is only based on index traders in the agricultural commodity markets (yet the author finds weak evidence that index traders contribute to rises in agricultural commodity prices and strong evidence for oil and metals markets).

6 Commodity Prices and Price volatility: Old Answers to New Questions

Author(s): Jeffrey Currie, Allison Nathan, David Greely and Damien Courvalin
Published: Goldman Sachs Economics, Commodities and Strategy Research, 30 March 2010
Commodities: crude oil, copper, corn, and natural gas
Time period: 2000-2010

Summary: This paper focuses on the key drivers of price volatility and price movements in the commodity markets. To assist the analysis, the authors use a

commodity pricing framework that they have developed to analyse recent developments affecting both long and short term supply and demand. The authors conclude that recent commodity price movements can be explained by increasing marginal costs in the long term and fluctuations in inventories in the short term.

The commodity pricing framework decomposes commodity prices into a structural component and a cyclical one. The idea is that fundamentals both drive the long run trend (which gives the structural component of prices) and the shorter term (over 2 years or so) that is also influenced by fundamentals but by shorter term ones (so for instance might include demand and supply shocks and changes that lead to changes in stocks or inventories).

More precisely the structural element is mainly determined by the long term supply curve or marginal cost of production and the cyclical component is largely determined by short term fundamentals as captured by inventory levels. The authors argue that a lack of investment in underlying production and storage infrastructure combined with strong demand from BRIC countries has substantially increased the marginal cost of production while restraining the marketôs ability to deal with any sudden changes in supply or demand resulting in increased price levels and price volatility. However, the authors also find speculative investors contributed to increased price levels and price volatility in recent years noting as speculators buy, prices generally tend to rise, and vice versa.

Moreover, the authors highlight the close relationship between price volatility, inventories and storage capacity. Inventories serve to bridge the gap between physical supply and demand. Without the ability to generate inventories, prices must force supply and demand into balance. The commodity price volatility is therefore closely tied to the ability to store the commodity.

In line with their commodity pricing framework, the authors suggest adopting an accommodative policy that encourages investment and thus technological breakthroughs which may stem rising commodity prices by reducing long-term marginal costs.

Comments: The authors analyse historic commodity price movements which appear to support their conclusion that prices are primarily determined by marginal costs and inventories. However, a convincing rationalisation of historic price

movements may not be a good predictor of future price movements or the key drivers underlying them. For example, the authors concede that speculation contributed to recent price movements whereas they did not previously.

7 The Adequacy of Speculation in Agricultural Futures Markets: Too Much of a Good Thing?

Author(s): Dwight Sanders, Scott Irwin and Robert Merrin

Published: Applied Economic Perspectives and Policy, 1 January 2010

Commodities: corn, soybeans, wheat, cotton, cattle and hogs

Time period: 2006-2008

Methodology: The focus of this paper is the necessary amount of speculation in agricultural futures markets. The authors rely upon new data from the CFTC (Commitments of Traders and Commodity Index Trader reports) to examine and better characterise the nature of speculation in grain and livestock futures markets.

First, the authors analyse descriptive statistics to determine whether any shifts or changes in trader activity have occurred from 1995 to 2008. The authors examine changes in open interest, the percentage of open interest accounted for by each trading groups and the percentage of long and short positions by trading group. Second, the authors assess the ñadequacy of speculationò by comparing Workingôs speculative index (including index positions) today with historical measures.

Summary: The authors note two major trends in agricultural futures markets since 1995: a rapid increase in open interest since late 2004 and a stabilisation of index fundsô percentage of open interest since 2006. Additionally, index funds usually comprise 10-20% of total open positions but, because the indexes are almost exclusively long, they tend to make up 20-40% of the long side of the market making them the predominant long position holder.

Regarding Workingôs speculative index, the authors do not find any material changes or shifts over the sample period i.e. the increase in speculative positions was equalled or surpassed by an increase in short hedging. Thus, current estimates of Workingôs speculative index are within historical ranges even after adjusting for index fund positions.

Finally, although this paper does not directly test for price impacts the authors note that a substantial effect is unlikely given the relatively normal level of speculation observed over the sample period. Therefore, the authors caution against policies aimed at curbing speculation. Rather, the authors suggest areas for additional research including: the size and motivation of various market participants, the activity of all trader groups using more detailed data, the patterns in index trading (i.e. rolling positions from one contract maturity to another), the price impact of trader groups and their incentives and the fundamental question of whether agricultural futures markets are still primarily hedging markets as Working theorised.

Comments: The data relating to index traders is very brief (2006-2008) which makes it difficult to draw meaningful conclusions with respect to this trader group. Further, it is still plausible that the Working index over- or under-estimates long or short positions due to the ñcontaminationòof data i.e. the data does not recognise the true motives of the traders and thus fails to distinguish amongst them.

8 Oil Market Dynamics through the lens of the 2002-2009 Price Cycle

Author(s): Bassam Fattouh

Published: Oxford Institute for Energy Studies, January 2010

Commodity: oil

Time period: 2008-2009

Summary: The focus of this paper is the causes of the sharp swings in oil prices observed in 2008 and 2009. The author argues that a dichotomy between fundamental and non-fundamental factors is too simplistic to explain recent price movements and that a more inclusive framework that emphasises the role of expectations and the dual nature of crude oil as both a physical commodity and a financial asset is required.

The author argues that during the 1980s and 1990s the oil price was stabilised by an expectation that extreme oil prices would prompt a strong response or feedback from supply, demand or policy. However, as oil prices began to rise in the 2000s an expectation of strong feedbacks was replaced by an expectation of weak feedbacks. At the same time, the oil market began attracting large investment flows as commodities emerged as an alternative asset class; this had a profound impact

on the price discovery process. However, the author notes that there is no consensus of the effect this increase in speculation has had on oil prices and price volatility and the author notes that commodities without futures markets have experienced similar, if not greater, price increases since 2001. Using this framework, the authors explain the oil price movements in 2008 and 2009 through a combination of fundamental factors and revised expectations for oil prices in both the short and long-term.

In the first half of 2008 expectations about the existence and timing of any feedback to stem the rising price of oil were destabilised. This destabilisation in combination with inelastic supply and demand and a news flow emphasising supply shortages in the short and long term created an uncertain environment which contributed to the dramatic increase in oil prices. The dramatic decrease in prices from July 2008 to February 2009 can be seen in two distinct phases. First, a ñcooling offòin prices from their peaks due to increased supply of key marginal producers following the Jeddah meeting in June 2008 and increasing evidence of a weakening demand in OECD countries. Second, the global financial crisis and ensuing recession decreased global growth expectations and thus demand for oil. The rising oil prices from February 2009 are due to an expectation of medium and long-term tight fundamentals due to increased global growth prospects and thus demand.

The author concludes the paper with policy prescriptions aimed at stabilising oil prices by stabilising expectations. Expectations are formed on the basis of data, thus improving the quantity and/or quality of data related to oil price fundamentals may help to stabilise oil prices. In addition, the author argues that oil importing and exporting countries should cooperate to stabilise market participantsôexpectations about a range of preferred oil prices.

Comments: The author admits that the framework for oil price determination introduced in this paper may be viewed as lacking theoretical microeconomic justification. Furthermore, regarding the effect speculation has on oil prices, the author does not perform any original analysis but merely quotes data and results from other papers which are subject to their own limitations.

9 The Impact of Index and Swap Funds on Commodity Futures Markets

Author(s): Scott Irwin and Dwight Sanders

Published: OECD, 2010

Commodities: corn, soybeans, crude oil, coffee, cocoa and lean hogs

Time period: 2000-2009

Methodology: The paper aims to test whether the major growth in index funds has increased price volatility in both agricultural and energy markets and, in particular, whether they helped cause a commodity price bubble in 2006-8.

The analysis uses two related data sets compiled by the CFTC to get at the breakdown between commercials (hedgers), and non-commercials (speculators) and to get an estimate of index fund positions. After noting that simple correlations (as shown for instance on graphs) can be misleading, the authors conduct a Granger-Causality test between measures of trader positions and speculation against various measures of returns including their volatility which should show whether the sets of data on trader positions is helpful in forecasting returns. Furthermore, using a systems approach more formal Granger-Causality tests are conducted for a number of causal variables and market characteristics. The authors also use a measure of the degree of excessive speculation in the markets called Workingôs T (see paper by Working discussed reviewed below) to examine its effect on price volatility.

Summary: The results from the tests provide strong evidence that index funds did not cause a price bubble in commodity futures markets, especially with respect to agricultural futures markets. The evidence is not as strong in the two energy markets which the authors attribute to limited data. The authors also find increasing index fund positions are consistently associated with declining price volatility but admit it may be due to a third common factor. This paper gives a plausible explanation for this negative correlation arguing speculation helps to provide sufficient liquidity for hedging needs.

The authors conclude by recommending that policy makers carefully consider any regulatory changes in the commodities futures market so as to avoid depriving them of an important source of liquidity and risk-absorption capacity. However, the

authors admit further research is needed in the field of price formation dynamics to better assess the role of index funds in the functioning of commodity markets.

Comments: The authorsô conclusions rely upon Granger-Causality which does not prove causality. Additionally, the authors concede that there is not sufficient data on trader positions in the energy markets to draw any firm conclusions.

10 Does Speculation Affect Spot Price Levels? The Case of Metals with and without Future Markets

Author(s): George Korniotis

Published: Federal Reserve Board, 26 May 2009

Commodities: copper, aluminium, lead, nickel, tin, zinc, steel, manganese, cadmium, cobalt, tungsten, rhodium, ruthenium and molybdenum

Time period: 1992-2008

Methodology: This paper focuses on non-precious metals markets with and without futures markets and any differences in price behaviour between them to determine the effect financial investors have on spot prices.

Non-precious metals are usually complementary goods (i.e. their spot prices should move in tandem); the author uses this fact to test whether the annual and quarterly price changes of traded and non-traded metals continue to move in tandem since the increase in speculative activity in traded metals since the early 2000s. The author then performs a structural break test to determine whether there was a fundamental shift in price behaviour for traded and non-traded metals in 2002 when most non-precious metals prices began to increase dramatically. Additionally, the author looks at whether any co-movement of non-precious metal prices are driven by economic fundamentals by regressing world per capita GDP growth and patterns in metals price growth in combination with an examination of ñprice increasingò and ñprice decreasingò news reports over the same period.

Finally, the author focuses directly on the relationship between speculation in futures markets and spot commodity market prices. To test this relationship the author performs a regression between returns of the Standard and Poors Goldman Sachs Commodity Index (SPGSCI) and spot prices. In addition, the author looks to see whether physical hoarding is correlated with price growth with the argument that speculation can only influence spot markets if it leads to physical hoarding.

Summary: The results obtained from the tests described above all point to a lack of evidence that speculation drives prices. The co-movement tests conclude that exchange-traded and non exchange-traded metals continue to move in tandem following the structural break observed in 2002 and despite the increase in speculative activity in exchange-traded metals. Furthermore, the author concludes that fundamental information and not speculation drives both exchange-traded and non exchange-traded metals prices and there is no empirical evidence of a direct link between speculation and spot prices (i.e. SPGSCI returns are uncorrelated with metal prices and there is no evidence of physical hoarding in exchange-traded metals).

In conclusion, the results indicate speculation has not disturbed the relationship between futures and physical industrial metal markets and the spot prices changes are primarily driven by world economy activity with financial investors merely responding to these price changes.

Comments: Some of the evidence used is inevitably a bit ad hoc: the assessment of supply and demand information using news reports for instance. There may also be a case that the co-movement between prices of metals where there are and are not futures markets are being driven by other factors (something argued in other papers with respect to wheat and rice).

11 Is Speculation Destabilizing?

Author(s): Celso Brunetti and Bahattin Büyükκahin
Published: 22 April 2009
Commodities: crude oil, natural gas and corn
Time period: 2005-2009

Methodology: The authors use a unique data set from the CFTC to determine if specific trader positions are useful in forecasting price movements in the crude oil, natural gas and corn futures markets using Granger-Causality tests. Further, to assess the impact of speculation on price volatility the authors run Granger-Causality tests to determine if trader positions are useful in forecasting price volatility in the futures markets being studied. Once Granger-Causality has been determined the authors use impulse response functions to determine the effect i.e. increasing or decreasing price volatility.

Summary: Using the methodology described above, the authors offer two main conclusions. Firstly, the position hedge funds hold does not contain useful information for predicting returns in the futures markets analysed, namely crude oil, natural gas and corn. Rather, hedge fund activity is Granger-caused by the other variables in the system. Secondly, the authors find that swap dealer and hedge fund activity Granger-cause a reduction in price volatility. The authors claim the results establish an important conclusion that speculation does not destabilize prices even during price surges and that speculation is, in general, responsive to market conditions and not the other way around.

Therefore, the authors conclude that speculative activity as a whole does not cause price movements and improves the functioning of futures markets by reducing price volatility while increasing liquidity.

Comments: Although Granger-Causality tests are relatively easy and well recognised, inevitably they have limitations which the authors concede:

> *"Unfortunately, Granger-causality does not allow us to distinguish between causes and effects. Nonetheless, Granger-causality is easy to compute and provides useful information as to whether a trader activity prompts, in a forecasting sense, price movements and/or vice versa."*

In addition, while the authors conclude speculation as a whole is beneficial to the functioning of futures markets they do not rule out the possibility that a single trader might implement trading strategies that move prices and increase price volatility.

12 Understanding Crude Oil Prices

Author(s): James Hamilton
Published: Energy Journal, 2009
Commodity: crude oil
Time period: 1970-2008

Methodology: To examine the factors responsible for changes in crude oil prices the author proposes three broad approaches. The first is a statistical investigation of the basic correlations between the percentage change in the oil price and the percentage change in the oil price, interest rate, or GDP growth rate observed in previous periods. The second approach examines three separate conditions that

should all hold in equilibrium according to economic theory. One, the expected price of oil in the next period is equal to the price in the current period plus the net cost of carry (returns to storage). Two, the current futures price is equal to the expected price in the next period plus a risk premium (futures markets) and lastly, the difference between the price and marginal cost of oil in the next period is equal to the difference in the current period times one plus the current interest rate (scarcity rent). The final approach examines the fundamental determinants and prospects for demand and supply by analysing estimates of price and income elasticities produced by various studies and data on quotas and actual oil production.

Summary: Using the three approaches described above, the author concludes that, rather than competing hypothesis, there is an element of truth to all of them. Nevertheless, the author identifies the three key features as the low price elasticity of demand, the strong global growth in demand from emerging markets and the failure of global production to increase in line with demand. The author suggests that these initial pressures may have triggered commodity speculation in the first place which may have alerted oil producers that small declines in production could increase current revenues and also be in their long run interests as well.

With respect to the first approach (correlations), the author concludes that oil prices follow a random walk without drift i.e. they are unpredictable. With respect to economic theory, the author finds historical oil prices are consistent with the three conditions identified and that the scarcity of oil, while it has not had a substantial impact on prices to date, may start to make a larger impact in the future amidst increasing demand from emerging economies. In addition, the author outlines a theoretical argument which suggests that speculation can create a positive feedback loop in the short-term. With respect to the supply and demand fundamentals, the author concludes that low price elasticity, strong demand growth in emerging markets and the failure of global production to increase in line with demand are the key factors behind the movement in crude oil prices.

Comments: The author does not provide his own analysis or evidence to support the claim that speculation succeeded in driving the futures prices up; this is a necessary preliminary result for the conclusion that speculation affects spot prices.

Further, the author notes the circularity inherent in trying to determine effect of speculation on oil prices:

> *"For this reason, an ongoing speculative price bubble would have to result in continuous inventory accumulation, or else be ratified by cuts in production. The former is clearly unsustainable, and if it is the latter, one might make the case that supply cuts rather the speculation itself has been the ultimate cause of the price increase."*

13 The rise and fall in oil prices: analysis of fundamental and financial drivers

Author(s): Global Energy Team

Published: UK Cabinet Office, December 2008

Commodity: oil

Time period: 2000-2008

Summary: This paper examines the unexpected movement in the oil price in 2008 by analysing the behaviour and relationship between spot and futures prices. The authors identify three plausible drivers of spot and futures prices: current market conditions, expectations of future conditions and financial flows into futures markets.

The authors analyse the evolution of supply and demand and conclude that the price movements observed since 2000 are determined primarily by market fundamentals, namely robust demand from emerging economies and supply restrained by lack of investment and uncertainty about future prices. However, the sharp price rise in 2008 coincided with an easing in the demand-supply balance and thus raised concerns about the functioning the market. Nevertheless, the authors find no empirical evidence that the increase in financial activity has systematically driven up prices. However, they do offer a possible explanation for the 2008 price rise whereby a surge in financial flows into the oil futures market led to high futures prices and tight oil market conditions led to high spot prices and these two phenomena reinforced each other.

Finally, the authors suggest policies to improve transparency in the commodities markets both on the fundamental and financial side to better inform their functioning.

Comments: Although the authors speculate that a reinforcing circle of high futures prices caused by an increase in investment and high spot prices caused by a tight market may have caused the oil price rise in 2008 they provide no evidence to support this claim. Indeed, the authors concede that ñthere is no empirical evidence of traders in financial markets having systematically driven up pricesòbut this may be due to a lack of detailed data.

14 World Economic Outlook: Financial stress, Downturns, and Recoveries

Author(s): International Monetary Fund

Published: October 2008

Commodities: oil, wheat, corn, gold and others

Time period: 1995-2008

Summary: The relevant chapter in this paper examines the drivers behind the rise in commodity prices observed in 2008 and the risks associated with this rise. The role speculators and increased financial investment in commodity markets may have played is also examined and, while financialisation may have contributed to increased co-movements, no systematic connection is found between speculation and price volatility or price changes.

To determine the effect of speculation on commodity prices the authors review the evidence provided by three methods most commonly used in the literature: Granger-Causality tests to determine whether trader positions cause price changes, an examination of recent inventory behaviour to determine whether speculation has caused hoarding and an examination of the relationship between prices before and after the financialisation. The authors conclude that most studies (including their own primitive regressions) do not find a relationship between trader positions and price changes, physical inventories have remained steady or declined during the recent price rises suggesting that speculation does not influence prices significantly and, lastly, co-movements among commodities have increased recently. Therefore, while the increase in speculation may have increased co-movements across commodities, there is no apparent systemic connection between speculation and commodity price volatility or price changes.

Rather, the authors conclude that strong demand from emerging economies, low capacity, low inventories resulting in slow supply responses and the interaction

between these factors have been the primary causes of the surge in commodity prices observed in the first half of 2008. In addition, demand for biofuel, supply disruptions and trade restrictions have caused food prices to surge even higher. The authors also note that this price momentum may have been reinforced by increased cross-commodity price linkages (i.e. co-movements).

Comments: The authors concede that ñdata on commodity inventories are poor and lack global coverageò

15 High prices on agricultural commodity markets: situation and prospects

Author(s): European Commission

Published: July 2008

Commodities: maize, rice, wheat and soybeans

Time period: 2006-2008

Summary: The focus of this paper is the cause of recent increases in agricultural commodity prices, specifically in 2008, and the prospects for high agricultural commodity prices in the future. The author concludes that the primary reasons for the current price pressures are a combination of increasing demand and lagging supply or production which has been exacerbated by short-term economic and policy factors. Further, the authors claim that structural factors like the growth in global food demand can be expected to maintain prices at sustained levels over the medium-term, though substantially lower than prices observed in 2008.

The author identifies three themes into which the major price drivers can be grouped: changes in agricultural production, changes in the macroeconomic environment and changes in agricultural and trade policies. The author notes that these factors are both cyclical and structural and that they vary between sectors. However, the author claims the price rises observed during 2008 cannot be explained by accepted market fundamentals.

With respect to speculation, the authors note the increase observed between 2005 and 2008, particularly in ñpassive investorsò. The authors group passive investors into two categories: those seeking portfolio diversification and those seeking profit. The author concedes that ñthere are divided opinions on whether more liquidity on the futures markets means more or less price volatilityò; nevertheless, the author

cites research (without citing specific articles) that indicates speculators were more likely to raise spot price volatility. Further, the author notes the possibility of positive feedbacks which could initiate a ñcycle of cash price destabilizationò

To conclude, the author sets out three key areas for action including efforts to mitigate the short to medium term impact of price rises, initiatives to increase supply in the longer term and efforts to address the crisis at the international level.

Comments: The results of this paper primarily rely upon visual inspection of various graphs. With respect to the impact of speculation on agricultural commodity prices, the author does not perform any tests or give any references to specific papers supporting the conclusion.

16 Interim Report on Crude Oil

Author(s): Interagency Task Force on Commodity Markets
Published: CFTC, July 2008
Commodities: crude oil
Time period: 2003-2008

Methodology: This paper provides an assessment of the fundamentals and market factors affecting the crude oil market between January 2003 and June 2008. With respect to fundamental factors, the authors rely on descriptive statistics and graphical representations from the Energy Information Administration and the International Energy Agency to assess the impact of changes in supply and demand on oil prices. Relationships between other macroeconomic variables and oil prices are also examined using similar methods. With respect to the impact of market participants, the authors perform Granger-Causality tests to determine whether changes in trader positions precede price changes or vice versa. The authors rely upon disaggregated CFTC data which includes 4 categories of ñcommercial participantsò (producers, manufacturers, dealers and swap-dealers) and 2 categories of ñnon-commercialò participants (hedge funds and floor brokers and traders).

Summary: The authors conclude that oil prices between January 2003 and June 2008 are largely due to fundamental supply and demand factors. The authors note the increase in activity in the oil futures market which coincides with price increases, however, the authorsôanalysis does not support the proposition that

speculative activity has systematically driven changes in oil prices. Rather, the rise in oil prices is mainly attributed to substantial increases in demand, particularly from emerging market countries, slow supply responses in combination with production shortfalls associated with geopolitical unrest and the inelasticity of demand.

The authorsôGranger-Causality tests indicate that changes in futures market participation by speculators have not systematically preceded price changes. On the contrary, most speculative traders change their positions after price changes suggesting that they are responding to new information ï just as one would expect in an efficiently operating market.

To conclude, the authors claim new and improved data will help market observers to better understand commodity markets.

Comments: Granger-Causality tests have some limitations, specifically they cannot prove causality. Further, since the analysis was performed for trader groups rather than individuals, it is impossible to determine the price influences some traders may have within a trading group.

Furthermore, the data on which the Granger-Causality tests are based relates to end of day positions and thus fails to capture any intraday position-price relationships. Finally, the tests were performed on aggregated net position changes in the nearby contracts alone which do not necessarily reflect any systematic effect of position changes at different maturities of the contracts.

17 Do Birds of a Feather Flock Together?

Author(s): Robert Weiner
Published: Resources for the Future, June 2006
Commodity: sweet crude oil and heating oil
Time period: 1993-1997

Methodology: The author uses a detailed database of two widely traded NYMEX petroleum contracts (sweet crude oil and heating oil) from 1993 to 1997 to test the prevalence or ñherdingò and ñflockingò among speculators (i.e. non-commercial traders) in futures markets. The author defines herding as trading in the same direction as a group within a market whereas flocking is defined as trading in the

same direction as a subgroup within a market. The author identifies two theories behind rational herd behaviour: the asymmetric information hypothesis and the monitoring/incentive hypothesis. Each theory generates different predictions with respect to which type of investor is most likely to exhibit herd behaviour and the author uses these theoretical predictions along with two empirical tests to assess whether herding or flocking occurs and why. The first test compares the number of buyers and sellers within and across groups and attributes any systematic deviations from equality to herding or flocking. The second test uses the position-change correlations for commercial traders (which do not exhibit herd behaviour) as a benchmark to compare the position-change correlations of non-commercial traders. The author attributes any systematic differences between the correlations of commercial and non-commercial traders to herding or flocking.

Summary: The results from the tests described above suggest speculators as a group did not herd. However, evidence is found that some subgroups of speculators tend to act in parallel ("flock"), notably commodity pool operators (equivalent of mutual funds in securities markets). Despite this, the extent of parallel trading is modest among those subgroups that flock.

The two theories behind rational herding are examined to determine the most likely reason for this flocking behaviour. The author finds no empirical evidence to support the asymmetric information view in which poorly informed traders make decisions based on observations of well-informed traders. However, the author finds evidence to support the monitoring/incentive theory in which institutional investors make decisions knowing their incentives are based on performance relative to a benchmark.

The main implication of this paper is that the influence of speculators on oil prices and price volatility is likely to be limited. In concluding, the author suggests more attention should be paid to issues related to market fundamentals rather than investigations of speculation activities.

Comments: We note that this study is somewhat dated and prior to the dramatic increase in index investment observed during the 2000s.

18 Facts and Fantasises about Commodity Futures

Author(s): Gary Gorton and K. Geert Rouwenhorst

Published: Financial Analysis Journal, March/April 2006

Commodities: none in particular

Time period: 1959-2004

Methodology: This paper looks at the long-term properties of commodity futures as an asset class by examining an equally weighted index of commodity futures covering the period 1959 through 2004 that is constructed by the authors. The authors use descriptive statistics and graphical representations to analyse the return and volatility characteristics of the constructed index in comparison with equities and bonds. The authors then compare the behaviour of the commodity index with that of equities and bonds by regressing the returns of the commodity index on the returns of equities, bonds and the interest rate. Finally, the authors examine the returns of various assets including the commodity index over the business cycle.

Summary: This paper concludes that commodity futures returns have provided effective diversification for stock and bond portfolios. Commodity futures have offered the same return and risk premium as equities over the study period and are negatively correlated with equity and bond returns due to different behaviour over the business cycle and positively correlated with inflation, unexpected inflation and changes in expected inflation.

Furthermore, the authors also suggest possible areas for future research which include the source of the documented risk premium, the source of the positive skewness observed in commodity returns and lastly, the reported returns to trading strategies that select commodities by their future basis.

Comments: The main concern lies in the index of commodity futures constructed by the authors. Due to differences in the nature of the commodities, size of the futures market and the volume of trade in each futures market it is debatable whether the authorsôcommodity index is truly representative, complex and versatile. However, papers like this have been important in encouraging people to invest in commodities, in particular index funds, and as such have contributed to the ñfinancialisationòof the commodity markets.

19 Onions revisited

Author(s): Roger Gray

Published: Journal of Farm Economics, 1963

Commodity: onions

Time period: 1922-1962

Methodology: The study uses the fact that futures trading in onions has only occurred at any scale for around a decade (in the 1950s) before being banned to look at how prices moved in each period.

The author uses data from the USDA on prices received by farmers for onions over the whole period (i.e. 1922-1962). The author then looks at these seasonal price changes over four selected periods. The first period was 1922-1941 when no futures market existed. The second period was 1949-1958 when a significant level of business was carried in the futures market. The third period, 1942-1949, was arbitrarily defined as the period between these two and the fourth period was 1958-1962 after the prohibition of onions futures trading. The variations in prices are then compared graphically.

Summary: By comparing the seasonal price volatility observed in periods prior to the existence of futures markets, during their existence and after their prohibition the author concludes that futures market reduced price volatility. The author argues futures trading improves the functioning of the market, providing more opportunities to trade onions and hence the volatility of the onion price is reduced.

Comments: This is a suggestive paper rather than conclusive proof. The wide range of lengths of the selected periods is not really suitable for comparison and no statistical techniques are used. Specifically, among these the most recent 4-year period could be too short to see any fair adjustment of price volatility after prohibition of onions futures trading, as the author concedes. Nevertheless it clearly shows that price volatility was less when future markets in onions were active.

20 Speculation on Hedging Markets

Author(s): Holbrook Working

Published: Food Research Institute Studies, May 1960

Commodities: cotton, wheat, soybeans, corn, eggs, wool tops, onions, potatoes

and bran

Time period: 1954-59

Methodology: This paper examines the relationship between speculation and hedging. The argument is made that the amount of ñexcessiveò speculation can only be determined in relation to the amount of hedging present since speculation is needed to allow hedging to take place. Various calculations are made to assess this ratio and to see how it varies between commodities.

Based on data from the USDA and the Commodity Exchange Authority (now the CFTC) the author compares the number of contracts of different classes (long and short hedging and speculation) for 11 products. He then uses an estimation procedure to better allocate the large number of non-classified contracts across these categories (rather than add them to small-scale speculation as had been done before). After having computed these ratios the author notes that the ratio of long speculation to short hedging (what he terms the ñspeculative ratioò) is fairly constant across commodities. Working uses this result to conclude that speculation is "causedò by the short hedging and not the other way round.

The author then compares the hedging ratio (between long hedging and short hedging) and the ñspeculative ratioò (between long speculation and short hedging) concluding that some of the excess speculation is in fact needed (ñeconomically necessaryò) and would imply strange behaviour if there was none - like no speculator expecting the price to fall.

Finally, Working discusses the relationship between long (short) speculation and short (long) hedging (the ñspeculative indexò) for the eleven commodities markets keeping in mind the different characteristics of each market. The author focuses on measuring the responsiveness of speculation to the continuously changing hedge carrying needs of the market to supplement his argument that the amount of speculation in these markets depends on the amount of hedging in the market.

Summary: Using the methods described above, the author argues that futures markets are primarily hedging markets and therefore not driven by speculation. The amount of speculation in these markets depends primarily on the amount of hedging in the market and no such market can exist without a sufficient quantity of

hedging to support it. In other words, speculation is to a great extent a consequence of hedging rather than a separate driver of prices.

Comments: The author uses improved data and statistical estimates to try and uncover the relationship between long speculation and short hedging: it is however based on an incomplete statistical procedure which the author admits gave a ñdistorted comparisonò

The author seems to find a strong correlation between the amounts of long speculation in these eleven commodities and the amounts of short hedging, however, the methods used are not able to determine causality.