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Commodity Speculation and Commodity Investment

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Abstract

I distinguish between speculation and index-based investment in commodity futures stressing the differing motivations of the two groups and the differing instruments that they use. I discuss the amounts of money deployed in these activities. I document evidence of extrapolative behaviour in metals prices, consistent with speculation affecting prices, and show that in at least one market (soybeans) index-based investment has a significant and persistent price impact.

JEL subject code: G110
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1. Introduction

Most major primary commodities are actively traded on futures markets and the prices discovered on these markets forms the basis for transactions prices in international commerce. Transactors in futures markets are generally classified as either hedgers or speculators and the exchanges are seen as transferring price exposure from the hedgers to speculators in exchange for a risk premium. Speculators take a view, either on the basis of information or through the use of more or less sophisticated trend-spotting procedures, on the prospects of the particular commodities in which they take positions. They provide the liquidity which allows hedgers to find counterparties. However, over the past two decades, a third class of transactors has become important. These are investors who regard commodity futures as an asset class, comparable to equities, bonds, real estate and emerging market assets and who take positions on commodities as a group based on the risk-return properties of portfolios containing commodity futures relative to those confined to traditional asset classes. As Masters (2008) testified, their behaviour is very different from that of traditional speculators, and it is therefore possible that this will result in different effects on market prices.

The sums of money invested by this third group of commodity investors may be very substantial. According to many commentators, this class of inventors has come to dominate the commodity futures markets with the consequence that fundamental movements have been relegated to a minor, supporting, role. Commodity markets have become akin to foreign exchange markets where weight of money outweighs the relative competitiveness (Purchasing Power Parity) fundamental. In June 2008 testimony to the U.S. Congress, George Soros asserted that investment in instruments linked to commodity indices had become the "elephant in the room" and argued that investment in commodity futures might exaggerate price rises (Soros, 2008). These comments were echoed by the British peer Meghnad Desai who further claimed that 2008 oil price rises were speculative and appeared to be a financial bubble.[1] One might paraphrase this view as stating that, in effect, the funds have become the fundamentals.

Over the past two decades, investment in commodities through managed commodity futures funds or using other vehicles has become a large, popular and profitable activity. The principles of, and problems with, commodity investment are well understood in the financial community, and have been set out in a number of recent practitioner-oriented publications –

[1] "Act now to price the bubble of a high oil price", *Financial Times*, 6 June 2006.

see Gregoriou *et al*. (2004), Till and Eagleeye (2007) and Fabozzi *et a*l. (2008a). There have been fewer discussions of commodity investing which succeed in bridging the industry-finance gap – see Geman (2005, especially chapter 14) and Radetzki (2007, 2008, ch.5). Perhaps as a result, commodity investors continue to be regarded with suspicion by other market participants and by outside commentators who see their activities as distorting the operation of the markets. Some politicians have followed Lord Desai in suggesting that these actors may be at least partially responsible, directly or indirectly, for recent high commodity price levels and have called for restrictions or limitations on futures trading. In this paper, I discuss of the mechanics of commodity speculation and investment and consider its effects on the cooperation of the underlying physical markets.

In section 2, I distinguish between the various actors in commodity futures trading and ask whether the widely-used *Commitments of Traders* data, made available by the Commodity Futures Trading Commission (the CFTC), is informative in relation to these distinctions. In section 3, I discuss actors normally thought of as speculators (Commodity Pool Operators, hedge funds and other traditional speculators) while section 4 looks at index-based investment. Section 5 looks at the returns on index-based investment and suggests that these returns may be lower in the future than has been the case over recent years. In section 6 I summarize the evidence on the effects of speculation on futures prices and volatility, and in section 7, I present evidence on the effects of index-based investments on prices. Section 8 contains conclusions.

2. Instruments and actors

Futures exchanges facilitate both commodity speculation and commodity investment. They do this in three ways:

a) Futures enable separation of ownership of the physical commodity from assumption of the price exposure. It is possible to speculate or invest by buying the physical commodity but this will usually be very costly. When a speculator or investor takes a long futures position, ownership of the physical commodity remains with a merchant or producer who has a corresponding short position in the future. Use of futures avoids the trouble and costs of managing the physical position.
b) Because one can only sell a physical commodity if one already owns it, it is difficult to take a short position in a purely physical market. Futures makes this straightforward – the costs of being long and short are identical.

c) Purchase of a physical commodity requires full cash payment at the time of purchase. It is possible for the speculator or investor to lever his position by taking a bank loan using the commodity as collateral but it is likely that the bank, conscious of the price risk, will only offer a fraction of the value. The purchaser of a futures contract will not be required to make any initial payment (a futures contract has zero value at the time of contracting) but will be required to make a deposit of initial margin, typically 10% of the value of position for a client of good standing – see Edwards and Ma (1992) and Hull (2006). Futures therefore allow much higher leverage than physicals.

Futures contracts can only be traded on the exchange which originates them – contrast this with equities which can be traded on multiple platforms. Much speculation and investment takes place off exchanges through OTC ("over the counter") rather than exchange contracts, in particular in the form of commodity swaps. An OTC contract can either be an exchange "look alike", in which case it differs from an exchange future only in that it is not intermediated through the exchange clearing house, or may have a different contract specification (e.g. delivery date or location).

Exchange-traded funds (ETFs) and commodity index certificates (the OTC analogue of ETFs) are two specific instruments which facilitate commodity investment. Commodity ETFs are funds which invest in commodity futures but whose price is directly quoted on an exchange. They may either restrict themselves to specific commodities – ETFs are currently available for crude oil, gold and silver – or aim to replicate the returns on a commodity futures index. They have the same structure as closed end funds in equities. Certificates are legal obligations, typically issues by banks, which yield a return defined by an underlying set of commodity futures investments. They have a structure closer to that of open end funds in equities. See Engelke and Yuan (2008) and Fabozzi *et al*. (2008b, p.13) for further discussion.

Swaps are portfolios of OTC futures. In a commodity swap, the long party receives payments in proportion to the gains on a portfolio of futures contracts and pays either a fixed or floating interest rate. OTC contracts have the advantage that they can be designed to suit client requirements, but the disadvantage that they can only be closed out through the original counterparty, i.e. swaps are non-fungible. Importantly, commodity swaps imply counterparty risk as well as commodity price risk. In a swap, the counterparty (usually a bank) will typically offset the net position in its swap book on exchange markets, and the swap will be marked to market against the exchange forward curve. Many institutional investors find it convenient to take on commodity exposure through a swap structure leaving the counterparty to manage the offsetting futures investments. Commodity swaps are currently the most important instrument by which investors take positions on commodity futures indices (ITF, 2008, p.22).

Edwards and Ma (1992, p.11) state "Futures contracts are bought and sold by a large number of individuals and businesses, and for a variety of purposes". This remains true. Broadly, we may delineate four classes of actors:

a) Hedgers: These are "commercials" in CFTC terminology. They have an exposure to the price of the physical commodity (long in the case of producers and merchants with inventory, short in the case of consumers) which they offset (usually partially) by taking an opposite position in the futures market.
b) Speculators: They take positions, generally short term based on views about likely price movements. Speculators may be divided between those who trade on market fundamentals and those who trade on a technical basis, i.e. on the basis of past trends or other, more complicated, price patterns. Hedge funds and CTAs (see below) typically fall into this category. Many speculative trades are "spread" rather than "outright" trades, that is to say they involve taking offsetting positions on related contracts (generally different maturities for the same future).
c) Investors: Investors take positions (usually long and usually indirectly) in commodity futures as a component of a diversified portfolio. This is the class of actors which appears to have grown dramatically over the two most recent decades.
d) Locals: Originally pit traders with modest capital but now mainly screen traders often operating from trading "arcades", locals provide liquidity by "scalping" high frequency price movements driven by fluctuations in trading volume and size. Many of their positions will also be spreads rather than outrights. Locals may also arbitrage across markets or exchanges.
e) Index providers: Banks or other financial institutions who facilitate commodity investment by providing suitable instruments, typically ETFs, commodity certificates or swaps. These institutions will generally offset much of their net position by taking offsetting positions on the futures markets.

These categories are easier to separate in principle than in practice. A producer or consumer who chooses not to hedge, or who hedges on a "discretionary" basis, is implicitly taking a speculative position. Some locals may hold significant outright positions over time. Long term investors will take speculative views on commodities versus other asset classes, and on specific groups of commodities (metals, energy etc.). Some agents have mixed motives.

As already noted, many positions will be held through intermediaries:

- US legislation defines a commodity pool as an investment vehicle which takes long or short futures positions. A Commodity Pool Operator (CPO) operates a commodity pool. Commodity Trading Advisors (CTAs) advise on and manage futures accounts in CPOs on behalf of investors. A CPO investment is a straightforward means of investing in a portfolio of commodity futures.
- Hedge funds invest on behalf of rich individuals. Some of these investments are likely to be in commodity futures or swaps. "Funds of funds" are hedge funds, or CPOs which invest in other hedge funds or CPOs, generating greater diversification albeit at the cost of a second level of fees. A small number of hedge funds are focussed specifically on traditional commodities, generally with an emphasis on energy and non-ferrous metals.
- Exchanges offer ETFs defined either in terms of specific commodities or commodity indices. Banks offer certificates with returns tied to or related to the same indices.

The CFTC requires brokers to report all positions held by traders with positions exceeding a specified size, and also to report the aggregate of all smaller ("non-reporting") positions. These positions are published in anonymous and summary form in the weekly CFTC *Commitments of Traders* (COT) report. The CFTC classifies reporting traders as either "commercial" or "non-commercial" depending whether or not they have a commercial interest in the underlying physical commodity. Commentators, both academic and in the industry, routinely interpret commercial positions as hedges, non-commercial positions as large speculative positions and non-reporting positions as small speculative positions – see Edwards and Ma (1992, pp.15-17). Upperman (2006) provides a guide to trading on the basis of the COT reports.

It is widely perceived that, as the consequence of the increased diversity of futures actors and the increased complexity of their activities, the COT data may fail to fully represent futures market activity. Many institutions reporting positions as hedges, and which are therefore classified as commercial, are held by commodity swap dealers to offset positions which, if held directly as commodity futures, would have counted as non-commercial. As the CFTC itself noted "… trading practices have evolved to such an extent that, today, a significant proportion of long-side open interest in a number of major physical commodity futures contracts is held by so-called non-traditional hedgers (e.g. swap dealers)

… This has raised questions as to whether COT report can reliably be used to assess overall futures activity …" (CFTC, 2006, p.2).

Responding to these concerns, the CFTC now issues a supplementary report for twelve agricultural futures markets which distinguish positions held by institutions identified as index providers. However, they have chosen not to provide this additional information for energy and metals futures, at least for the present, on the grounds that offsetting may involve taking positions on non-US exchanges and because many swap dealers in metals and energy futures have physical activities on their own account making it difficult to separated hedging from speculative activities. See CFTC (2006). I make use of the data from the supplementary reports in the analysis that follows.

3. CPOs, hedge funds and other traditional speculators

Commodity speculation has traditionally been thought of as undertaken by individuals – the proverbial New York cab drivers and Belgian dentists. Their activities are likely to be small in relation to the entire market and are reflected in the non-reporting columns of the COT reports.[2] There is no suggestion that this category of speculation has grown markedly over recent decades. Instead, commodity speculation has tended to be channelled through "funds", in particular CPOs and hedge funds. The growth in fund activity may reflect the increasing number of highly wealthy individuals and the difficulty in obtaining high returns in what has been, until recently, a low inflation environment.

Table 1
2002 Funds Snapshot

	Number	Median Assets ($m)	Total Assets ($bn)	Median fee structure
CPOs	1510	13	162	2% + 9%
Hedge Funds	2357	36	1580	1% + 20%
Funds of Funds	597	34	343	1% + 20%

CPOs are funds operated by CTAs. Total assets may double count money invested through funds of funds. Fee structure is fixed + percentage of profits. Source: Liang (2004).

Table 1, taken from Liang (2004), gives a snapshot of money under management in CPOs, hedge funds and funds of funds in 2002. These figures almost certainly exaggerate the

[2] i.e. Brokers report the aggregate of these positions to the CFTC, not the positions themselves.

amount of money estimated in “traditional commodities”. There are two reasons for the overstatement in the aggregate fund figures:

- Most hedge funds invest across the entire range of asset classes. Instruments relating to traditional commodity markets are likely to account for only a small proportion of these investments.
- US CPOs and CTAs are regulated under the Commodity Exchange Act (CEA) which defines a commodity future as any futures contract traded on a futures exchange.[3] The commodity futures asset class therefore also includes financial futures as well as futures on traditional commodities. These are much more important in aggregate than futures on commodities.

Within the commodity class, energy futures have traditionally had the highest weight and agricultural futures the lowest weight. Metals are intermediate. Fabozzi *et al.* (2008b) state that in 2007 there were around 450 hedge funds with energy and commodity-related trading strategies. Schneeweis *et al*. (2008) offer a lower estimate of around $50bn in managed futures investment in 2002 rising to $160bn by the third quarter of 2006. Eling (2008) suggests a 2007 figure of $135bn under CTA management. There is no reporting requirement on positions held on non-U.S. exchanges, and this prevents out obtaining a complete picture of participation in global futures markets.

Irwin and Holt (2004), who use data deriving from a study undertaken by the CFTC on large positions on US futures exchanges over a six month period in 1994, provide the most comprehensive evidence on commodity allocations of CPOs and large hedge funds. Table 3, taken from Irwin and Holt (2004), gives percentage allocations on a gross and net volume (i.e. offsetting long and short positions) basis and confirms the heavy concentration on financial futures (including gold futures). Note, however, that positions in agricultural futures are comparable with those in energy. It is unfortunate that more recent data of this type are unavailable.[4]

The estimates in Table 2 suggest around 30% of commodity fund investments were in traditional commodities in 1994. Combining the estimates from Tables 1 and 2, and making the heroic assumptions that the same allocations apply to CTAs and hedge funds and that

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[3] The CFTC is responsible for regulation of what the CEA defines as commodity futures markets. It is unclear whether the CFTC or the Securities and Exchanges Commission (SEC) has responsibility for regulating futures on individual equities. The CEA is codified at 7 USC Section 1.

[4] Gupta and Wilkens (2007) have suggested quantification of CTA exposure through estimation of the betas of CTA returns. Their estimates are broadly in line with those reported in Table 2 but suggest lower weights for agriculturals.

these proportions were unchanged from 1994 to 2002, we may estimate that commodities accounted for that approximately $50bn of the $162bn managed by CTAs in 2002. (It is difficult to make a comparable judgement for hedge funds since their assets are not entirely, and perhaps not mainly, invested in futures).

Table 2
Composition of Large CPO and Large Hedge Fund Futures Portfolios, April – October 1994

	Gross Volume	Net Volume		Gross Volume	Net Volume
Coffee	1.6%	1.7%	Gold	25.7%	8.0%
Copper	2.9%	3.0%	Live hogs	7.4%	0.9%
Corn	5.4%	5.7%	Natural gas	0.9%	4.5%
Cotton	2.3%	2.6%	S&P 500	5.5%	7.1%
Crude oil	4.0%	8.4%	Soybeans	6.8%	6.1%
Deutschemark	8.2%	7.3%	Treasury bonds	23.2%	21.8%
Eurodollar	6.0%	22.9%			

Source: Irwin and Holt (2004), Table 8.2

Irwin and Holt also present the same numbers as a proportion of total trading volume on the relevant exchanges and I reproduce these numbers (again relating to 1994) as Table 3. At times when funds take large positions, these amounted to between one quarter and one half of total trading volume. Positions of this order are sufficiently high to have a significant market impact.

Table 3
Large CTA and Large Hedge Fund Futures Portfolios as a Share of Total Volume, April – October 1994

	Gross Volume		Net Volume	
	Average	Maximum	Average	Maximum
Coffee	6.9%	26.7%	5.9%	26.7%
Copper	11.1%	39.8%	9.3%	34.6%
Corn	7.0%	23.0%	6.0%	23.0%
Cotton	12.9%	39.4%	11.1%	39.4%
Crude oil	5.4%	19.5%	4.4%	16.3%
Deutschemark	5.3%	23.1%	4.8%	20.1%
Eurodollar	7.2%	28.5%	5.3%	23.6%
Gold	8.6%	24.7%	7.3%	24.7%
Live hogs	11.6%	47.8%	9.4%	47.8%
Natural gas	14.0%	54.4%	12.2%	53.6%
S&P 500	3.7%	14.9%	3.2%	12.0%
Soybeans	6.7%	12.6%	6.0%	21.6%
Treasury bonds	2.4%	10.3%	1.8%	7.5%

Source: Irwin and Holt (2004), Table 8.3

CTAs are obliged, under the CEA, to disclose their investment strategies. The most important distinction among CTAs is between the majority, which follow "passive" allocation strategies and the much smaller minority which adopt discretionary strategies. Passive strategies rely on trend identification and extrapolation – once an upward trend is identified, the fund will take a long position in the asset and *vice versa* for a downward trend. Trends are generally identified by application of more or less sophisticated moving average procedures – see Taylor (2005, ch. 7). CTAs compete on the predictive power of their trend extraction procedures and also on the extent of their activity – whether they always take a position in a particular future or whether they can be out of the market for that future for extended periods.

Hedge funds are both more diverse and less transparent than CTAs. They are not obliged to report their investment strategies which must therefore be inferred from performance. They will also typically be opportunistic and hence may not follow consistent strategies over time. I do not attempt to quantify their activities or importance in this discussion.

4. Commodity index investors

The driving rationale of investment in commodity futures is that commodities may be considered as a distinct "asset class", and seen in this light, have favourable risk-return characteristics. The claim that commodities form a distinct asset class, analogous with the equity, fixed interest and real estate asset classes, supposes that the class is fairly homogeneous so that it may be spanned by a small number of representative positions. Specifically, this requires that the class have a unique risk premium which is not replicable by combining other asset classes – see Scherer and He (2008). Given this premise, the claim that commodities form an asset class which is interesting to investors relies on their exhibiting a sufficiently high excess return and sufficiently low correlations with other asset classes such that, when added to portfolio, the overall risk-return characteristics of the portfolio improve – see Bodie and Rosansky (1980), Jaffee (1989), Gorton and Rouwenhorst (2006), and for a summary, Woodward (2008).

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Index funds set out to replicate a particular commodity futures index in the same way that equity tracking funds aim to replicate the returns on an equities index, such as the S&P500 or the FTSE100. The most widely followed commodity futures indices are the S&P GSCI and the DJ-AIG index. The S&P GSCI is weighted in relation to world production of the commodity averaged over the previous five years.[5] These are quantity weights and hence imply that the higher the price of the commodity future, the greater its share in the S&P GSCI. Recent high energy prices imply a very large energy weighting – 71% in September 2008. The DJ-AIG Index weights the different commodities primarily in terms of the liquidity of the futures contracts (i.e. futures volume and open interest), but in addition considers production. Averaging is again over five years. Importantly, the DJ-AIG Index also aims for diversification and limits the share of any one commodity group to one third of the total. The September 2008 energy share fell just short of this limit.[6] September 2008 weightings of these two indices are charted in Figure 1.

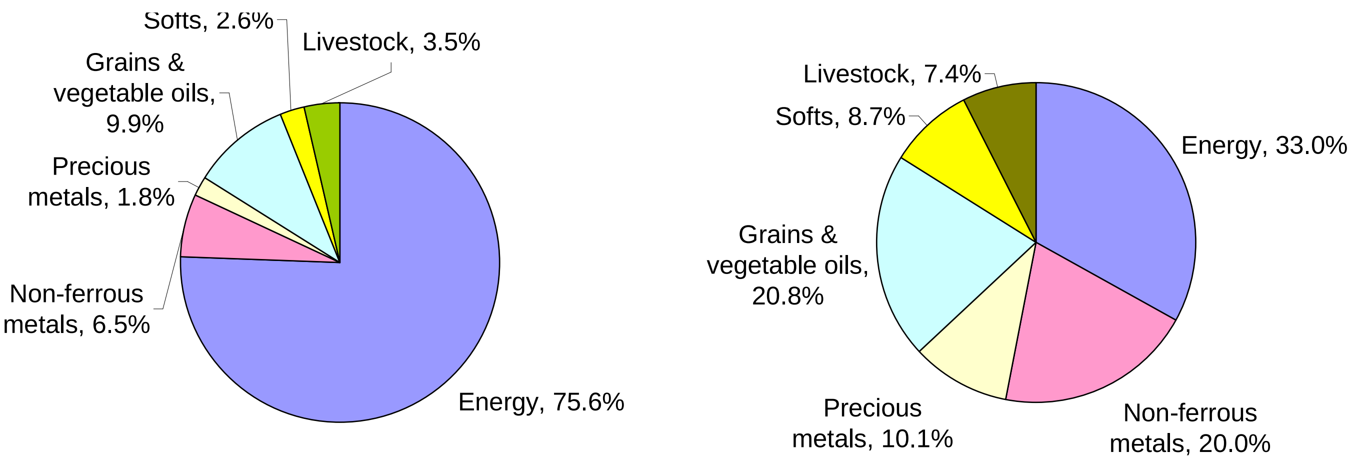

Figure 1: Commodity Composition, S&P GSCI (left) and DJ-AIG Commodity Indices, September 2008

The sums of money invested by this third group of commodity investors may be very substantial. Using official non-public information, the CFTC estimated the notional value of positions held by index-funds to the $146bn at end December 2007as $146bn ($118bn on

[5] http://www2.goldmansachs.com/gsci/#passive

[6] http://www.djindexes.com/mdsidx/index.cfm?event=showAigIntro Raab (2007) argues that returns on energy futures tend to be more highly correlated with returns on financial assets, implying that an over high energy weight reduces the diversification benefits of commodity investment.

U.S. exchanges) rising to $200bn at the end of June 2008 ($161bn on U.S. exchanges). See CFTC (2008). Table 4 summarizes these data for the eleven commodities covered in the CFTC's special call on commodity swap and index providers, reported in CFTC (2008).[7]

Table 4
Index Fund Values and Shares

	31 Dec 2007		30 June 2008	
	$bn	**Share**	**$bn**	**Share**
Crude oil	39.1	31.1%	51.0	26.6%
Gasoline	4.5	22.9%	8.0	23.9%
Heating oil	7.8	34.8%	10.0	34.5%
Natural gas	10.8	16.8%	17.0	14.7%
Copper	2.8	49.9%	4.4	41.7%
Gold	7.3	15.9%	9.0	22.7%
Silver	1.8	15.5%	2.3	20.1%
Corn	7.6	25.8%	13.1	27.4%
Soybeans	8.7	26.1%	10.9	20.8%
Soybean oil	2.1	24.8%	2.6	21.7%
Wheat	9.3	38.2%	9.7	41.9%
Cocoa	0.4	11.3%	0.8	14.1%
Coffee	2.2	26.0%	3.1	25.6%
Cotton	2.6	33.0%	2.9	21.5%
Sugar	3.2	29.0%	4.9	31.1%
Feeder cattle	0.4	23.2%	0.6	30.7%
Live cattle	4.5	48.4%	6.5	41.8%
Lean hogs	2.1	43.6%	3.2	40.6%
Other U.S. markets	0.7		1.4	
Total (U.S. markets)	117.9	26.8%	161.5	25.8%
Non-U.S. markets	28.1		38.4	
Overall total	146.0		199.9	

Source: columns 1 and 3 CFTC (2008) valued at front position closing prices; columns 2 and 4, CFTC, *Commitment of Traders* reports. The wheat figures aggregate positions on the Chicago Board of Trade and the Kansas City Board of Trade. Open interest is valued at the closing price of the front contract. The aggregate share relates to positions on U.S. exchanges for the listed commodities. Except in the final two rows, figures relate only to positions held on U.S. exchanges.

Of the $161bn of commodity index business in U.S. markets at the end of June 30 2008, approximately 24% percent was held by index funds, 42% by institutional investors, 9% by sovereign wealth funds and the remaining 25% by other traders (CFTC, 2008). The table

[7] Twelve contracts since wheat is traded on both the Chicago Board of Trade and the Kansas City Board of Trade.

also gives the shares of the index funds' net positions in total open interest. These average 26%-27%, but are much higher for copper, crude oil, wheat, live cattle and lean hogs.

5. Commodity index investment returns

Over the long term, the trend in physical commodity prices is determined by the trend in production costs. Two opposing factors are at work here:

- Productivity changes take place in the agriculture, mining and energy industries just as they do in manufacturing. The difference is that, while in manufacturing, much of these productivity advances show up as quality improvements (a 2008 automobile is quieter, more fuel efficient and safer than a 1978 automobile), in the commodities industries, productivity advance shows up entirely in lower prices (a barrel of oil in 2008 is identical to a 1978 barrel) – see Lipsey (1994). Productivity advances thus tend to put measured prices onto a downward trend.
- Metals and energy are non-renewable. Companies will exploit the highest grade and most accessible deposits before lower grade and more remote deposits. As these low cost deposits become exhausted, average extraction costs rise (Hotelling, 1931).

The first of these effects was dominant over the twentieth century and prices fell in real terms at around 2% per annum. A long buy-hold strategy for physical commodities would therefore not only have been expensive in terms of warehousing and financing costs but would also have yielded poor financial returns. This may change in the future if production does become constrained by lack of resources, as may already be the case with petroleum.

The returns from investing in commodity futures are more complicated. The returns from a long portfolio of commodity futures have four components – see Lewis (2007)

a) the spot or holding return,
b) the roll yield
c) the collateral yield, and
d) (depending on the definition of the portfolio) the recomposition yield.

The spot return is the appreciation or depreciation of the different futures contracts held in the portfolio. The roll return arises from selling short dated positions and moving into longer dated positions in the same future. The collateral yield is the risk-free rate of return earned on the investor's margin account. If the investment is unlevered, this will be the riskless return on the sum invested. Recomposition yield arises from periodic redefinition of the basket of commodities underlying the index. The total return is the sum of the four components. The final component, which may be important, is discretionary and hence is generally ignored. The excess return on a constant composition index is the sum of the first two components.

Consider first the holding (spot) return on the rolled futures position. This will differ from the spot return on the physical commodity by exclusion of the expected element in the latter. In practice, commodity price movements are largely unexpected with the result that movements in commodity futures prices are highly correlated with spot price movements – see Gorton and Rouwenhorst (2006). A second way of making the same point is that, if futures prices were unbiased, this return element would have expected value of zero. However, if speculators (and investors) are net long and commodity risk is not completely diversifiable, long futures positions can earn a risk premium. The evidence is emphatic that, over the long term, spot returns have contributed little to overall returns on rolled commodity futures positions – see Beenen (2005) and Erb *et al*. (2008). However, they were very important over the commodity boom of the first decade of the current century.

Roll returns will be positive when markets are in backwardation (i.e. when short dated positions are at a premium to longer dated positions) and negative in contango markets. The long term contribution of roll returns therefore depends on the extent to which "normal backwardation" (Keynes, 1930) prevails. The evidence on this is mixed. On the one hand, Erb and Harvey (2006) have shown that roll returns account for over 90% of total excess returns on rolled futures on specific commodities over the period December 1982 to May 2004 – see also Erb *et al*. (2008). On the other hand, there is little general evidence for normal backwardation – see Kolb (1992), who states "normal backwardation is not normal", and also Scherer and He (2008). The reconciliation of these conflicting pieces of evidence may be that, either by accident, design or evolution, commodity futures indices have been weighted towards those commodities with the highest excess returns and hence the highest roll returns. Energy products have dominated this list.

Rebalancing yield is important since commodity indices rarely retain a constant composition over time – see Erb and Harvey (2006). Portfolios which rebalance so as to capture backwardation tend to out-perform passive strategies – see Gorton and Rouwenhorst (2006). Different portfolios might rebalance in different ways, so this return component appears to be discretionary rather than directly implied by the asset returns. As already noted, it is generally ignored in calculating index returns.[8]

[8] Backwardation is associated with shortage and hence high prices, and so rebalancing towards constant value shares will tend to generate a positive return over time provided prices mean revert. This observation motivates Erb and Harvey (2005) to measure the rebalancing yield as the difference

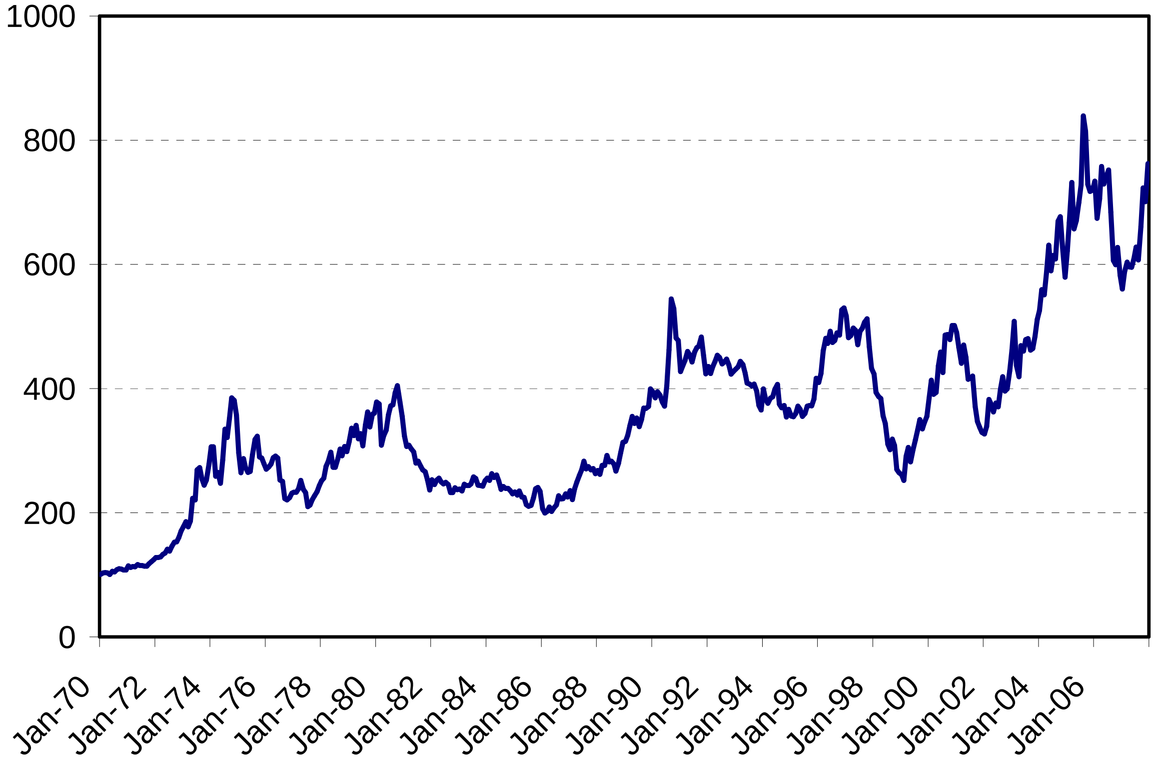

Figure 2: S&P GSCI Excess Return Index, January 1970 – December 2007

Figure 2 charts the S&P GSCI from its notional inception in 1970 to the end of 2007. A long investment in a GSCI fund would have shown handsome positive returns over the periods of rising oil prices in the early and late nineteen seventies (1971-74 average 36%, 1978-79 average 21%) and from 1999 until late 2005 (average 18%). The index was flat or declining during the recession of the first half of the nineteen eighties (1980-86 average -6%) but then recovered sharply in the latter half of the eighties (1987-90 average 21%). The nineteen nineties were a second period of largely flat or negative returns (1991-98 average -5%). The index was down 19% in 2006 but has recovered part of this loss in 2007. Over the entire period of 27 years, excess returns averaged 8.1% with a standard deviation of 23.0%, implying a Sharpe ratio of 0.35. Recomposition has not been important for the S&P GSCI so little is lost by supposing constant composition.

Commodity investments are generally justified more in terms of their contribution to overall portfolio returns than as attractive stand alone investments. Gorton and Rouwenhorst (2005) analyze data from July 1957 to December 2004, which is a longer period than

between the (weighted) geometric and arithmetic returns on the portfolio assets – a constant value portfolio will return the latter while a portfolio which is constant in terms of the number of contracts will return the latter. See also Erb at al. (2008).

commodity index investments have been available. They report returns which compare favourably with those on equities although with slightly greater risk, and which dominate bonds in terms of the Sharpe ratio – see Table 5. Over the period they consider, the commodity returns have a statistically insignificant (0.05) correlation with equities and a low but significant negative (-0.15) correlation with bond returns. These calculations suggest that investment in a long passive commodity fund could have bought diversification of an equities portfolio at a lower cost than through bonds.

Table 5
Risk-Return Characteristics

	Equities	Bonds	S&P GSCI
Average return	5.6%	2.2%	5.2%
Standard deviation	14.9%	8.5%	12.1%
Sharpe ratio	0.38	0.26	0.43

Annualized monthly returns, July 1957 – December 2004
Source: Gorton and Rouwenhorst (2006)

Despite these positive statistics, it seems possible that the investment community may be exaggerating the likely portfolio benefits from investment in commodities. The danger is that, as investors buy large long dated futures positions, they will pull up the prices of the long dates relative to those of the short dates and hence drive markets into contango. Such developments will depress or even nullify the roll returns from commodity investments without reducing risk.[9]

Evidence for this may be seen by decomposing the excess return on the S&P GSCI into its spot and roll return component as in Figure 3 which charts centred 25 month averages. Visually it seems apparent that while spot returns have been very favourable over the past decade, roll returns have been generally negative. The two sets of returns appear uncorrelated, so if the commodity boom draws to a close and roll returns remain negative,

[9] "Index buying is based on a misconception. Commodity indexes are not a productive use of capital. When the idea was first promoted, there was a rationale for it. Commodity futures were selling at discounts from cash and institutions could pick up additional returns from this so-called 'backwardation'. Financial institutions were indirectly providing capital to producers who sold their products forward in order to finance production. That was a legitimate investment opportunity. But the field got crowded and that profit opportunity disappeared. Nevertheless, the asset class continues to attract additional investment just because it has turned out to be more profitable than other asset classes. It is a classic case of a misconception that is liable to be self-reinforcing in both directions." (Soros, 2008, p.3).

commodity futures investments will perform poorly.[10] If this view is correct, the risk-return characteristics that Gorton and Rouwenhorst (2006) and others have estimated for commodity investments over a historical period in which such investments were not easily available is likely to over-estimate the returns realizable in the current environment in which these investments have become straight-forward. Profitable investment in commodity futures will likely depend on adoption of an active investment strategy rather than simply tracking a standard index.

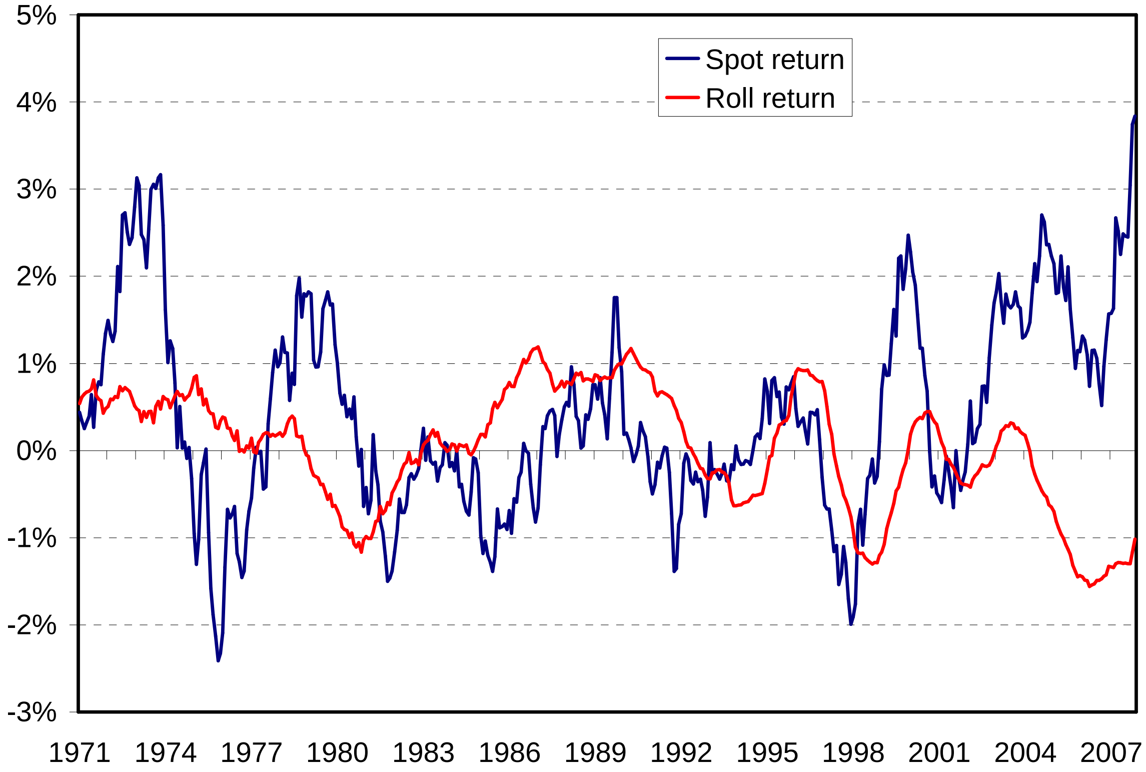

Figure 3: S&P GSCI Spot and Roll Returns (25 month centred moving averages), January 1971 – December 2007

6. Speculation, volatility and extrapolative behaviour

Finance theory distinguishes between informed and uninformed speculation (Bagehot, 1971; O'Hara, 1995, ch.3). According to this theory, informed speculation should have price effects as this is the way in which private information becomes impounded in publically-quoted prices. Uninformed speculation should either not have such effects, or in less liquid markets,

[10] The statistics are suggestive rather than conclusive. Roll returns averaged -5.4% over the eight years 2000-07 as against 0.1% in the 10 years 1990-99. The *t* statistic on a difference in means test is - 2.05 which is just significant at the 5% level.

should not have persistent effects. If uninformed trades do move a market price away from its fundamental value, informed traders, who know the fundamental value of the asset, will take advantage of the profitable trading opportunity with the result that the price will return to its fundamental value. The informed speculators stabilize in the manner set out by Friedman (1953).

Despite this, economists and policy-makers both worry that trend-following can result in herd behaviour. CTAs operate by identifying trends and positioning themselves accordingly – see section 3. There is therefore a concern that a chance upward movement in a price may be taken as indicative of a positive trend resulting in further buying and hence driving the price further upwards, despite an absence of any fundamental justification. The result will be a speculative bubble. Negative bubbles are also possible.

There are two standard responses to this type of argument:

- First there is the Friedmanite argument that, in an efficient market, supply and demand fundamentals will rapidly re-assert themselves as informed fundamentals-based traders taking contrarian positions. However, De Long *et al* (1990) show that informed traders may not act in this way if they have short time horizons (perhaps as the result of performance targets or reporting requirements) and if there are sufficiently many uninformed trend-spotting speculators. If these conditions apply, the informed traders will bet on continuation of the trend even though they acknowledge it is contrary to fundamentals. The 1999-2000 internet equities bubble appears to fit this description.
- Trends are only completely clear *ex post* and this leaves considerable scope for disagreements between different CTAs as to whether or not a particular market does exhibit a trend at any moment in time. In aggregate, speculators will therefore generally not take a consistent position on one side of the market of the other. This argument may often be correct, but in those cases in which speculators are unanimous that a trend does exist, their behaviour may reinforce this trend.

The existence and extent of trend-following behaviour may in principle be ascertained by regressing CTA-CPO positions on price changes over the previous days. These data are not, however, publically available and we therefore need to rely on studies undertaken by the regulatory agencies. Kodres (1994), Kodres and Prisker (1996), Irwin and Yoshimaru (1999) and Irwin and Holt (2004) fall into this category. Using the CTC's confidential sample already discussed in section 3, Irwin and Holt (2004) find that the net trading volume of large hedge funds and CTAs in six of the twelve futures markets they consider is significantly and positively related to price movements over the previous five days.[11] However, the degree of explanation is low. Irwin and Yoshimaru (1999) report very similar results for CTA-CPO positions.[12] In summary, the empirical evidence is consistent with the existence of trend-following behaviour but also indicates that this generally be swamped by other influences.

Can speculation of this type result in commodity price bubbles? A natural strategy is to regress price changes on the changes in the COT net non-commercial positions. However, the results of such regressions are difficult to interpret. Firstly, the commercial/non-commercial dichotomization no longer accords with contemporary market developments – see section 2. Secondly, futures positions identically sum to zero. Since aggregate non-reporting positions show only modest variability, there is necessarily a strong negative correlation between net commercial and net non-commercial positions. This makes it difficult to distinguish between the effects of changes in commercial and non-commercial decisions. If current period positions are used as regressors, severe identification issues arise.[13]

There is a clear and well-established (positive) link, observed across the entire range of financial markets, between trading volumes and price volatility so it should therefore not be surprising that an increase in non-commercial positions increases futures volatility – see Chang *et al* (1997), Bollerslev and Jubinski (1999) and Irwin and Holt (2004). Identification and collinearity issues also arise in this context but, because it seems likely that there will be only a modest feedback from price volatility to the positions themselves, endogeneity issues may be less acute. Irwin and Holt (2004), using their 1994 CFTC dataset, find significant positive coefficients linking the trading activity of large hedge funds and CTAs to futures volatility for nine of the thirteen markets they examine. (The coefficients are positive but statistically insignificant for the remaining four markets).

An alternative, indirect, approach is to attempt to estimate the profitability of speculative positions. Reversing the Friedmanite argument, we might suppose that, to the extent that speculators have made profits, they must have had a stabilizing impact on prices – see Hartzmark (1987) and Leuthold *et al.* (1994). This inference is tendentious. Speculative

[11] Copper, corn, cotton, gold, live hogs and natural gas. There is a significant negative relationship for Eurodollar futures.

[12] One can perform the same exercise for the entire non-commercial category, as in Dale and Zyren (1996), but interpretation is problematic as this category has become contaminated over recent years by the growth of index trading – see the discussion of the COT reports in section 2.

[13] Gilbert (2000) sets out a model in which speculators (non-commercials) have private information. Conditional on this information, the futures price is uninformative. Hedgers (commercials) attempt to infer this information from the futures price but are unable to do so completely because of the presence of noise traders (non-reporting traders). The consequence is that, following a positive signal, speculators bid positions away from hedgers.

profits can be highly variable both across markets and over time, implying that we would need a large sample to justify any such inference. Irwin and Holt (2004) note this difficulty but also report a large ($400m) overall trading profit from the six month period they consider. What they do not emphasize is that this profit was due entirely to profits in just two markets, and that in one of these (coffee), these profits resulted almost entirely from a double frost episode in Brazil which speculators could not possibly have anticipated – they were simply lucky to have been long at the right time.[14]

In general terms, the clear existence of bubbles in other asset markets, most notably equities and real estate, over the past decade makes it difficult to assert that efficient markets will always eliminate bubble behaviour. Moreover, commodity markets are characterized by very low short run elasticities of both production and consumption, despite the fact that long run supply elasticities are probably high. In a tight market in which only minimal stocks are held, the long run cost-related price becomes irrelevant and market equilibrium price ceases to be well-defined, not in the sense that the market does not clear, but in the sense that it will be very difficult to assess the price at which the market will clear on the basis of longer term fundamental factors. Fundamentals-based analysis may show where the price will finish but this will provide very little guide as to where it will go in the interim. This indeterminacy allows weight of the speculative money to determine the level of prices.

It is simple to test for extrapolative behaviour. Consider a simple regression of today's futures price f_t on yesterday's price

$$\ln f_t = \alpha + \beta \ln f_{t-1} + \varepsilon_t \tag{1}$$

(i.e. an autoregression). If the (log) futures price follows a random walk process, we have $\beta = 1$, consistently with the futures price being an unbiased predictor of future spot prices – see the discussion in section 5. Extrapolative behaviour will imply an explosive autoregression with $\beta > 1$. It is sometimes held that explosive processes are implausible since otherwise prices would tend to zero or infinity, but this is not true if the coefficient β is only slightly in excess of unity, implying that autoregression is mildly explosive and if the explosive behaviour does not last for a long time.

[14] This episode was discussed by Brunetti and Gilbert (1997) who made similar calculations.

Table 6
Tests for Explosive Behaviour: Non-Ferrous Metals February 2003 – August 2008

		Spot	3 Months	15 Months	% Change in 3 Months Price
May 2003 (n = 18)	**Nickel**	1.022 (0.198)*	1.026 (0.244)*	0.987 (-0.116)	10.8%
December 2003 (n = 19)	**Nickel**	1.007 (0.148)*	1.003 (0.052)*	1.04 (0.597)*	30.6%
April 2004 (n = 18)	**Nickel**	1.025 (0.445)*	1.025 (0.545)*	0.939 (-0.425)	- 21.9%
May 2004 (n = 17)	**Zinc**	1.062 (0.410)*	1.097 (0.758)*	1.146 (1.248)**	7.9%
September 2004 (n = 17)	**Aluminium**	1.003 (0.039)*	0.986 (-0.183)	0.978 (-0.298)	7.1%
	Copper	1.081 (1.072)**	1.052 (0.692)*	0.909 (-0.845)	5.2%
	Nickel	1.042 (0.605)*	1.038 (0.547)*	1.010 (0.134)*	15.1%
	Zinc	1.211 (1.222)**	1.215 (1.318)**	1.229 (1.294)**	13.4%
January 2006 (n = 19)	**Zinc**	1.011 (0.204)*	1.007 (0.136)*	1.004 (0.082)*	19.6%
November 2007 (n = 20)	**Nickel**	1.070 (0.781)**	1.052 (0.551) *	1.038 (0.434)*	- 14.3%
February 2008 (n = 19)	**Aluminium**	1.018 (0.195)*	1.020 (0.217)*	1.049 (0.621)*	16.6%
	Nickel	1.172 (1.152)**	1.181 (1.155)**	1.120 (0.707) *	14.0%
	Tin	1.165 (1.817)**	1.166 (2.143)**	1.002 (0.016)	10.6%
	Zinc	0.993 (-0.045)	1.004 (0.022)	1.011 (0.069)*	13.7%
May 2008 (n = 18)	**Nickel**	1.024 (0.478)*	1.024 (0.475)*	1.013 (0.254)*	- 26.2%
	Tin	1.041 (0.211)*	1.041 (0.212)*	0.977 (-0.112)	- 11.2%
	Zinc	0.988 (-0.080)	1.005 (0.030)	1.011 (0.065)*	- 9.8%
June 2008 (n = 19)	**Copper**	1.015 (0.159)*	1.020 (0.219)*	1.016 (0.149)*	5.6%

The table reports the autoregressive coefficient β from regression of the log of the daily price on the previous day's price over the calendar month in question for the six LME metals (aluminium, copper, lead, nickel, tin and zinc). The *t* statistic, in parentheses, tests the null hypothesis $H_0 : \beta = 1$ against the explosive alternative $H_1 : \beta > 1$. This statistic has the Dickey-Fuller distribution but unlike the standard case, we are interested in the right tail. Based on 100,000 bootstrap simulations, critical values for n = 17, 18, 19 and 20 observations are 0.035, 0.032, 0.023 and 0.019 (95%) and 0.767, 0.760, 0.750 and 0.738 (99%). These simulations were performed under the null hypothesis that β = 1. A single asterisk indicates a statistic which rejects H_0 at the 95% level and a double asterisk one which rejects also at the 99% level. Statistics are reported only for metals and months where at least one estimated coefficient β is significantly greater than unity. The percentage change in prices is the price on the final day of the month relative to that on the final day of the previous month.

I estimated autoregressions of the form defined above using daily data for each of the six London Metal Exchange (LME) metals for each month from February 2003 to August 2008. Table 6 lists the months for which coefficients were estimated as explosive.[15] There are ten months in which explosive behaviour is detected. Three of the periods estimated as indicated as being subject to this type of behaviour, April 2004, November 2007 and May 2008, saw falling prices indicating that extrapolative behaviour can be negative as well as positive. Nickel features in seven of the ten explosive months and zinc in five. There is some bunching: in September 2004, aluminium, copper, nickel and zinc are all seen as upwardly explosive and in February 2008, aluminium, nickel, tin and zinc were upwardly explosive, while in May 2008, nickel, tin and zinc were downwardly explosive.

The proportion of ten out of the total of 67 months considered is 15%, more than is likely simply by chance on the random walk hypothesis. This may underestimate the number of periods of explosive behaviour since some periods will have straddled calendar months. Furthermore, it is not to be expected that explosive behaviour will be evident in all periods. These results therefore do suggest that extrapolative behaviour has been a feature of non-ferrous metals over recent years.[16]

Episodes characterized by explosive behaviour may have been short-lived. There is no implication that prices necessarily over-reacted, that bubbles persisted or that speculation was responsible for a significant proportion of the most recent commodity price boom. Several commentators have noted that a number of commodities whose prices rose most over the recent boom either do not have futures markets (coal in the energy group, molybdenum in non-ferrous metals) or have relatively illiquid futures markets (steel in metals, rice in agriculturals). It is clear that futures speculation could not have played a role in the price rises experienced by these commodities. Nevertheless, the discussion in this section shows that the efficient markets view that uninformed speculation has no effect on market prices and volatility should be rejected. The more difficult issue is to identify those periods in which speculation has taken prices away from fundamental values and to establish the persistence of such departures.

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[15] Explosive behaviour is easily detected and this is reflected in the low Dickey-Fuller critical values – see Fuller (1976) and the notes to Table 6. These low critical values arise because the estimated β is downward biased and hence, on the null hypothesis, there is a very low probability of observing an estimate in excess of unity. This approach draws on Phillips (2006). See also Phillips and Magdalinos (2007). I am grateful to Isabel Figuerola-Ferretti and Rod McCrorie for discussion of these issues.

[16] In Gilbert (2008) I report similar results for the Chicago Board of Trade corn, soybeans and wheat contracts.

7. Effects of index-based investment

There has been less research on the effects of index-based investment in part because it is still a relatively new phenomenon, in part because the distinction between investment and speculations is not yet standard but, most importantly, because of lack of publically available data which allows index-based investment to be distinguished from speculation.

In this section, I report results of Granger non-causality tests which makes use of the CFTC's supplementary COT reports, discussed above in section 2, and which allow one to distinguish between positions held by index providers and those of other non-commercial traders. Here, I consider the effects of these positions in the four Chicago Board of Trade agricultural markets covered in the COT supplementary reports – corn (maize), soybean soybean oil and wheat. The tests are conducted within a third order Vector AutoRegression (VAR) framework

$$r_t = \alpha_0 + \sum_{j=1}^{3} \alpha_j r_{t-j} + \sum_{j=1}^{3} \beta_j x_{t-j} + \sum_{j=1}^{3} \gamma_j z_{t-j} + \varepsilon_t \quad (2)$$

where r_t is the week-on-week change in the price of the nearby contract on the Chicago Board of Trade,[17] x_t is the weekly change in futures positions of index providers and z_t is the weekly change in futures positions of other non-commercial traders.

The VAR framework defined by equation (2) allows us to test two sets of hypotheses. The first two hypotheses is changes in the index and non-commercial positions respectively do not affect returns

$$H_0^1 : \beta_1 = \beta_2 = \beta_3 = 0 \quad H_0^2 : \gamma_1 = \gamma_2 = \gamma_3 = 0$$

These correspond to standard Granger non-causality tests – see Stock and Watson (2003, chs. 13 and 14). Conditional on rejection of either of these null hypotheses, we may examine persistence may by looking at the sum of the coefficients. Specifically, the test $H_0^3 : \sum_{j=1}^{3} \beta_j$ looks at persistence of the effects of changes in index positions and the test $H_0^5 : \sum_{j=1}^{3} \gamma_j = 0$ relates to persistence of the effects of changes in non-commercial positions. (In each case, the alternative hypothesis is the negation of the null). Table 7 reports the test results.[18]

[17] I follow the convention of rolling on the first day of the delivery month. Price changes are always measured in relation to the same contract (i.e. in a roll week the price change is relative to what was previously the second position).

[18] The coefficient estimates are uninteresting and are omitted.

Table 7 Granger Non-Causality Tests for CBOT Agricultural Futures Index and Other Non-Commercial Positions					
		Corn	**Soybeans**	**Soybean Oil**	**Wheat**
H_0^1	$F_{3,125}$	0.50 [68.2%]	3.53 [1.7%]	1.91 [13.2%]	0.92 [43.5%]
H_0^2	$F_{3,125}$	0.23 [87.1%]	1.22 [30.6%]	0.17 [91.5%]	0.82 [48.7%]
	$\sum \beta_j$	- 0.413	5.374	- 2.652	0.769
H_0^3	$F_{1,125}$	0.35 [55.4%]	10.35 [0.2%]	1.09 [29.9%]	0.15 [69.8%]
	$\sum \gamma_j$	- 0.078	0.932	- 0.169	- 1.019
H_0^4	$F_{1,125}$	0.06 [80.0%]	3.51 [6.4%]	0.12 [73.3%]	1.07 [30.2%]
R^2		0.053	0.096	0.068	0.039

The table reports the test outcomes for the five tests outlined in the text. Tail probabilities are given parenthetically.
Sample: 31 January 2007, weekly, to 26 August 2008. Estimation by OLS.

The first row of the table gives the Granger non-causality tests for the index positions. Rejection of the null hypothesis H_0^1, indicated at the conventional 95% level by a tail probability of less than 5%, implies that changes in index positions cause (in the sense of Granger-cause) futures price returns over the following weeks. A rejection is obtained for soybeans but nor for the other three commodities. The second row reports the same test for the changes in net non-commercial positions. Here the null hypothesis H_0^2 is not rejected in any of the four cases considered. Since we have rejected H_0^1 for the case of soybeans, we may look at the persistence of this effect. The estimated VAR shows that the sum of these coefficients is positive, and the test of H_0^3 establishes the statistical significance of this impact. The data therefore indicate that changes in index positions had a persistent positive impact on soybean prices over the sample considered. However, there is no evidence for similar effects in the other three commodities examined.

Failure to reject the null hypothesis of no effect should not be taken as implying that neither changes in index positions nor those in non-commercial positions affect futures returns. According to the Efficient Markets Hypothesis, we should expect the price effects of position changes to be contemporaneous. This implies that Granger non-causality tests of the type reported here probably lack power. Increased power might be obtained by looking at the contemporaneous correlations. The correlations between returns and changes in index positions range from 0.06 for wheat to 0.38 for soybeans. The correlations between returns and changes in non-commercial positions are higher: 0.40 for wheat to 0.57 for soybeans. However, interpretation of these correlations is problematic since causation might also run from returns to position changes.

Overall, therefore, there is weak evidence that index investment may have been partially responsible for raising at least some commodity prices during the recent boom.

8. Conclusions

The traditional futures market distinction between hedgers and speculators no longer corresponds closely with the differences in types of actors in commodity markets. In particular, the traditional distinction fails to acknowledge the emergence of index-based investment which now accounts for 20%-50% of total open interest in many important U.S. commodity markets. This has been acknowledged by the U.S. commodities futures regulator, the CFTC, which has gone some way to providing additional information, although currently only for agricultural markets.

Traditional speculators are often trend followers, moving from one market to another as the opportunities arise. They may either be long or short, but typically they hold positions for only short periods of time. Index-based investors aim to track the returns one of other of two major commodity futures indices, or sub-indices of these indices. Funds are therefore allocated in largely predetermined proportions across the different commodity markets reflecting index composition. These indices only give positive weights and hence index investors are always long. Investors are motivated to improve the risk-return characteristics of their overall portfolios, in which commodities will typically form a small component, rather than in the risk-return properties of the commodity sub-portfolio or its individual commodity components. They tend to hold for long periods implying that the index-provider will need to roll offsetting futures positions as they approach expiration. By contrast, speculators will seldom roll positions.

The returns to commodity futures investment differ from those obtained from investing in the physical commodity. In addition to the spot returns, the investor also earns a roll return when the position is rolled (positive if the commodity is in backwardation, negative if in contango), the risk free rate of interest on the collateral posted against the position and also a recomposition return if the index is reweighted. Spot returns have generally been positive over the most recent decade as the consequence of the commodity boom but roll returns have tended to decline and become negative. It seems possible that, despite overall high prices, growing investment in commodity futures has pushed markets into contango. If this conjecture turn out to be correct, commodity investors are likely to be disappointed by future returns.

Finance theory indicates that, although informed speculation should have an impact on prices, since this is the way in which information becomes impounded in prices, uninformed speculation should not have any price effect. If uninformed speculation takes the market price away from its fundamentally-determined level, contrarian fundamental-based traders should take advantage of the resulting profit opportunities thereby retuning the price to its fair value. This may happen, but the other possibility is that a chance movement in price may attract trend-following speculators who exacerbate the departure of the price from its fundamental value. This will lead to prices exploding upwards or downwards, albeit generally only for short periods of time. I show evidence that non-ferrous metals markets have been characterized by so-called weakly explosive behaviour of this sort consistent with the view that uninformed speculation can be destabilizing. These episodes appear too frequent to be the result of chance. I conclude that commodity prices have not always reflected market fundamentals, and that there may have been elements of speculative froth.

The same argument implies that index-based investment should not have any effect, or more weakly any persistent effect, on commodity futures prices. I have tested this hypothesis using data on the four agricultural commodities treaded on the Chicago Board of Trade for which the CFTC provides position data on the positions of index providers. In the case of soybeans, there does appear to be evidence that changes in index positions have had a positive and persistent effect on futures returns. Data for the other three commodities examined fail to support this hypothesis. Overall, there is weak evidence for the contention that index investment contributed to the recent commodity price boom.

None of this implies that either speculation or commodity investment have been a major factor in the commodity boom of the first decade of the century. On the other hand, it is too simple to rule out the possibility that these activities may have affected prices in particular markets at particular periods of time. It is indeed possible that some of these effects have been substantial and some persistent. These observations will probably not surprise market participants. The urgent agenda is to incorporate them into the models which economists use to discuss the operation of these markets.

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