Future Agricultures

Working Paper

# Food price volatility and financial speculation

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# Introduction[1]

Throughout history people have raged against financial speculators. In the 1960s, they were christened the 'gnomes of Zurich' by the UK Chancellor George Jones during the sterling crisis. A little more recently, George Soros attracted vitriol after he famously 'broke the Bank of England' in 1991, reportedly netting £1 billion from bets that the UK would exit the Exchange Rate Mechanism (ERM). Similar attacks have been made by developing country policy makers. In 1997 as the Asian Crisis took hold, Malaysian President Mahathir launched a vociferous attack on 'rogue speculators', again targeting the much maligned George Soros.

More recently still, government ministers from the Eurozone have railed against the malign influence of speculators, imposing bans on the short-selling of stocks, and proposing a financial transaction tax (FTT), at least partly out of a desire to curb the activities of speculators. In February 2010, Martin Khor of the Third World Network linked the Eurozone to the Asian crisis in an article entitled: *Euro crisis: Financial speculators are behind this too!*[2]

The standard response is always the same: 'don't shoot the messenger!' Invariably, market participants and supporters argue that they simply reflect economic realities. There is some evidence for this. George Soros concluded that, in a recession, the UK would not stick with the painful economic policies compatible with sterling's continued membership of the ERM. He was right. Similarly, in 1997, many observers considered some Asian economies' dollar exchange rate pegs unsustainable, or at least incompatible with export competitiveness. Again, this was correct. While only a fool would predict the outcome of events in the Eurozone, few argue that markets are creating economic tensions were none would otherwise exist.

However, while markets often do reflect economic reality, they may also help to create it. Outcomes that appear inevitable with hindsight may only do so because market behaviour altered the options that were available. Spain's debt burden today is often described as unsustainable, but it is not much higher than the UK's. What makes it unsustainable is that markets are demanding interest rates of 7% or more on Spanish debt, while the UK is borrowing at record low levels. It may be that they are taking a cold-eyed view of the long-term prospects of the two countries, and factoring in the importance of an independent currency and central bank. It may also be a self-fulfilling cycle, driven by 'herd behaviour' under the influence of mass psychology. Or, most probably, both of these explanations may be partially true.

It is also the case that markets have a tendency to overshoot. Even when there are good reasons for prices to fall (or rise) the tendency of market actors to follow trends can move prices below (or above) levels justified by economic fundamentals.

The simple tale of markets holding a mirror up to reality is therefore far from being the whole story. In most cases this is all that they do. In others, markets amplify this reality by exacerbating market movements. While in certain conditions market 'sentiment' – which may become decoupled from economic fundamentals – helps create this reality. The price effects differ in each case are: in the first example, prices are maintained at equilibrium or 'fair value' levels; in the second, price volatility is exacerbated by the tendency of market actors to follow momentum strategies, where price rises encourage more buying, and falls encourage selling; and third, prices are forced away from 'fair value' levels for extended periods, and this may be self-fulfilling in that market behaviour can potentially alter what might be considered 'fair value.'[3]

This paper focuses primarily on the second of these potential market impacts with respect to global food prices. While the issue of price levels is not ignored, this has been extensively researched – though no consensus has been reached. Understanding better the relationship between financial markets and food price volatility is the motivation for this paper.

The questions to be considered are as follows:

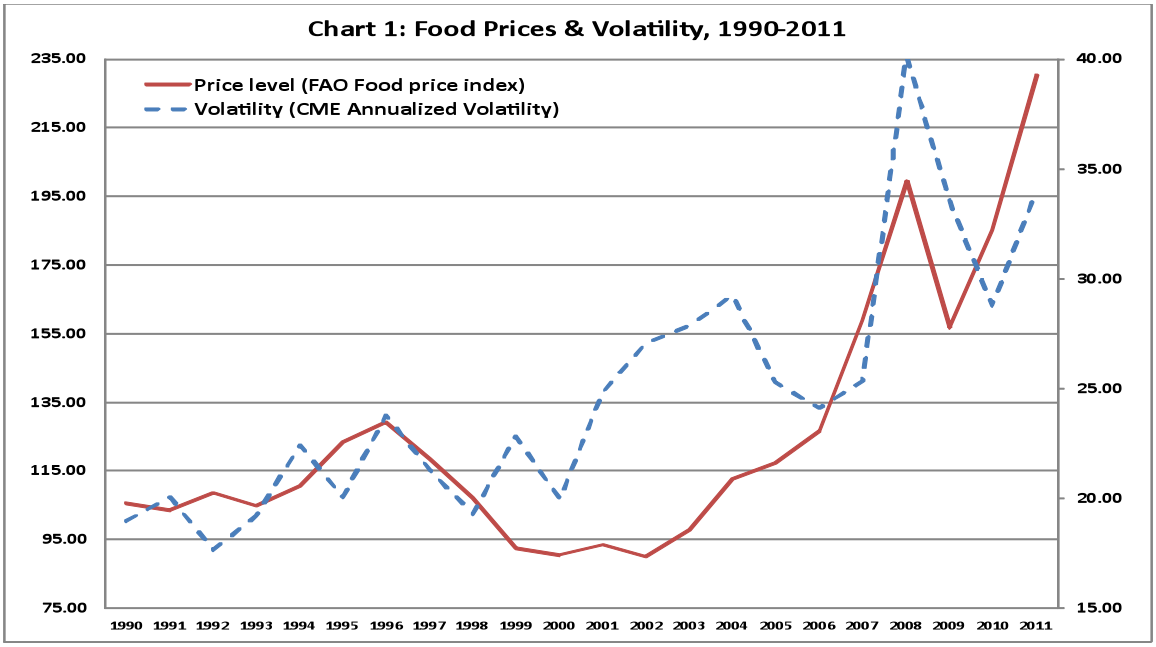
- How has the relationship between financial actors and food commodity markets – particularly futures markets – changed in the last ten years?
- What have been the benefits and costs of the increased role of financial sector actors in these markets?
- How might the balance between benefits and costs change in the future?
- What reforms, if any, are needed to ensure that benefits exceed costs?

This paper is organised as follows. Part 1 establishes the context in terms of price movements and the evolution of food and financial markets over the past decade. Part 2 develops a typology of speculation as a framework for thinking about these issues. Part 3 applies this typology to global food markets, while part 4 reviews the differing explanations for food price movements. Part 5 considers the role of uncertainty and complexity, and the role of financial markets in this regard, and part 6 considers some policy options and concludes.

2008 saw the global price of many foods spike to historic highs. Following a sharp fall thereafter, prices began to rise in 2009, spiking again in 2010. After another decline, prices have again risen sharply in 2012. Price volatility has been unusually high. Many have pointed to major changes in supply and demand conditions as the primary cause. Others identify financial speculators as the culprits. Establishing cause and effect has proven to be impossible. Opinion has become polarised and oppositional.

What is not in dispute is the huge increase in financial investments of various forms in futures markets, including food. Some point to the correlation between these flows and price movements, arguing that some financial speculators (i.e. index funds) increase net demand and therefore prices, while others (i.e. hedge funds) increase volatility. While the correlations are not disputed, the direction of causality is: opponents counter that rising prices have attracted investors, and that food markets have always been characterised by price volatility, and that hedge funds are attracted to volatile markets.

Chart 1 below illustrates the problem.




Source: FAO Stat and CME Historical Data

From 1990 to 2005, food prices were relatively stable, as shown by the solid line in chart 1. From around 2002, however, we see the start of a steady increase in prices culminating in the spike of 2008. The sharp fall after the spike of 2008 was followed by another rapid increase in prices, culminating in a second spike in 2010 after which prices fell again. The dotted line shows trends in the price volatility[4] of futures contracts from 1980 to 2011 for four food commodities traded on the Chicago Mercantile Exchange (CME). A clear upward trend can be seen from the late 1990s onwards in all cases, with the price spikes of 2008 and 2010 being particularly marked.

Part of this rise in volatility is explained by higher prices, which magnify the effect of price movements, but an underlying rise in volatility can be seen even when this is stripped out. Figure 1 illustrates a volatility measurement tool developed by the International Food Policy Research Institute (IFPRI). Using date from 1954, the model identifies periods of excessive volatility based

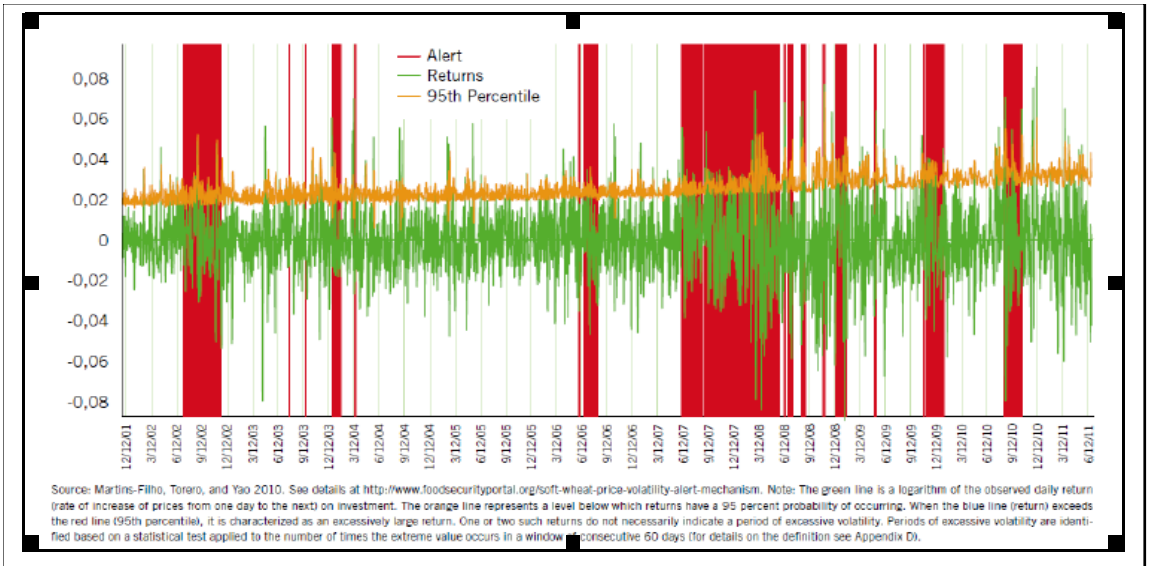
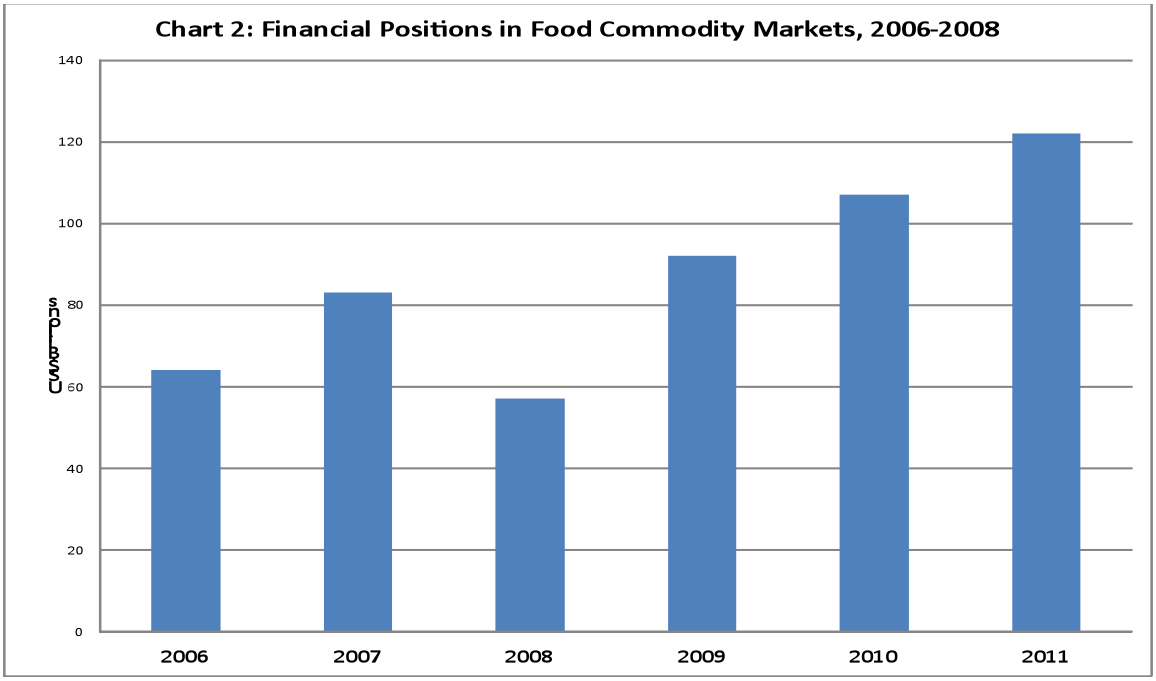



**Figure 1: IFPRI Food Price Volatility Model; Wheat, 2001-2011**




Source: Barclays Capital (2011)

on deviations from historical levels of volatility. Figure 1 shows results for the wheat market, from 2000 to 2011.

So, we have steadily rising food prices, coupled with two sharp price spikes – and potentially another in 2012 – as well as increasing levels of price volatility. The second part of the story is the very large increase in financial flows into these markets.

One of the distinguishing features of financial actors' engagement in food markets is that they do not wish to take possession of the actual commodity, Rather, the aim is to gain exposure to price movements, which is generally achieved via the futures markets, either directly or using swaps.[5] Chart 2 shows the changing scale of financial investment in these markets from 2006 to 2011. Although this represents a near doubling of investment, it is actually a tenfold increase from 2000, when financial investment was estimated at $12 billion.

In the next section we sketch the key changes to these markets over the last ten years.

## *1.1. The changing nature of agricultural futures markets*

The history of futures market trading began on the American Midwestern frontier in the early nineteenth century, and was tied closely to the development of commerce in Chicago and the grain trade of the Midwest. The earliest recorded forward contract in corn was made in Chicago on March 13, 1851 at the recently formed Chicago Board of Trade (CBOT) Futures contracts were formalised by the CBOT in 1865, establishing the fundamental building block from which other instruments were built. (CBOT, 1997)

The need for the market stems from the fact that agricultural production is characterised by an irreducible level of unpredictability: harvests vary. As a result, prices are more unstable over time than is the case with manufactured goods or services. The possibility of adverse price developments on the spot (cash) markets creates risk for producers as well as for industrial processors. To avoid the risk of adverse price changes, producers, processing companies and other users of agricultural commodities started to transfer risk (i.e. 'hedge'[6]) to commercial speculators, who were willing to accept price risk in exchange for potential profits. (Kerckhoffs, Van Os, Vander Stichele; 2010).

These 'speculators' make a profit in two ways: first, they charge a fee for providing security to farmers; and second, they hope to gain from the price difference when the contract is made and the market price when the futures are due (Wahl, 2010.)

Price agreement on these contracts is (partially) based on the expected value of the commodity in the future, on which opinions differ because of irreducible uncertainty. When futures are above spot prices, the market is said to be in 'contango'; when they are below, the market is in 'backwardation'.[7] Futures prices are important for price discovery in spot markets, helping commodity traders set benchmarks for current prices.

For most of the twentieth century, commodity derivatives were traded on regulated exchanges. Exchange-trading requirements (requiring all futures contracts to be entered into on organised exchanges) and position limits (restricting the size of positions financial market actors could take) were implemented in 1936 in the US with the Commodity Exchange Act. Following a protracted period of lobbying, and the support of influential players such as Federal Reserve Chairman Alan Greenspan, the US Congress passed the

Commodity Future Modernization Act in 2000. The act deregulated commodity markets, weakening speculative position limits and providing loopholes for off-exchange speculation in unregulated Over-the-Counter (OTC) markets.

An important feature of the legislation was that some speculators could be considered as 'hedgers', which freed them from restrictions in how many speculative contracts (positions) they could enter into. Traditionally, the Chicago Futures Trading Commission (CFTC) recognised two types of participants: 'commercials', who used the market to hedge the risks associated with physical commodities (e.g. farmers); and 'speculators' who were not hedging such risks but simply taking a position in the market. From the first year the act was passed, non-commercial participants began to increase their share of commodity future markets till reaching its high in 2007-2008. (Frenk; 2010)

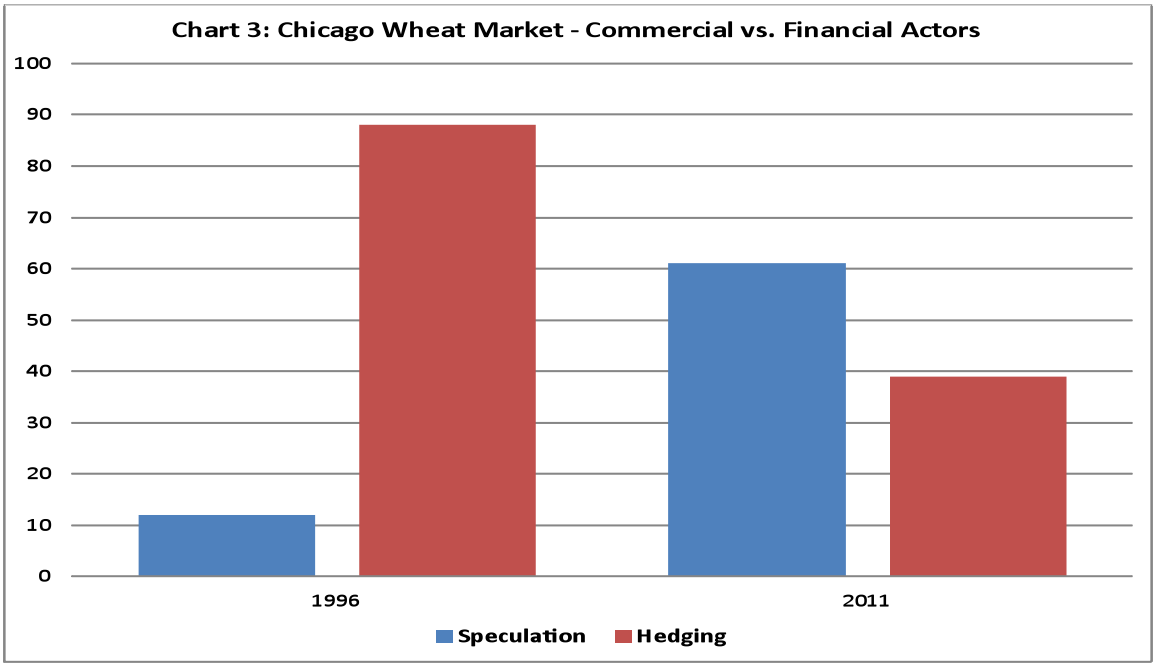
The act opened the door to a range of new financial actors such as pension funds, hedge funds, sovereign wealth funds, insurance companies, and even governments. The attraction was simple: the expectation of future price increases due to economic fundamentals, and relatively low correlations with other asset classes. As a result, non-traditional speculators came to out-number hedgers and traditional speculators. The number of futures and options contracts on commodity exchanges worldwide grew threefold between 2002 and 2008 (Mayer; 2009)

Index funds were the most popular mechanism used by these actors to gain exposure to commodity markets. A Commodity index seeks to replicate the returns on the futures contracts of commodities included in the index, where these are combined using different weights. The Standard and Poor Goldman Sachs Commodity Index (SP&GSCI), for example, is based on different commodity futures of which, agricultural commodities accounted for 12% of the total, energy for 71% and base and precious metals for 17% (Kerckhoffs, Van Os, Vander Stichele; 2010). To replicate price movements of the basket of commodities, fund managers buy futures contracts on exchanges, increasing the demand for agricultural and non-agricultural commodity futures contracts. Managers then sell to other investors or end-users before the delivery time. When the market is in 'backwardation' the futures' price rises as it nears the delivery date (i.e. it converges with the spot price), this generates a positive 'roll yield', which coupled with profits from a rising market provide the index funds returns (ibid.)

Other instruments used by non-traditional speculators are commodity 'swaps' and Commodity Exchange Traded Funds (ETFs). Commodity swaps are mostly done through 'swap' dealers working for investment banks in the unregulated, over-the-counter (OTC) derivative market, where contracts are created bilaterally rather than on an exchange. Commodity ETFs are offered and operated, for a fee, by banks and other institutions (e.g. hedge funds) that create shares that can be bought and sold on the exchanges by retail investors.[8] The ETF manager invest shareholders' money in a basket of commodity derivatives as reflected in the index (e.g. the SP&GSCI) reflecting the value of the of the commodity index upon which the fund is based (ibid.)

In 1996, the overwhelming majority (88%) of futures contracts were held for hedging purposes. By 2011, this had fallen to less than 40%, with financial 'speculators' – i.e. those with no link to the physical market – now holding more than 60% of contracts.

Recent years has also seen a change in the composition of speculators. Until the 2008 price spike, the majority of new financial investors were long only index funds, who accounted for 65-85% of total investment between

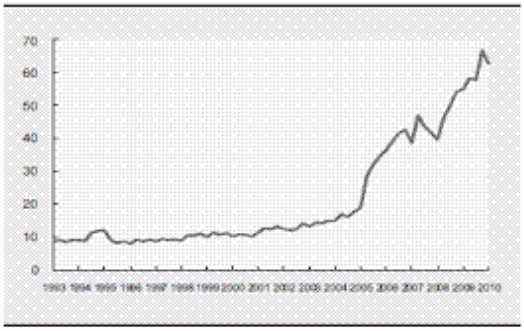



Source: WDM (2011)

*Figure 4*

**FUTURES AND OPTIONS CONTRACTS OUTSTANDING ON COMMODITY EXCHANGES, DECEMBER 1993–DECEMBER 2010**

*(Number of contracts, millions)*

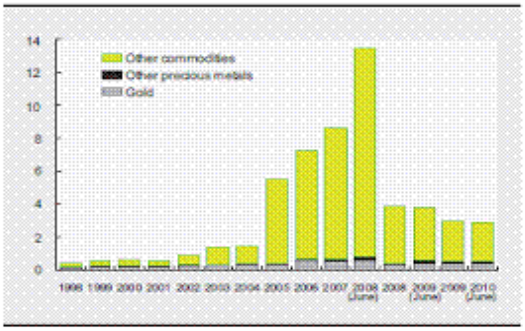



Source: Bank for International Settlements (BIS), *Quarterly Review*, March 2011, table 23B.

*Figure 5*

**NOTIONAL AMOUNT OF OUTSTANDING OVER-THE-COUNTER COMMODITY DERIVATIVES, DECEMBER 1998–JUNE 2010**

*(Trillions of dollars)*

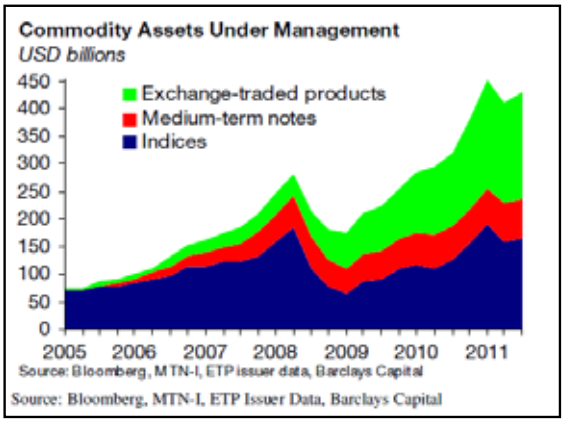



Source: BIS, *Quarterly Review*, March 2011, table 22A.

2006 and 2008. Since then their share has fallen to 45%, with the majority now composed of 'active' players such as hedge funds (UNCTAD, 2011).

This shift is illustrated above. As shown in the figure to the right, the value of OTC commodity contracts peaked in 2008 and has since declined rapidly. In contrast, the number of contracts traded on exchanges has risen sharply over the same period. This is confirmed by the figure to the left, which illustrates the relative decline in the importance of index investment compared to exchange traded products (ETPs) and medium-term notes across all commodity markets (i.e. including oil and metals). Far from declining, therefore, the importance of financial actors on global commodity exchanges has increased significantly since the first price spike of 2008.

Source: IIF (2011)




Source: Bloomberg, MTN-I, ETP Issuer Data, Barclays Capital

To summarise, there has been a large increase in the flow of finance into food commodity futures markets, which has coincided with higher price levels and an increase in price volatility, punctuated by severe spikes. None of this proves causation, however. As we have seen, the composition of financial actors involved in these sectors has changed significantly within a context of growing total investment. 'Speculators' are often referred to as if they were a homogenous group, but this is not the case. Before considering what, if anything, should be done about speculators in global food markets, it is important to be clear about who we are talking about.

## 2. A typology of speculation

There are numerous definitions of financial speculation. The one given below is typical:

> *"The taking of above-average risks to achieve above-average returns, generally during a relatively short period of time. Speculation involves buying something on the basis of its potential selling price rather than on the basis of its actual value."*[9]

There are two aspects to this. First, the emphasis is on above-average risks with a short time horizon. Second, a distinction is made between a financial asset's 'selling price' and its 'actual value', with speculators being concerned with the former rather than the latter.

Such a definition encompasses most of the higher risk segments of the modern asset management industry. Funds that buy public or private equities, or sovereign and corporate bonds, do so to obtain a return. In part this may be a stream of income – such as a dividend or bond yield – but more often capital gain is the goal. Different funds are more or less aggressive with respect to risk, with a relatively large section being willing to take on 'above-average risk' in pursuit of high returns. Whether these gains result from a fundamental improvement in a company's prospects reflected in higher prices, or because of a generalised market trend driven by uninformed psychology, is irrelevant. But most people are not calling for the closure of stock exchanges, or for restrictions on those who can participate in them. In an attempt to shed some light on this, we need to unpack the concept of speculation a little more.

## 2.1. Forms of speculation

When thinking about 'speculation,' we can identify four distinct types of activity that could potentially fall within this definition:

I. Natural-independent hedging
II. Market hedging
III. Natural-independent speculation
IV. Market speculation

The differences between these activities can be described by two factors: motivation and impact. For the former, the transaction may be motivated simply by the desire to profit, and directed by a view on the future direction of prices. Alternatively, it may be a necessary transaction to facilitate some other (real) economic activity. Few people take issue with the second type of motivation, but some would with the first.

For impact, the question is whether the activity creates negative effects, regardless of motivation. Transactions may be motivated solely by the desire to maximise returns, but few take issue with this unless negative consequences result. Which people or groups these consequences effect is important. Generally speaking, there are few calls for intervention when impacts are restricted to the initiator of the activity.[10] It is when impacts extend to wider society that calls for interventions tend to be made.

Below we relate these two factors to the typology of speculation introduced above.

*I. Natural-independent hedging*

This form of hedging refers to financial positions taken as protection against the risk of unforeseeable and uncontrollable events, which are independent of markets. Buying futures to hedge against adverse weather conditions and their influence on harvests are a good example. 'Natural-independent hedging' is thus akin to insurance, where the *motivation* is to mitigate risk. The *impact* of this activity on its initiator is to safeguard livelihoods/income (at a sustainable level). An important wider economic impact is that it enables greater investment than would otherwise be the case. Importantly, there is no impact upon the probability that the events being insured against will occur: buying weather futures does not affect the weather, just as insuring your house against fire does not increase the probability of it burning down. Both for the individual and for wider society, therefore, natural-independent hedging could be said to have positive consequences.

*II. Market hedging*

Market hedging is the taking of financial positions as protection against adverse market movements. It is similar to natural-independent hedging in many respects. Exporters and importers do need to hedge against exchange rate volatility, for example, and such hedging is thus also motivated by the need to mitigate risk. While the impact on the initiator is again to maintain livelihoods/income, the wider effects are more complicated.

As with natural-independent hedging, higher levels of investment are facilitated by the mitigation of risk, but a potential link between the activity and the phenomena being insured against is created. Hedging in the foreign exchange market to protect against volatility has the potential to influence price volatility, for example.[11] Another important difference is that the need to hedge market risk – or not – is determined by how volatile markets are, and this is not an 'act of god' like the weather. Prior to the abandonment of fixed exchange rates in the 1970s, for example, no such hedging was necessary. The need for hedging is therefore contingent upon the *structure* of the market, and this in turn is at least partly[12] a result of policy actions (and inactions).

Therefore, while hedging against market risk is likely to have a positive impact by facilitating real economic activity, it does not follow that a different form of market structure – where hedging would be less needed – might not be *more* positive.

*III. Natural-Independent speculation*

By natural-independent speculation we mean trading to profit from outcomes in the natural-independent hedging market – e.g. weather-influenced securities or insurance markets. This is 'pure' speculation in the sense that it is not *motivated* by a need to facilitate some real economic activity, either directly (for example, through trade) or indirectly (though the hedging activity needed to facilitate such trade). It does not follow, however, that is serves no useful purpose.

For the initiator of trades, the impact is simply a matter of profit or loss, with no wider implications – notwithstanding issues of systemic risk. There is also no link between this activity and the phenomena it relates to: the trading of weather derivative products[13] does not influence the incidence of extreme weather events. Such trading does increase liquidity in the markets where these risks are hedged, however, reducing transaction costs for those that do need to hedge against such events. In this area, therefore, the wider impact on real economic activity is likely to be positive, regardless of its motivation.

Certain forms of gambling have some similarities. Betting on a horse race does not – corruption notwithstanding – influence the outcome of the race. While it is difficult to find positive spill-over effects from these kinds of activities, negative impacts are largely restricted to the gambler themselves. An analogy can be found with certain kinds of synthetic derivative instruments, such as 'contracts for difference' (CFD). Two speculators may have a different view on the likely movements of an asset – let's say the dollar-Euro exchange rate. They can then agree a contract for a specified period, at a benchmark rate. At the agreed time, if the exchange rate is above the benchmark, party A pays party B the difference; alternatively, if the exchange

rate is below the benchmark, part B pays party A the difference. This 'contract for difference' allows both parties to take a speculative position in the dollar-Euro, but without having to buy the underlying currencies, so avoiding the transaction costs this would involve. Impacts are therefore restricted to the counterparties, as the speculation is not connected to the actual dollar-Euro market. Again, it is hard to argue that there are any wider economic benefits to this activity, but neither are there likely to be wider costs.

*IV. Market speculation*

This final form of activity is also 'pure' speculation in that the motivation is solely to profit from market movements rather than facilitate real economic activity. Unlike the previous case, however, these 'market movements' are not independent of the speculative activity: the market where 'speculation' takes place is the same as where the anticipated 'movement' occurs.

For impact, the initiator again experiences either a profit or loss. In terms of wider effects, this activity also adds liquidity to markets, lowering transaction costs and providing counterparties to those needing to engage in 'market hedging'. It is therefore facilitative of real economic activity as it makes market hedging cheaper and easier. Indeed, this is the justification generally given for why speculation is a good thing.

There is a further potential impact, however: market speculation may directly influence prices, and therefore the need to hedge in the first place. For example, while an exporter may need to hedge foreign exchange risk, and can do so at a lower cost because of the additional liquidity provided by currency speculators, the volatility of foreign exchange markets – and so the need for the hedge – may also be influenced by this activity.

We thus have two forms of wider impact: (i) positive, in providing liquidity and reducing hedging costs; and (ii) negative, in terms of the potential amplification of volatility and so the increased need to hedge market risk. Whether the net effect will be positive is not obvious, and will depend on various factors, many of which will be market specific. This is not the end of the matter, however. Even if market speculation was shown to increase volatility, and this outweighed positive effects on hedging costs by some measure, the questions remains as to whether this matters enough to do anything about it.

## *2.2. When and where does this matter?*

Based on this categorisation, we might want to encourage (or at least not discourage) activities 1 and 3, but take a different approach to 2 and 4, depending on the following questions:

a) Does speculation increase volatility?
b) Is this increased volatility a major problem in each market?
c) Do the benefits of addressing the problem outweigh the costs[14]?

If market speculation does not increase volatility, that is the end of the matter. If it does, however, what criteria should we use to assess questions b and c?

A lot of stock market activity can be thought of as market speculation as defined here. Owners of shares are usually seeking a capital gain and their activities collectively determine the price of the shares that they own. Share prices can also be highly volatile, with markets subject to waves of 'irrational' exuberance and pessimism, Furthermore, prices can – and do – move a long way from what might be considered fundamental valuations.

While history is replete with tales of fortunes lost on stock markets, most people would accept that the potential for high returns necessitates risk, and investors enter these markets fully aware of this. Few would argue that the developmental consequences of stock market volatility are severe enough to warrant intervention to curb 'speculation.'

Even if this were the case, however, we would need to balance micro costs with potential macro benefits when answering question c. Stock markets provide risk capital to firms, enabling investment and long-term productivity growth. The potential benefits of interventions to reduce volatility, would have to be set against the potential economic costs of impairing this function.

For stock markets most people would answer no to questions b and c. What if we pose these questions for commodity markets? Again, it depends on the market. While fluctuations in the price of gold may have few wider impacts, the price of food has a direct effect on the ability of people to meet their basic needs. The same level of price volatility in gold and staple food markets, would thus lead to very different answers to question b.

Markets are sources of price signals on supply and demand conditions. Volatility will muffle these price signals, and this will matter more in some markets than others. Clear price signals are more important in some markets than others. In the next section we unpack this a little more.

# 3. Speculation and food markets

It is broadly accepted that, in principle, speculation can cause volatility in food markets:

> *"Section 4a(a) of the CEA, 7 USC 6a(a), specifically holds that excessive speculation in a commodity traded for future delivery may cause "sudden or unreasonable fluctuations or unwarranted changes in the price of such commodity."* (CFTC)[15]

In this section we consider the differential impacts of price levels and volatility, before examining whether current levels of speculation can be linked to volatility in practice.

There are two questions to consider in terms of impact. First, impact of what, and second, impact on whom? For types of impact, we need to distinguish between price levels and price volatility, and again between high and low prices and volatility.

There are two main groups of actor.[16] The first consists of producers and consumers in developing countries, physical traders and manufacturers, developing country policy makers and food-related development agencies. The second group are finance focused, consisting of index and hedge fund investors, as well as commodity exchanges. These can be distinguished by their motivations. The first group are concerned with meeting needs and securing livelihoods, either directly (as producers, consumers, traders or manufacturers) or indirectly (as national and international policy-makers). The second are concerned with maximising financial returns, either through trading (index and hedge funds) or through providing the infrastructure to make trading possible, and taking a commission on each trade (commodity exchanges).

Despite their similar motivation, the interests of the members of each group are not identical. For example, farmers in developing countries want as high a price as possible, while consumers want the opposite. Manufacturers will prefer low prices, as will international agencies focused on food security – particularly those which have to buy supplies in global markets. Physical traders may be neutral on price levels. Developing country policy makers in countries which are net exporters of food are likely to want high prices, while net importers want the opposite.

On the finance side, commodity index funds are 'long-only' investors, in that they buy futures contracts on a rolling basis, and profit in a situation of rising prices. Hedge funds are often 'long-short' investors, able to profit from rising or falling prices. Anticipating the direction of prices and having a good strategy to exploit it is what matters, not the direction of prices themselves. Commodity exchanges are ambivalent. The bulk of their earnings come from the levying of a small, fixed fee to execute and settle trades.[17] The price at which trades settle is not important, what matters is trading volume.

Table 1 illustrates these differing interests for the impact of price levels and volatility, where we see a clearer split between the two groups in the case of volatility.

For the group concerned with food production, consumption and supply, and livelihood security in developing countries, high volatility is clearly a bad thing. In contrast, given that volatility is associated with increased trading volumes, commodity exchanges have a preference for high rather than low levels. Long-short hedge funds seek to benefit from price movements, often on a very short-term basis, and are thus likely to prefer relatively volatile over more stable price regimes. Index funds are interested in long-term price trends in the context of a diversified portfolio, where volatility in one part of the portfolio will be offset by another. They are thus likely to be broadly neutral on volatility.

An important caveat relates to time. As well as the direct impacts (either developmental or financial) prices serve a vital signalling function. 'The best cure for high prices is high prices' runs the saying, as high prices induce an increase in supply, lowering prices in the longer term. Artificially low prices thus benefit no-one, as they prevent an adjustment to supply. At the same time, as well as negative short-term effects, artificially high prices can have negative longer-term consequences, as they may lead to an unnecessary increase in supply, driving long-term prices below their equilibrium level, and penalising farmers in developing countries in the process.

The clear need is for prices to accurately reflect real demand conditions, and therefore to send correct signals. Artificially high or low prices send spurious price signals, while excessive volatility distorts these signals: in order to respond to high prices by raising supply, producers need some degree of certainty that price levels will be maintained.

More generally – and regardless of the time horizon – price volatility has no positive effect from a development perspective. There is, however, a 'signalling' effect from high volatility with respect to financial actors. As argued above, higher volatility is likely to attract particular kinds

**Table 1. Impacts and actors**

| | *DC farmers (rural)* | *DC consumers (urban)* | *Manufacturers* | *Physical traders* | *DC policy makers* | *Development agencies* | *Index fund investors* | *Hedge fund/ money mkt investors* | *Commodity exchanges* |
|---|---|---|---|---|---|---|---|---|---|
| High prices | √ | x | x | - | x/- | x | √ | - | - |
| Low prices | x | √ | √ | - | x/- | √ | x | - | - |
| High volatility | x | x | x | x | x | x | - | √ | √ |
| Low volatility | √ | √ | √ | √ | √ | √ | - | X | x |

of speculators, as price variability creates more scope for returns.

In terms of questions b and c, therefore, we can tentatively conclude that:

- negative impacts of food price volatility are concentrated on producers and consumers in developing countries, and agencies seeking to support these groups; and,
- 'beneficiaries' of higher volatility are restricted to hedge-funds with long-short strategies, and exchanges where revenues are linked to trading volume.

We would suggest that the negative impacts on the first group are far more important than the returns of the latter – i.e. the answer to question b. is yes. For question c, we have also argued that high volatility muffles price signals, potentially influencing the ability of supply to adjust to demand. Again, the costs are likely to far outweigh the benefits, where the beneficiaries are the same group as above.

The same point can be made for price levels. Artificially high prices may bring windfall gains to farmers, but have severe effects on poor consumers. If these high prices reflect growing demand and provide a necessary signal to increase supply, there is a long-term benefit. If, however, prices are artificially high because of the activities of financial actors, the resulting increase in supply will drive prices down below their equilibrium level, benefiting consumers, but creating severe impacts for producers.

Clearly, the ideal situation is relatively stable prices that accurately reflect the real global balance of supply and demand. The question, therefore, is whether the activities of financial speculators have moved us away from this situation.

# 4. The determinants of food prices

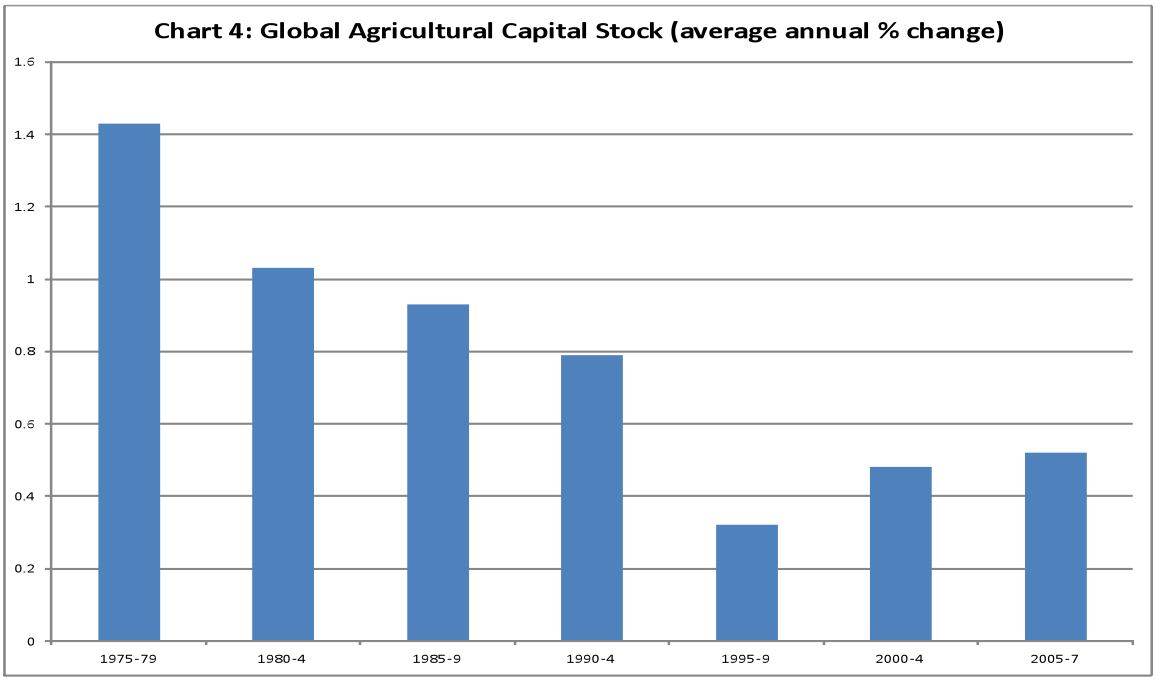
The (ongoing) debate on the causes of food price levels, spikes and heightened volatility turns on differing opinions on three questions:

(i) How important are supply effects?
(ii) How important are demand effects?
(iii) To what extent do market prices accurately reflect changes in supply and demand conditions?

## *4.1. Supply-centred accounts*

Accounts that focus on supply differ in the timescale that they focus on. The most short-term explanations focus on the impact on harvests of specific weather events, in Australia, for example, which reduced supply at a time when global stocks were already low (Wright and Bobenrieth, 2010). Another proposed short-term explanation is the supply shock caused by export bans introduced by countries keen to ensure they could meet domestic demand.

While these short-term shocks could, in principle, trigger a price spike, and contribute to higher levels of volatility, there are reasons to think this is limited. Problems with harvests are specific to particular markets and so cannot explain broad price effects across a range of markets (Gilbert, 2010). Second, export bans have been the result of increasing prices and volatility, rather than their cause. While they may have amplified these effects, therefore, they cannot have initiated them.




Source: WDM (2011)

A major medium-term, supply-based[18] explanation is the impact of the biofuel sector, particularly in the United States. The US is one of the largest exporters of a range of grains,[19] but by 2009 a quarter of the total US crop was converted into biofuels rather used as food. The primary driver of this trend was the subsidies introduced during the Presidency of George Bush. There is broad agreement that this has put upward pressure on prices[20], though the magnitude of the effect is not clear.

The longest-term accounts that focus on supply are, first, the current and potential impacts of climate change, and, second, the possibility that the 'green revolution' was really an anomaly rather than a permanent shift. In 2011, the High Level Panel of Experts on Food Security and Nutrition (HLPE) described this as follows:

> "The question is whether the food crisis is indicative of the end of a long period of structural overproduction in international agricultural markets, made possible by the extensive use of cheap natural resources (e.g. oil, water, biodiversity, phosphate, and land). In other words, are we at the end of a period of historically unprecedented agricultural production growth that relied on a strategy akin to mining?" (HLPE, 2011: 30)

If this view is correct, then the drivers of climate change and the 'structural overproduction in international agricultural markets', which have held down food prices are the same: the extensive use of cheap and non-renewable natural resources.

Related to these trends, there has been a steady decline in the growth of investment in agricultural capital (illustrated in chart 4), as well as in research and development (R&D). ODA related to agriculture has also declined steadily since the mid-1980s. (HLPE, 2011)

## *4.2. Demand-centred accounts*

While it is probable that each of the supply-based accounts has had some effect on prices in some markets, Gilbert (2010) makes the point that short-term, idiosyncratic shocks in particular markets (e.g. particular weather events) cannot explain the broad-based price changes across a range of commodity markets. For Gilbert, this is more characteristic of demand shocks, though the longer-term supply effects described above might also be expected to have effects across a range of markets.

Some demand-focused accounts help explain the transmission of supply shocks. For example, while the price elasticity of demand with respect to food is around -0.5 in the poorest developing countries, in developed economies it is effectively zero. (HLPE, *op cit*). A consequence is that there are no limitations on price rises driven by demand: consumers in developed countries will buy the same amount of food regardless of its price, while people in the poorest developing countries will respond to the same price rises by eating less food. Increasing demand relative to supply does not, therefore, lead to a reduction on consumption across the board, but a reduction in consumption by the relatively poor, and the maintenance of consumption levels by the relatively wealthy.

Other explanations also interact with supply effects. Perhaps the most common demand-based account is the rapid growth in the global population, compounded by a rapidly expanding middle-class, particularly in China. More people means more demand, but more relatively well-off people also changes the composition of this demand. As incomes rise people eat a more protein rich diet. Higher demand for meat leads to changes in land-use, with agricultural land being converted for pasture, and agricultural products being used as animal feed. Higher demand for meat thus lowers the supply of cereals and grains.[21]

The most controversial argument has been that financial actors have created significant new demand in global food markets, and this has been a major driver of price rises. Numerous studies[22] have pointed to the correlation between the huge growth in financial investment in commodities from around 2002, with the start of the sustained rise in food prices. Others took a different view. The strong correlation between financial inflows and food price trends was not disputed, but the direction of causality was. Rather than finance bidding up prices, it was rising prices – driven by the factors described above – that attracted additional finance.

A more fundamental critique was that activity in the futures market cannot affect prices in the spot market. A high profile contributor was Paul Krugman, who made the following points[23]:

- Food is a physical commodity, the price of which is determined by real supply and demand.
- For every new futures contract bought another must be sold. An increase of buying in the futures market is thus exactly offset by an increase in selling and is not 'new demand' in any meaningful sense.
- Activity in the futures market can only influence the spot price by influencing supply or demand for the physical commodity
- The channel though which this could happen is inventories: if activity in futures markets causes people to hoard stocks (in anticipation of higher prices in the future) this will reduce current supply driving up prices.
- The 'signature' of speculation is thus rising inventories: in most food markets inventories were falling at all the crucial times rather than rising.

Krugman's argument was supported by a number of detailed quantitative studies,[24] which found no causal link between increased activity in commodity futures markets and spot prices. The debate remains unresolved, and may not be resolvable using standard econometric

techniques. The question of causality is particularly intractable, not least because there are numerous explanations for rising food prices, all of which are plausible to some extent.

The crucial point of difference between the two camps is the relationship between activity in the futures market and spot market prices. To return to the typology of speculation introduced above, the argument of Krugman et al, is that speculation in commodity futures markets is independent speculation, in that this activity does not impact upon the spot price, and can therefore not be blamed for higher volatility (or higher prices). Opponents dispute this, characterising these activities as market speculation (as defined above), which does impact upon spot market prices.

In the next section we address this issue, in the context of a discussion of market based account of volatility.

## 4.3. Market-based accounts

To what extent do market prices accurately reflect changes in supply and demand conditions? In the debate described above, one camp argues that changes to food prices (both levels and volatility) over the past ten years is explained by shifting patterns of supply and demand, and that financial flows into the asset class reflect a rational belief that these trends will continue. Others argue that financial flows do not simply hold up a mirror to economic reality, but are themselves a key driver of prices. Furthermore, the story goes, this can be self-fulfilling, in that financial inflows drive up prices, attracting more inflows and driving prices up further.

This is an old debate. On the one hand we have proponents of some version of the 'efficient market hypothesis' (EMH),[25] combined with a belief in the efficacy of 'rational arbitrageurs'.[26] The EMH states that, in open and liquid markets, all relevant information about an asset is incorporated into the price, and that new information is factored in instantaneously. Price movements are thus driven by the appearance of new and relevant information about an asset's value.

An objection is that it does not follow that this information is an accurate reflection of 'fair value', which is where the rational arbitrageurs come in. In his celebrated defence of floating exchange rates, Milton Friedman argued that when prices move away from 'fair' or 'equilibrium' value an arbitrage opportunity is created, which will be exploited in competitive markets. Undervalued assets will be bought, and overvalued assets sold. In each case, arbitrageurs take advantage of a profit opportunity, and in so doing move prices back to equilibrium levels. For Friedman this must be true, since arbitrageurs who buy overvalued assets, and sell undervalued assets will soon go out of business. Taken together, these hypotheses imply that prices will accurately reflect changes to underlying fundamentals, and that any deviations from this will be quickly corrected.

The opposing camp has an equally impressive cast of characters to draw upon. Developing pioneering work by Frank Knight (1921), John Maynard Keynes applied the concept of uncertainty to asset pricing. For Keynes the future was inherently uncertain, so that the very idea of an 'objective' and accurate valuation was impossible. This uncertainty was then exacerbated by 'arms-length' investors with little or no knowledge of the assets they were buying or selling. In such an environment, market actors tend to mimic their peers, with bandwagon and herd effects. Keynes (1936) put it as follows:

> *"A conventional valuation which is established as the outcome of the mass psychology of a large number of ignorant individuals is liable to change violently as the result of a sudden fluctuation of opinion due to factors which do not really make much difference...the market will be subject to waves of optimistic and pessimistic sentiment, which are unreasoning and yet in a sense legitimate where no solid basis exists for a reasonable calculation."*

Contrary to Friedman, Keynes essentially argued that there is no 'true', or equilibrium value for investors to rally round, and for arbitrageurs to move prices towards. Others have stressed the limits to human cognition. Herbert Simon (1957; 1991) developed the concept of 'bounded rationality', which questions the ability of humans to process and act upon information to the degree implied by theories such as those described above. The field of behavioural finance grew out of work by Tversky and Kahneman (1972) on cognitive psychology, which demonstrated that people employ 'rules of thumb' (or heuristics) in their decision-making, and that these are subject to systematic biases.[27]

Addressing Friedman's arguments directly, others have stressed the 'limits to arbitrage' (Shleifer, 1997). Even if everyone knows prices are implausibly high (low) they will not necessarily sell (buy), since they may also conclude that prices will remain implausibly high (or low) for a sustained period – i.e. longer than they can afford to take a contrarian position. The dotcom bubble is a good example. Many – if not most – investors knew valuations were absurd, but they also saw that momentum remained and that getting off the 'bandwagon' would see their returns suffer relative to their peers. In such circumstances, the most profitable strategy is to stay on the bandwagon right up until it reaches the cliff edge, and jump off before the crash comes.

These tendencies may also have been exacerbated by more recent developments in trading and risk management strategies of financial actors. There has been an increased use of technical trading based on similar quantitative models, creating a convergence on the same kinds of strategies (UNCTAD, 2011). Also, financial institutions manage their risks through quantitative models based on concepts such as Value-at-Risk (VAR). Such models assess risk according to the (relatively recent) historical price movements of assets in their portfolio, and the correlation between these

movements. The fact that commodities are relatively uncorrelated with other asset classes such as equities and bonds was thus a major part of their attraction, as was their recent upward price trend. This needs to be viewed dynamically though: the appearance of safety encourages a diverse range of institutions using similar risk management tools to converge on the same assets. This then alters the very pattern of correlations that made them attractive in the first place, but is also the classic ingredients for a asset price bubble.[28]

Spratt (2006) suggests that prices will more closely resemble the EMH/Friedman view in long-established markets, where there is broad agreement over the determinants of value, and market actors have access to good information on movements in these determinants. In such markets, historical precedents have been built around what 'fair value' is, and this acts as an anchor for investor expectations and behaviour.

How might these arguments relate to global food markets? While it is difficult to think of more long-standing markets than those for food, this is not the case for their current form. It is only in the last ten years – following the deregulation described above – that financial 'speculators' have become major players in these markets. As we have seen, the composition of financial actors in global food markets has also changed significantly in recent years.

The second question is whether there is consensus over the determinants of market prices. In some ways this is the case: the supply and demand drivers of prices are well understood. As we have seen, however, these have also been changing rapidly in recent years, so that the relative impact of each on price movements has become increasingly uncertain. The measurement difficulties described above compound these problems.

The third question is whether there is good information available. UNCTAD (2011) has much to say on this question, and is worth quoting at length:

> *The availability of up-to-date and reliable information on commodity supply, demand and stocks is essential for the formation of accurate price expectations and an efficient functioning of commodity markets. Existing gaps regarding accurate information on market fundamentals risks causing market participants to trade on little or wrong information, which in turn will tend to accentuate price movements and may cause a sizeable divergence of actual prices from fundamental values, at least for some period of time. While information on market fundamentals is available from a range of sources...there are doubts as to the timeliness and reliability of that information. Harmonization of data provision and a more systematic way of data presentation would greatly facilitate the accessibility of available information. Finally, stocks are often held by the private sector and the proprietary character of the information on those stocks causes publicly available stock data to be particularly incomplete. Owing to these factors, monitoring and analysing of information on commodity market fundamentals is a difficult task.*

If market actors do not have good information on the fundamentals of supply and demand it is not possible for them – even in principle – to act as the EMH/Friedman perspective would suggest. In such circumstances, investors are likely to look to their peers for guidance, inferring knowledge in the behaviour of other investors and following their lead. This is very much the situation described by Keynes, which is likely to give rise to herding and bandwagon effects.

UNCTAD (ibid.) also suggests the following:

> *For these reasons, changes in market prices are not easy to interpret. Market participants cannot easily distinguish between price signals that are based on fundamentals and contain new information, and distorted price signals introduced by market participants that trade on the basis of purely financial news or signals from mathematical models. As the data based on fundamentals is limited (especially for inventories) it is difficult to form price expectations. Therefore market participants may rely, instead, on futures prices to convey the right signals. This increases the risk of herd behaviour and a perpetuation of the misleading price signals.*

This suggests that there is indeed a link between futures and spot markets via the formation of financial actor's price expectations. A number of other studies confirm this. Lagi et al (2011: 12), put the case as follows:

> *"...claims have been made that there is no possibility of speculator influence on commodity prices because investors in the futures market do not receive commodities. We have investigated this claim by asking individuals who set prices at granaries (the spot market) and who monitor the prices at the US Department of Agriculture how they determine the prices at which to buy or sell [83, 84]. They state that spot market prices are set according to the Chicago Board of Trade futures exchange, assuming that it reflects otherwise hidden global information, with standard or special increments to incorporate transportation costs, profits, and when circumstances warrant, slight changes for over- or under-supply at a particular time in a granary. Thus the futures market serves as the starting point for spot market prices."*

If it is the case that futures prices provide an anchor for price expectations in spot markets, the possibility of financial actors influencing the global price of food commodities becomes very real, if still unproven. In

relation to our typology of speculation, speculation in futures markets may not be *independent* of price movements in spot markets.

# 5. Uncertainty compounded?

In principle, the global price of any commodity should reflect the balance of supply and demand for this good. In global food markets, however, high levels of uncertainty make it very difficult to accurately assess this. As explored above, the question is whether greater prevalence of financial actors makes this better or worse. Recent research, spurred by the global financial crisis of 2008, has relevance to this question.

## *5.1. Complexity*

The study of complex systems has become increasingly important across a range of disciplines. Starting in the natural sciences, researchers began to notice that many natural systems shared certain features:

- they were comprised of large numbers of heterogeneous agents;
- these agents were strongly inter-related through dense networks of linkages;
- feedback loops were common;
- outcomes were highly sensitive to initial conditions (i.e. the 'butterfly effect');
- although such systems exhibited tendencies towards self-organisation, they were also liable to 'flip' from one relatively steady state to another;
- such changes were often non-linear in nature;
- 'emergent' properties could be observed at the system level, which could not be inferred from observing the sum of the behaviours of the individual agents;
- outcomes in systems of this kind did not appear to follow the normal probability distribution (i.e. they exhibit 'fat tails').

In the 1970s, physicist turned ecologist Robert May turned his new discipline on its head by arguing that complexity should not be equated with stability. Before May, the standard view was that ecosystems were self-stabilising, and that the more complex there were – in terms of connections between individual agents – the more stable the system would be. Crudely, the logic was that inter-relatedness ensured external shocks were widely diffused through the system, and the large number of agents ensured that an attack on any one group could not bring the whole system down. So, the more agents – and the more they were connected – the better.

May (1973) showed that the opposite could be true, and that high levels of complexity could engender systemic fragility. The key breakthrough was the identification of a threshold effect: at low levels of complexity, adding linkages between agents does indeed increase system stability. Beyond a certain point, however, greater interdependence does the opposite, as agents become overly dependent on the survival of other agents, such that a failure anywhere at any point is rapidly propagated throughout the system, threatening its survival.

## 5.2. Finance and complexity

In many ways, the modelling of complexity is the opposite of the approach taken in orthodox economics. Complexity research is bottom-up, open ended, stresses the heterogeneity of agents, the importance of their interactions with each other and their ability to learn and adapt. This last point gives rise to the term 'complex adaptive systems'. In contrast, economic modellers often assume all agents are the same – the so-called 'representative agent' – and that their preferences do not change. There is no learning and adaptation in this framework. Moreover, agents do not interact with each other in any meaningful sense, but respond to centrally determined price signals. These constraints are necessary to simplify neo-classical models sufficiently to make them mathematically tractable. The casualty is the fit with the real world.

Nowhere is this more evident than in finance, which resembles a complex ecosystem as described above far more than the elegant system of neoclassical economics. It was Robert May again who noticed this similarity. May et al (2010: 1):

> *'Tipping points', 'thresholds and breakpoints', 'regime shifts' — all are terms that describe the flip of a complex dynamical system from one state to another. For banking and other financial institutions, the Wall Street Crash of 1929 and the Great Depression epitomize such an event. These days, the increasingly complicated and globally interlinked financial markets are no less immune to such system-wide (systemic) threats.*

May's insight that apparently robust systems can 'flip' into fragility as shocks are rapidly propagated appears highly pertinent for financial systems. As in ecology, the orthodoxy in economics was that increased inter-relatedness enhanced stability. In financial systems, this was through the dispersal – and so diminution – of risk. By moving risks to those parts of the system best able to cope with them, individual institutions became safer and the system itself more robust, and so able to take on more risk.

In the light of this worldview, the more linkages between institutions the better, as the denser the network of linkages, the more dispersed is total system risk, and the most robust are both the individual institutions and the system itself. But if this is not the case, and greater connectivity – beyond a certain point – increases total risk, then the implications for financial regulation are significant. As with ecological systems,

safety will be enhanced at the level of the system by reducing these linkages.

May et al (op. cit: 1) describe the implications:

> *...ecologists and others have long suggested that modularity — the degree to which the nodes of a system can be decoupled into relatively discrete components — can promote robustness. Thus, a basic principle in the management of forest fires and epidemics is that if there is strong interconnection among all elements, a perturbation will encounter nothing to stop it from spreading. But once the system is appropriately compartmentalized — by firebreaks, or vaccination of 'superspreaders' — disturbance or risk is more easily countered.*

By 'superspreaders', the authors refer to the fact that not all 'nodes' in the system are equally linked. The great majority have few or no linkages between them, but are instead all connected to a small number of 'super' nodes. The systemic implications of the failure of one of these 'superspreaders' are accordingly serious, as the collapse of Lehman Brothers amply demonstrated.

Andrew Haldane is Director of Financial Stability at the Bank of England, and has published a series of papers on the links between complexity research and the financial system, both independently and with Robert May. Haldane and May (2011: 1) describe the increasing intra-system linkages that preceded the financial crisis of 2008/9:

> *Perhaps as much as two-thirds of the spectacular growth in banks' balance sheet over recent decades reflected increasing claims within the financial system, rather than with nonfinancial agents. One key driver of this explosive intrasystem activity came from the growth in derivative markets.*

This rapid growth in connectivity, with financial institutions creating new (derivatives) instruments, and then trading them between themselves, was seen as inherently beneficial. As well as the positive risk management effects described above, financial innovation and the creation of new products and markets was assumed to be welfare enhancing. For economists, such developments appeared to move markets closer to 'completeness'.[29] Market completeness is a requirement for solving the Arrow-Debreu general equilibrium model, maximising total welfare. While seemingly arcane, such theoretical abstractions were used to underpin the assumption that financial innovation – to create new products and new markets – was by definition a good thing.

The empirical reality of the global financial crisis blew a major hole in this edifice, which has since been further undermined by empirical and theoretical research. For example, Brock et al (2008) describe how increasing hedging activity can increase rather than reduce the volatility that hedging instruments are designed to provide protection against.[30] Caccioli et al (2009) build on this work, arguing that the expansion of markets and proliferation of instruments has little impact on volatility and risk until it approaches a tipping point, or 'singularity', beyond which system stability is threatened by further expansion. Haldane and May (op. cit: 2) describe the process:

> *Note that the consequences of this singularity are not easily intuited from the competitive equilibrium setting. It seems to us that the basic process—in grossly simplified terms—is that once there are enough derivatives to span the space of available states of nature (the net supply of derivatives within the system necessary to meet true hedging demand*
>
> *from non-banks), the market is essentially complete in the sense of the Arrow–Debreu model. Once that happens, gross derivatives positions within the system are essentially unbounded... Such trades are essentially redundant, increasing the dimensionality and complexity of the network at a cost in terms of stability, with no welfare gain because market completeness has already been achieved.*

Caccioli et al (op. cit.) spell out the implications of their results:

> *It has been recently suggested that market stability appears to have the properties of a public good...the expansion in the repertoire of traded assets introduces an externality which drives the market to unstable states. This suggests that systemic instability may be prevented by the introduction of a tax on derivative markets, such as that advocated long ago for foreign exchange markets by Tobin, or by the introduction of "trading permits", similar to those adopted to limit Carbon emissions....the ideal view of the markets on which financial engineering is based is not compatible with market stability. The proliferation of financial instruments makes the market look more and more similar to an ideal arbitrage-free, efficient and complete market. But this occurs at the expense of market stability.*

Haldane (2008: 7) stresses the importance of diversity to maintaining system stability, and goes onto describe the increasing homogeneity of financial market actors' behaviour, even as they sought to enhance their own stability through diversification:

> *Firms migrated activity to where returns looked largest. As each new day dawned – leveraged loans yesterday, CDOs today, proprietary trading tomorrow – the whole sector was drawn to the new source of sunlight. Through competitive forces, finance engaged in a frantic game of follow-the-leader, played for real money. From an individual firm perspective, these strategies*

*indeed looked like sensible attempts to purge risk through diversification: more eggs were being placed in the basket. Viewed across the system as a whole, however, it is clear now that these strategies generated the opposite result: the greater the number of eggs, the greater the fragility of the basket - and the greater the probability of bad eggs... Nodes grew in size and interconnections between them multiplied. The financial cat's-cradle became dense and opaque. As a result, the precise source and location of underlying claims became anyone's guess. Follow-the-leader became blind-man's buff. In short, diversification strategies by individual firms generated heightened uncertainty across the system as a whole.*

And of course, one of the sectors that these actors herded into – where returns had been high and were expected to remain so – was food commodity markets. Another attraction was the low correlation with other markets, but as commodities became a core component of the portfolios of institutional investors, system level holdings became increasingly homogenous.

Global food markets have undoubtedly become more 'financialised'. Although there is no incontrovertible proof that this has contributed to either heightened volatility or artificially high prices, there are good reasons to assume that it either has happened, or if not is likely to in the future. Financial instruments are also becoming more complexity, as index fund managers use increasingly complex derivatives to mimic movements in underlying commodity prices, and hedge funds become more and more involved in food markets.

Global food markets have long been characterised by high levels of uncertainty. There are good reasons to think that the increasing involvement of financial actors will make this worse not better. The experience of the global financial crisis, and our greater understanding of complex systems, suggests strongly that financial innovation is not always positive for system-level stability. We have seen the consequences of this in other markets, the question is whether food is different, and if so, what should be done about this situation.

# 6. What (if anything) is to be done?

As we saw in part 1, food commodity markets have become more complex in recent years. From a position where physical trade predominated, and financial transactions were entered into to hedge against 'natural-independent' and 'market risk' (i.e. natural-independent and market hedging), speculative financial actors (i.e. market speculators) have become increasingly important. The catalyst was the process of deregulation began at the turn of the century, which ushered in an era of new actors and new instruments, and increasing complexity.

So what, if anything, should be done about this? The framework developed in section 2.2 suggests this depends on the answer to three questions:

a) Does speculation increase volatility?
b) Is this increased volatility a major problem?
c) Do the benefits of addressing this outweigh the costs?

The answer to the first question is not clear. Volatility has certainly increased in key markets, and this has coincided with a significant increase in the role of new financial actors. Although proving causality has proven to be very difficult, it is not sufficient to insist that there is no link between futures and spot markets, and that is it the end of the matter. While it is possible to construct a theoretical case to support this position, the evidence presented in section 4.3 – particularly that from UNCTAD (2011) – suggests that in practice there is such a link. If this is so, then speculation in futures markets is not completely independent of price movements in spot markets, and it is legitimate to consider what the consequences of a greater role for financial investors might be given this linkage.

Booms and busts fuelled by 'irrational' exuberance and pessimism have often accompanied an increasing role for finance in other markets. Given that food markets are already characterised by high levels of uncertainty, complicating the price discovery mechanism, the potential for bubbles and crashes would also seem to be quite high.

More recent work on complexity – as well as the stark lesson of the global financial crisis – suggest that financial innovation, and increasingly interconnected networks, can embed deep fragility into seemingly robust systems.

It is also clear that volatility in food markets matters in a way that is not true for other markets. Both farmers and consumers suffer when prices are highly volatile, and price signals on the relative balance between supply and demand are muffled, with potentially profound long-term consequences for global food supply. Set against this, the 'beneficiaries' of volatility are limited to a class of hedge-funds and commodity exchange operators who benefit from an increase in volumes traded. It seems reasonable to conclude, therefore, that increased volatility does matter, that this is of greater weight than the very limited benefits it may bring, and that less volatility would be preferable to more.

The final question is whether, in the light of this, it is worth addressing the problem on a cost-benefit basis. Below we list some potential policy options, organised into three categories: light, medium and strong.

## *6.1. 'Light' policy options*

The options in this category are relatively uncontroversial, focusing on measures to make markets work better by providing better, and more timely information. While there is some disagreement on the

correct level or emphasis of these measures, most people would be content with their implementation. The 'costs' of these measures are minimal and there is a clear case on a cost-benefit basis.

Examples include:

- Improving the quality and timeliness of information (on supply and demand conditions)
- Improving transparency (of positions) by bringing over-the-counter (OTC) derivative transactions onto exchanges.
- Clarifying and simplifying definition of instruments and close loopholes

All commentators agree on the need for better information, so that there has been widespread support for the development of Agricultural Market Information System (AMIS), which was introduced in 2011. AMIS provides a common source of data for all actors in the market to work off, as well as an important discussion forum. A key objective of AMIS was to reduce the probability of countries taking unilateral action to restrict exports, which some suggest has been an important factor limiting price rises in 2012 following a severe drought in the summer of 2012 in the US in particular.

More contested have been calls for OTC transactions to be moved onto exchanges,[31] with opponents arguing that the standardisation required for exchange-traded products will restrict risk mitigation options unnecessarily. As with AMIS, however, the ultimate goal of this is to increase the supply of information and therefore enable more informed decision-making by market participants. Clarification of definitions are proposed for the same reasons.

Whether this is sufficient depends on one's view of how markets operate. Many point to the problem of market abuse, where very large financial positions may be taken and used to manipulate the market. Addressing these concerns requires stronger measures.

## *6.2. 'Medium' policy options*

This set of policy options go a step further than the provision of better information, and are focused on limiting the activities that individual institutions can undertake.

For example:

- Increasing margins (reduce leverage)
- Restrict high frequency trading
- Tighter (institutional level) position limits
- Tighten exemptions from position limits

Proposals to increase margin requirements are designed to reduce the amount of leverage (i.e. borrowing) that institutions can do. The goal is to improve the stability and creditworthiness of these institutions, and so the stability of the markets in which they operate.

Regulators in both the US and European Union are currently attempting to implement position limits, despite strong lobbying from the financial sector. Following a Directive from the US Congress, the CFTC has proposed limiting the size of positions that any one institution can take in the market. Although there has been criticism that these are too lax – institutions could still control up to a quarter of the market – the CFTC was taken to a Federal District Court by financial institutions to challenge the decision. The question was whether the CFTC needed to prove that imposing position limits was necessary to improve the functioning of markets, and the Court ruled that this was necessary, and that the CFTC had not demonstrated this need. As a result, the CFTC was prevented from implementing position limits in the market. In November 2012, the CFTC voted 3-2 to appeal against this decision, and this case had not been held at the time of writing.

As part of its Markets in Financial Instruments Directive (Mifid II) process, the European Union is currently planning to implement position limits, though it remains to be seen how this will be affected by the outcome of the CFTC appeal in the US.

Despite the fierce lobbying by the financial sector, measures of this kind are fully compatible with a very positive view of markets. Indeed, both light and medium policy measures of the kind described here are explicitly designed to help markets work better: transparency and good information aid accurate price discovery; position limits prevent markets being manipulated; limited exemptions to position limits help ensure a level playing field for market participants.

Many of the major reports written on these issues – G20 (???), Foresight (???), HLPE (2011) – would be fully supportive of the 'light' and 'medium' policy options described here. While seemingly anathema to parts of the financial sector, there is no real opposition to position limits at the institutional level from other commentators.

If one takes the view that markets work well when information is good and well dispersed (i.e. a 'weak' EMH/ Friedman view), then there would be no need for further measures. If one thinks, however, that markets are prone to periodic bouts of 'irrationality' – even with good information/transparency, and in the absence of abuse – further measures are likely to be required.

### 6.3. 'Strong' policy options

Although most commentators and regulators agree on the need for better information and coordination, as well as limits on what individual market actors can do, there is less agreement on reforms to more general aspects of markets.

One issue, for example, that has attracted interest in Europe is computerised high-frequency trading (HFT), which critics argue can amplify market movements excessively, increasing volatility unnecessarily. In September 2012, Members of the European Parliament

(MEPs) voted in favour of a 500 millisecond delay in ultra-fast trades.

Another issue is the relative weight of 'speculative' money in the market. Although regulators in the US and EU have proved willing to limit the size of positions that individual actors can take, the CFTC in particular has been strongly opposed to imposing limits on the total amount of 'speculation' in the market. To return to our typology of speculators, this implies one of two views. First, that futures market trading activity is independent of market prices, so that it does not matter – for spot prices – what proportion of total futures market activity is accounted for by these actors. Or second, that futures market trading can influence spot prices, but only in the sense that they will improve the price discovery mechanism. That is, we are either dealing with 'independent speculators', or 'market speculators' who are rational arbitrageurs.

This may be the case. The link between futures and spot markets has not been definitely proven, and it may not be possible to do so. The evidence presented here, however, suggest that there is a good chance that such a link exists. This may not matter though, as financial actors behaving rationally could help stabilise the market around 'fair values' that accurately reflect underlying economic fundamentals. Again, however, the evidence presented here – particularly given the high uncertainties around supply and demand conditions in food markets – suggests that heightened volatility and inaccurate price signals is a more likely outcome. Given this, there appears to be a strong case for the precautionary principle to be applied.

If increasing financialisation raises system level risk over time, which may flip into a fragile state once key thresholds are passed, then the total level of market speculation may be very important. As well as the total weight of speculation in the market, the volume – and speed – of trading activity may also serve to amplify booms and busts. Solutions could be to place restrictions on high-frequency trading in these markets, and/or to introduce very small transaction taxes which only impact upon those making large numbers of trades.

Others have reached a similar conclusion. The World Development Movement (op cit) have called for limits to the proportion of the market accounted for by financial speculation. The HLPE (2011) report calls for a 'precautionary' approach to be applied to financial speculation. De Schutter (2010: 8) also stresses the risks of the market becoming dominated by (relatively ill-informed) market actors:

> *Access to commodities futures markets should be restricted as far as possible to qualified and knowledgeable investors and traders who are genuinely concerned about the underlying agricultural commodities. A significant contributory cause of the price spike was speculation by institutional investors who did not have any expertise or interest in agricultural commodities, and who invested in commodities index funds because other financial markets had dried up, or in order to hedge speculative bets made on those markets.*

Finally, if market prices can become subject to momentum driven booms and busts, moving prices away from fundamental for long periods, there may be case for the creation of 'virtual reserves' where trading funds are established to take contrarian positions in the futures market, thereby preventing speculative bubbles taking hold.

# Conclusions

As we have seen, the policy responses that different commentators favour are strongly influenced by two things. First, their view on the link between increasing financial speculation in futures market and price movements in spot markets. Second, their view on the relationship between financial market prices and underlying economic fundamentals. Reasonable people take different view on these questions, and it is not possible to answer them definitively. On the balance of evidence, however, we have proposed the cautious use of the precautionary principle, largely because of the fundamental importance of global food markets to the lives of billions of people.

Set against this, the 'costs' of placing greater curbs on financial participation in food markets seem relatively trivial. Some argue that reducing speculation would reduce market liquidity, increasing hedging costs. But there has been no reduction in hedging costs as financial engagement has grown. The only real cost, therefore, may be a reduction in the profitability of some financial institutions. Set against the potential benefits, this seems a price well worth paying.

## Notes

1. Thanks to Benoit Daviron, Jörg Mayer and Jim Sumberg for comments on earlier drafts of this paper, and to Miguel Rivera Quinones for research assistance. Errors, of course, remain my own.

2. http://www.twnside.org.sg/title2/resurgence/2010/234/cover03.htm

3. See Obstfeld, (1988) for a discussion of how market activity can create these 'multiple equilibria' with respect to exchange rates.

4. Volatility is calculated as the annualized standard deviation of the first difference of the log of futures' returns.

5. A 'swap' is a derivative contract between two parties who agree to exchange payments (or cash flow) at agreed moments within a certain agreed period of time. In the case of commodity contracts, a predetermined fixed price of a underlying commodity is paid by one party in exchange for which the other party paid the (floating) spot price of the commodity on the agreed days of payment.

6. This insurance mechanism is made possible through the use of instruments such as futures contracts, which are an agreement to purchase or sell a commodity for delivery in the future at a price determined at the initiation of the contract that obligates each party to the contract to fulfil the contract at a specific time. Another traditional instrument is the option contract. Options convey the right, but not the obligation, to buy or sell a particular item at certain price for a limited time. Such contracts are a less secure, but cheaper choice for producers (CBOT; 1997)

7. In his Treatise on Money (1930) John Maynard Keynes argued that 'normal backwardation' – where futures prices are below spot prices – is a normal state in commodity markets where producers are likely to hedge risks.

8. Commodity index funds, in contrast, are only accessible to institutional investors

9. Wall Street Words: An A to Z Guide to Investment Terms for Today's Investor

10. There are exceptions to this. For example, gambling may be restricted to a greater or lesser extent, and drug use is prohibited in most jurisdictions. The rationale may be to 'save people from themselves', or because of cultural or religious sanction. More often, however, it is to reduce spillover effects (i.e. externalities) from the activity to the wider society.

11. By influencing demand for a particular currency, the level of exchange rates may also be affected.

12. Some markets are inherently more volatile than others.

13. The Chicago Mercantile Exchange introduced exchange-traded weather futures contracts in 1999.

14. For example, reducing speculation may reduce liquidity and increase hedging costs, which is a real cost.

15. http://www.cftc.gov/IndustryOversight/MarketSurveillance/SpeculativeLimits/index.htm

16. In practice, there will be some blurring of these boundaries. Large firms focused on physical trading may also engage in financial speculation, for example.

17. The Chicago Mercantile Exchange (CME) has revenues of $1.5 billion in 2010. Of this, 67% came from execution and settlement fees. CME (2011)

18. This could also be thought of as a demand-based explanation, as biofuel usage of grains has increased the demand for the commodity.

19. With nearly 40% of maize and 10% of global wheat production.

20. See Mitchell (2008), for example.

21. See Wright and Bonrieth (2010), for example

22. For example, see: Ghosh and Chandrasekhar (2008); SOMO (2010); the World Development Movement (2010; 2011); Ghosh et al (2011)

23. http://krugman.blogs.nytimes.com/2011/02/07/signatures-of-speculation/

24. See Irwin and Saunders (2010) for the most thorough example of this perspective.

25. Fama (1970)

26. Friedman (1953)

27. For example, people tend to overweight the probability of events that have recently occurred, see trends in very small samples, and assume very unlikely events are impossible. To make matters worse, they are generally overconfident in their own abilities and judgements

28. See Persaud (2000)

29. Market completeness is a situation where it is possible to enter into contracts for all possible eventualities, both geographically and temporally.

30. The logic is straightforward enough: more hedging instruments enable risk averse investors

to take larger positions in any given setting. Where these bets come off, the original decision is vindicated, and a larger signal to other investors on the 'success' of this approach is sent, inducing them to herd into the same approach. Over time this should amplify the tendency of markets to 'overshoot', thus increasing volatility in the system.

31. See de Schutter (2010), for example.

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