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Bubbles in food commodity markets: Four decades of evidence☆

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A B S T R A C T

We use daily prices from individual futures contracts to test whether speculative bubbles exist in 12 agricultural markets and to identify whether patterns of bubble behavior exist over time. The samples begin as far back as 1970 and run through 2011. The findings demonstrate that all 12 agricultural markets experienced multiple periods of price explosiveness. However, bubble episodes represent a very small portion—between 1.5 and 2%—of price behavior during the 42-year period. In addition, most bubbles are short-lived with 80–90% lasting fewer than 10 days. Though receiving far less attention, negative bubbles contribute significantly to price behavior, accounting for more than one-third of explosive episodes. Markets over-react during both positive and negative explosive episodes, leading to a correction as they return to a random walk. This adjustment back to fundamental values is most pronounced with positive bubbles particularly in the earlier part of the sample. While the magnitudes of the corrections are generally small, there were a few instances of significant increases in prices and large over-reactions, most notably in the softs (e.g., cocoa 1973, coffee 1994, cotton 2010). We also find that explosive periods did not become more common or last longer in the second half of the sample period and that the most recent bubble episodes may not have been as severe as in mid-1970s.

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Food commodity prices have trended upward and experienced several large spikes since 2006, the most dramatic in 2007–2008. An acrimonious world-wide debate has ensued about the nature and cause of the price spikes. Much attention has been directed towards the trading activities of a new type of participant in commodity futures markets—financial index investors. A common assertion (e.g., Masters, 2008, 2009) is that unprecedented buying pressure from financial index traders created a series of massive bubbles in agricultural futures prices. However, a number of recent studies fail to find a direct empirical link between index trading and agricultural futures price movements, casting doubt on the view that index trading distorted pricing in these markets (see Irwin and Sanders (2011) for a review).

The failure to find a link between the positions of a particular group of traders (commodity index traders) and agricultural futures prices does not rule out the presence of bubble components in prices, particularly during the spikes that have been of such concern to policy-makers. This broader issue of the existence of bubble components in agricultural futures prices has received much less attention. To date, four studies have tested for the presence of bubble components in various agricultural prices over the past few years and find mixed results (Gilbert, 2010; Phillips and Yu, 2011; Etienne et al., 2012; Gutierrez, 2013). These studies utilize new bubble tests developed by Phillips et al. (2011), Phillips and Yu (2011), and Phillips et al. (2012) that can detect and date-stamp bubbles by determining whether prices deviate from a random walk and become mildly explosive. In general, these studies indicate grain futures prices experienced periods of explosiveness with bubbles in soft and livestock markets being less prevalent.

While the findings are informative, results of previous tests for bubbles in agricultural futures prices may be compromised by the use of a series of cash prices or rolling nearby futures price (i.e., the series are constructed using prices until near the maturity date and then switching to the subsequent maturing contract). Bobenrieth et al. (2013) show that in the presence of supply and demand shocks in a rational storage model cash prices of storable commodities may behave in a bubble-like fashion, but the "bubble" is driven entirely by fundamentals. In earlier work, Wright and Williams (1991) demonstrate that in the presence of demand and supply shocks cash prices of a storable commodity may contain large spikes similar to the patterns detected by the new bubble tests. Wang and Tomek (2007) also show that cash prices in general do not follow a random walk and may contain systematic components. Nearby futures prices often behave essentially as cash prices given the short time to contract expiration (Peterson and Tomek, 2005). Thus, explosive periods identified for a cash price or nearby futures price series may be a result of fundamental factors rather than bubbles.

Another technical problem is presented by the use of a nearby futures price series for storable commodities. The new bubble tests (e.g., Phillips et al., 2011) are based on price levels and require the price levels to be differenced before conducting statistical tests. Since a nearby futures price series must be "rolled" from a nearby to a next deferred contract near expiration, the price difference on each roll date is computed across contracts. When a storable market is in contango (i.e., nearby price less than deferred price), the price change will be positive, with the price of storage as an upper bound. However, when a storable market is in backwardation (i.e., nearby price greater than deferred price) the price change will be negative, with no lower bound as the nearby futures converges to a cash price that is influenced by immediate commodity scarcity. As a result of the roll, considerable noise may be introduced into bubble tests applied to a series of nearby futures prices and the potential for large distortions in test results exist in the presence of strong and recurrent backwardation.

In this paper, we use the daily prices from individual futures contracts to test whether speculative bubbles occur in agricultural futures markets and identify whether patterns of bubble behavior exist over time. A series of prices from an individual futures contract will behave as a sequence of expected cash prices at maturity and should follow a random walk if one assumes rational expectations and no risk premium or basis risk (Peterson and Tomek, 2005). Deviations from a random walk in the series of prices for individual futures contracts may thus provide more reliable evidence for the presence of a bubble component in food commodity prices. We also test for bubbles over a very long sample period. In particular, we test for bubbles in samples of daily futures prices for 12 agricultural futures markets that begin as far back as 1970 and run through 2011. This allows us to compare the behavior of agricultural futures prices during recent spikes with those during the mid-1970s, the last period of comparable market volatility (Piesse and Thirtle, 2009).

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