The Unimportance of “Low” World Grain Stocks for Recent World Price Increases

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ESA Working Paper No. 09-01
February 2009

Agricultural Development Economics Division
The Food and Agriculture Organization of the United Nations

www.fao.org/es/esa
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Abstract

Beginning in 1999/2000, global stock to use ratios for the major cereal grains declined rapidly, and just before the beginnings of the world food crisis in the second half of 2006 these ratios had reached their lowest levels in more than 20 years for all of the three major grains (rice, wheat, and maize). Most of the decline was driven by stock drawdowns in China, however. The declines in stock to use ratios for the world without China were much less rapid and the ratios did not reach particularly low levels before, or even during, the world food crisis. Although China’s demand does influence world markets, it makes sense to analyze the stock data without China because China is a relatively small player in world grain markets and because China’s stock management does not appear to influence or be influenced by world market trends. These observations suggest that stocks did not have an important effect on the evolution of the world food crisis.

Key Words: Stocks, food prices, food crisis.

JEL: Q17, Q18.

Constructive comments from Abdolreza Abbassian, Peter Timmer and Keith Wiebe are gratefully acknowledged. Unfortunately, none of them agreed to take responsibility for any errors in the paper, so I will have to accept that responsibility myself. Views and opinions presented here do not represent FAO’s institutional views.
The unimportance of “low” world grain stocks for recent world price increases

Introduction

It is often stated that abnormally low world grain stocks were one cause of increased price volatility and the surge in world grain prices in 2007/08, although some have questioned this view (Headey and Fan 2008). The purpose of this short note is to explore stock movements in more detail. The conclusion is that the importance of stock levels for recent price movements has been exaggerated.

This note will not discuss in any detail what constitutes the optimal level of stocks at either national or global levels. Any such analysis would need to explicitly compare the costs and benefits of stockholdings relative to other investments such as improved rural infrastructure, irrigation and agricultural research to stabilize yields. Costs of storage include quality deterioration, interest costs (the opportunity costs of holding physical inventories), as well as the costs of the physical storage facilities. The main benefit is the ability to respond quickly to changing market conditions. For the public sector, this might involve stabilizing prices, while for the private sector it would mean the ability to make a profit by selling when prices are temporarily high (e.g. just before harvest) or by buying when prices are temporarily low (e.g. just after harvest). In quantifying these benefits, it is crucial to consider the costs of trade as an alternative to storage. For example, grain harvests occur at different times in different countries, and allowing for international trade will reduce the level of optimal storage (e.g. a northern hemisphere country might wish to buy wheat from the southern hemisphere in the two to three months before a new harvest as opposed to storing wheat for nine months until the next harvest). On the other hand, releasing supplies from storage allows for a more rapid response to changing market conditions than does procuring supplies on international markets and having them shipped to the point of demand.

This note will also not discuss the quality of the data on stocks in any detail, beyond noting that data on stocks are problematic for at least two reasons. First, in many countries, much of the stocks are held in private hands and it is difficult to obtain reliable estimates of the true quantities (private traders may be reluctant to disclose their positions to competitors or to the government for fear of being branded as a speculator or hoarder). Second, even for public stocks, some countries refuse to release information because it might compromise the government’s ability to influence markets. These data limitations also make it difficult to discuss private and public stocks separately. Nevertheless, the numbers used in this analysis are the best that are widely available,1 and given that stock to use ratios were often cited during the discussion of the world food crisis, it is worth examining what these data reveal.

The importance of China

A large part of the undeniable decline in world grain stock to use ratios in recent years (Figure 1) is due to China’s drawdown of stocks that began in 1999/2000 (Figure 2). The stock drawdown was a logical response given the high levels of China’s stocks at that time, both relative to past history in China and relative to other countries in the world in the late 1990s. Thus, while stock to use ratios for maize, rice, and wheat in China in 1981/82 were 66%, 33%

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1 This paper uses data on stocks from the United States Department of Agriculture because long time-series of data are available on the Internet at http://www.fas.usda.gov/psdonline/psdquery.aspx. FAO data show similar trends, although FAO data generally show higher stock to use ratios, especially for China. The conclusions of the analysis in this paper do not change if FAO data are used.
and 27%, respectively, these ratios increased steadily into the 1990s until they reached 106%, 94% and 73% respectively in 1999/2000. These latter ratios were at or near all time records for China for all three major grains. Further, the average stock to use ratio for countries other than China in 1999/2000 were 14%, 22% and 18% for maize, wheat and rice (see Figure 1), showing that China’s stocks were not only high by their own historical standards but were also high by the standards of other countries at that time. Indeed, China’s ratio of ending stocks to domestic consumption for total cereals was the third highest in the world at this time (only Paraguay and Bolivia, two landlocked countries, had higher ratios), and China was in the top five for each cereal individually. Finally, FAO (1983) suggested that stock to use ratios of 17-18% would be adequate to substantially stabilize prices and consumption. While there is substantial uncertainty surrounding these FAO recommendations, China’s ratios exceeded the suggested ratio by a factor of about five. Thus, by all three of the standards discussed here (China’s own past history, other countries in the world in the late 1990s and expert recommendations), China’s stock to use ratios in 1999/2000 were clearly very high, and it is very likely that it made economic sense to substantially reduce those ratios.

If one graphs the stock to use ratio for rice, wheat and maize for the world without China (see Figure 3), one finds that ratios for rice and maize during the past few years were not particularly out of line with recent history. The story for wheat is different, but the stock to use ratio for wheat has been declining steadily for the past 45 years. There have been no new developments in the trend, and in terms of levels, it seems questionable to arbitrarily posit some threshold that, once stocks fall below that arbitrary level, prices will surge. This is especially true when wheat stocks are still above the level of rice and maize stocks (in ratio terms).

Some argue that the stocks of world exporters are most important, although it is not clear theoretically that this should necessarily be the case. Stocks held in importing countries should reduce demand by importers, helping to moderate world price increases. In any event, graphs of stock to use ratios for the major exporters of each of the three major grains (Figure 4) show trends that are similar to those for the world without China.

**Excluding China from the analysis makes sense**

It is possible to argue that while stock to use ratios for the world without China are interesting, they are largely irrelevant because China in fact is part of the world and it does have an influence on global markets. China’s demand certainly does have an impact on global food markets, but the argument that it is important to consider China’s stocks when analyzing the state of world food markets implicitly assumes that China’s stocks are or will be used on world food markets. In fact, however, as noted by Headey and Fan (2008), China is largely self-sufficient in each of the three major cereals and is not a major player in these markets. More to the point, China’s drawdown of stocks beginning in 1999/2000 did not lead to increases in China’s share of the world export market for any of these cereals; the stocks were used domestically (with the possible exception of one year for maize; see Figure 5). Nor was there any surge in Chinese grain imports after the stock drawdown was complete.

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2 It is possible that stocks in exporting countries could be more useful than stocks held in importing countries if there are barriers to importing countries exporting their stocks to the world market, e.g. due to quality concerns on the part of traders or due to lack of established marketing channels. On the other hand, if importers already have high stocks, they will not need to draw on the stocks of exporters.
Furthermore, changes in world cereal prices do not seem to induce a change in China’s grain stocks. For example, Figure 2 shows that China actually increased its stocks of wheat and maize during the 1995-96 price spike (for wheat, this was just a continuation of a long term trend), as opposed to decreasing them. For rice, there was little change. Thus, China’s stock holding behaviour seems to be driven by domestic considerations, not the state of international markets. This assertion is supported by events in 2008. China could have made large profits by exporting some of its rice stocks during the sharp price spike in 2008, but decided to keep domestic stock levels roughly constant, despite the fact that its rice stock to use ratios are still high by world standards.

**World stocks excluding China were not particularly low**

If China’s stocks are not in play on world cereal markets, then it makes sense to examine global stock to use ratios excluding China, as is done in Figure 3. But if China is excluded from the calculations, then world grain stocks were not particularly low in the prelude to the crisis. If stock levels were not particularly low, then it is not clear why they should have had major effects on world market prices. Indeed, there is no need to posit low stocks as an important explanation for the price surge that lasted from 2006 to 2008, as there were any number of other factors that were likely responsible for the increase in prices: high oil prices, a depreciated dollar, and additional biofuels demand among others.

The picture looks slightly different when the stock to use ratio for all major cereals combined (rice, wheat and maize), again without China, is graphed. Although it is common to include all cereals together in the aggregate, it is not entirely clear this is appropriate, as it implicitly assumes that the three cereals are perfect substitutes for one another. Thus, the separate analyses for rice, wheat and maize described above seem more likely to yield insights. Nevertheless, since it is a common procedure, it is worth further examination.

Figure 6 shows that, at the end of 2005/06, the end stocks to use ratio was 17.7%, slightly above the average over the period 1991/92 to 2004/05 of 17.2%. This average level of stocks was the state of affairs immediately before world maize prices surged in the second half of 2006. Over the next year, the cereal stock to use ratio (excluding China) then declined to 15%, which is only slightly low by historical standards and was about the same level as three years earlier. Further, this decline in the stock to use ratio was a response to other factors such as surging biofuel demand; thus, it is misleading to characterize low stocks as a causal exogenous factor in this particular episode. The slightly low stock to use ratio at the end of 2006/07 was an endogenous response to other events.3

Furthermore, any given stock to use ratio in 2007 is likely to provide a more effective buffer than an identical stock to use ratio in 1990 due to improvements in transportation and information management during the past 15-20 years. In other words, since trade and stocks are substitutes for one another, more efficient communication and shortened transport times (on both international and domestic markets) allow governments to use trade for market interventions/stabilization more effectively today than in the past, reducing the relative benefits of stocks. Another factor pointing in the same direction is the increased geographical dispersion of stocks noted by Sarris (2000). As stocks become more spread out geographically, transport costs and times should tend to diminish, similar to the effects of improved transportation and communication. It is beyond the scope of this note to quantify

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3 The “supply of storage” model stresses the role of price expectations in the determination of inventory levels (and vice-versa). See Houthakker (1987) for more details.
these effects, but it seems likely that a simple comparison of historical stock to use ratios is biased in favour of finding that current stocks are too low.

**Other considerations: Changes in stock to use ratios and perceptions**

Despite the fact that world stock to use ratios without China were not particularly low before or even during the world food crisis, it is possible that changes in these ratios are more important than the ratio itself, and that declines in stock to use ratios were very rapid before the world food crisis. While theoretically possible, the data do not support such an interpretation. For the world without China, stock to use ratios increased substantially from 2003/04 to 2005/06 for both wheat and maize, and increased slightly for rice (Figure 3). Stock to use ratios for wheat and maize did decline during the crisis, but similarly rapid declines also occurred in the early to mid 1990s and also in the early years of the current decade. Furthermore, as noted earlier for the stock to use ratio itself, declines in stock to use ratios are endogenous and are driven by exogenous factors such as those mentioned earlier.

Another possibility is that perceptions of low stocks contributed to the price increases, especially as low stock levels have been widely reported. This paper does not address that issue, and can not rule it out. However, if this is the case, it should be noted that the policy implications of low perceived stocks are very different than the policy implications of low actual stocks. If stocks are adequate but perceived to be inadequate, then improved analysis and/or better information should receive high priority. On the other hand, if stocks are indeed at low levels, then government intervention to raise stock levels might be appropriate, although an analysis of whether government failure or market failure is driving the low stock levels would be important. Credit market imperfections, for example, could lead to suboptimal levels of stocks. Alternatively, government regulations that impede the operations of private traders might also be responsible. It is also important to note that higher levels of government stocks might crowd out private stocks to some extent.

**Conclusion**

Beginning in 1999/2000, global stock to use ratios for the major cereal grains declined rapidly, and just before the beginnings of the world food crisis in the second half of 2006 these ratios had reached their lowest levels in more than 20 years for all of the three major grains (rice, wheat, and maize). Most of the decline was driven by stock drawdowns in China, however. The declines in stock to use ratios for the world without China were much less rapid and the ratios did not reach particularly low levels before, or even during, the world food crisis. Although China’s demand does influence world markets, it makes sense to analyze the stock data without China because China is a relatively small player in world grain markets and because China’s stock management does not appear to influence or be influenced by world market trends. These observations suggest that stocks did not have an important effect on the evolution of the world food crisis.

**References**


Figure 1. Ending grain stock to consumption ratios for the world

Maize
Rice
Wheat
Figure 2. Ending grain stock to consumption ratios for China
Figure 3. Ending grain stock to consumption ratios for the world without China
Major exporters are comprised of USA, EU, Canada, Former Soviet Union, Argentina, and Australia for wheat; USA, Argentina, and Brazil for maize; Thailand, Viet Nam, India, USA, and Pakistan for rice.
Figure 5. China's share of world cereal exports
Figure 6. Ending grain stock to consumption ratio for all major cereals (rice, wheat, maize) combined, world without China
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