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# Discussion: Revisiting Macroeconomic Linkages to Agriculture: The Impact of Macroeconomic Variables and the Oil Sector on Farm Prices and Income

John B. Penson, Jr.

Periodically, events occur in the domestic and global economies that remind agricultural economists that macroeconomics matter. This was evident in the early 1980s when the Federal Reserve responded to double-digit inflation by driving interest rates to post–World War II period highs. The Asian financial crisis in the late 1990s, rising oil prices this past decade, and current stress in domestic and overseas financial markets serve to remind us again that externalities can have an effect on the economic performance and financial strength of U.S. agriculture. These effects are transmitted through interest rates, inflation, unemployment, real gross domestic product, and exchange rates.

*Key Words:* macroeconomics, linkages, net farm income, exchange rates, interest rates, real GDP

**JEL Classifications:** E31, E44, Q41, Q43

It is important that the macro-to-market-to-micro linkages as they relate to agriculture and our nation's food and fiber system be understood. I teach a senior-level course at Texas A&M University entitled the "Macroeconomics of Agriculture." In this course, I refer to the "Big Five" variables when discussing the linkages between agriculture and the general economy. These are the rate of interest, the rate of inflation, real gross domestic product (GDP), the civilian unemployment rate, and the foreign exchange rate in an open economy context. I

was pleased to see all five of these variables present to different degrees in these three articles. My focus today is limited to the qualitative aspects of the three articles and what they reveal about the macroeconomics of agriculture.

## Baek and Koo Paper

The authors (Baek and Koo, 2010) claim to be the first to investigate the impact of the macroeconomy on U.S. net farm income. Their article correctly updates their earlier paper that uses agriculture's contribution to GDP as a proxy for net farm income. Their claim might be true for time series investigations—I have not validated this—but they seemingly ignore structural econometric and general equilibrium model contributions. There may be a good reason why others have focused on commodity markets because of the aggregative nature of

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This invited discussion was presented at the annual meeting of the Southern Agricultural Economics Association, Orlando, FL, February 2010.

net farm income. It masks the specific linkages to individual commodities or groupings of commodities. Commodities like wheat and cotton, for example, are affected differently than say fruits and vegetables, which collectively account for 17% of total farm revenue and seasonal net imports. The sample period included 52 annual observations covering the 1957–2008 interval. The variables used in the time series model estimated in this article included the ratio of the price received index for all farm products to the index of prices paid index for commodity, services, interest, taxes, and wage rates. Other variables included were real GDP as a proxy for real domestic income, the nominal exchange rate measured as trading partner currency per U.S. dollar, and the nominal effective Federal funds rate.

A couple of observations are worth noting here. First I would have liked to have seen a more recent sample period given the structural change taking place in agriculture and the macroeconomy over the 1957–2008 period, but I realize that net farm income is an annual metric. Second, why not use real exchange rates rather than nominal values and perhaps trade weighted as well? I note too that interest is captured both in the denominator of the price ratio variable and by the Federal funds rate. Setting this issue aside, why not use the risk-adjusted rate of interest on agricultural loans reported in the Board of Governors of the Federal Reserve System's Agricultural Finance Databook, particularly given the author's reference to financial risk captured by this variable? The spread between the Federal funds rate and the rate of interest on farm loans varied from  $-1.5\%$  points to 5.2 percentage points over the last 40 years.

Missing from their model is government payments, which were particularly important during the farm financial crisis in the mid-1980s and again in the early 1990s. Real net farm income would have been at or below zero 16 years over the last 40 years.

The authors conclude that the exchange rate has a more pronounced impact than real GDP and interest rates on net farm income. They suggest that real income may have had a relatively weak effect as a result of the low income

elasticity for agricultural products and that interest rates may have a weak effect as a result of the presence of risk management tools that isolate the effects of financial risk.

### **Saghaian Paper**

The author (Saghaian, 2010) explores the linkages between agriculture and energy markets in an effort to determine how variables such as crude oil and ethanol prices impact prices of specific agricultural commodities. The variables included in the model used in this article are monthly observations of five commodity price series for corn, soybeans, wheat, crude oil, and ethanol. The time period covered was 1996:01–2008:12.

Rather than model the simultaneity between these crops, the author used a time series approach to investigating the linkages among these five prices. A directed graph identified a causal relationship between crude oil prices and ethanol prices and among corn prices, soybean, and wheat prices and between soybean prices and wheat prices. The causal linkage between ethanol prices and corn prices I would have expected to see suggested by events over the last 3 years was supported by this analysis. The author does note that a close bidirectional relationship exists between ethanol and corn prices, yielding a conclusion of predictive significance but lack of causality. Perhaps a more recent sample period might have altered this finding.

I heartily agree with the author's concluding remarks that macroeconomic variables play an important role in explaining commodity prices. This will likely continue to be the case in an increasingly global economy. Within the context of this article, the oil–ethanol–corn linkage will continue given the 2007 energy mandates for ethanol production over the next 5 years. The commercialization of cellulosic ethanol represents a factor that may well alter this linkage going forward. Other factors not directly captured in this study but recognized by the author is the role of a depreciating dollar and its impact on grain exports, which have maintained its share of total corn disappearance. Although beyond the scope of this article,

I would have liked to see exchange rates endogenized in this study of causality.

## **Orden Paper**

This article (Orden, 2010) offers a historical perspective on an important linkage among the macroeconomy, monetary policy, and agriculture—the exchange rate. Beginning with Ed Schuh's pioneering work on this linkage, the author walks the reader through a chronological series of events occurring in the macroeconomy and modeling attempts to capture this and other linkages to agriculture.

The author then introduces the Taylor rule and discusses how monetary policy applications both track and deviate from this rule over time.<sup>1</sup> For example, the deviation from this rule after 2001 as the Federal Reserve feared deflation led to expansionary monetary policy actions that contributed to the housing boom. Contractionary monetary policy actions beginning in mid-2007 contributed to depreciation of the dollar and subsequent sharp increase in oil prices. Today the effective Federal Funds rate is essentially zero, leading to the use of balance sheet transactions by the Federal Reserve to combat the most serious downturn in the economy since the 1930s. Its exit policy as the economy recovers will bear watching for its effect on all of the Big Five variables, including interest rates and exchange rates so important to agriculture.

Finally, the author refers to the study by Shane et al. (2009), which used two models solved in recursive fashion that suggest two radically different outlooks for agricultural exports and net farm income out to 2017 depending on either a strong or a weak dollar (Shane et al., 2009). He concludes by urging we keep in mind that the recent boom in agricultural prices and net farm income occurred in the presence of a weak dollar and low interest rates. As the Federal Reserve executes an exit policy from its existing expansionary policies, there is no assurance that these two linkages will not change and change quickly.

I rarely pick up a journal article these days and read it through from start to end. I will read the introduction and the conclusions. If it peaks my interest, then I will try to muddle through the intervening sections. That was not true of the Orden article. I read it from start to finish and I recommend all agricultural economists, particularly those who think only microeconomics matters, do the same.

## **What Was Missing?**

Two significant metrics that reflect the effects of macroeconomics in agriculture beyond commodity prices and net farm income are unrealized capital gains from appreciating land values and off-farm income of farm operator families.

The single most important source of growth in equity in agriculture over the post-World War II period is the appreciation in farm land values. When the farm financial crisis hit agriculture in the 1980s and real net farm income approached the purchasing power of net farm income fell to Great Depression levels, land values fell sharply. As a result, farms were lost that had been in families for generations; foreclosures and rural bank failures rose sharply. Lenders responded by placing increasing weight on cash flow lending as opposed to relying heavily on collateral lending.

The single most important source of internal finance to farm operator families seeking to expand their operations and/or manage their exposure to risk during the time periods covered in all three articles is off-farm income, which in turn can be affected by regional unemployment rates. Off-farm income has exceeded net farm income at the national level over the last 40 years with the exception of 1973. Its importance to internal finance varies both regionally and by size of operation.<sup>2</sup> Although relatively less important to farms with sales in excess of \$1 million, it is important to midsized and smaller operations. Off-farm income is also important to farm lenders who

<sup>1</sup>The Taylor rule and its relationship to monetary policy is detailed in Asso, Kahn, and Leeson (2007).

<sup>2</sup>See Fernandex-Cornejo (2007) for an in-depth discussion of this relationship.

recognize this source of income when making lending decisions.

Finally, access to capital, or external capital rationing, also deserves mention. Although this has not had quite the impact on agriculture we have seen in other sectors of the economy the last few years, it suffices to say that Farm Service Agency loan requests are up markedly from 2008, and the terms of loans from commercial lenders have changed.

## Conclusions

I wish to congratulate the authors of all three papers today for furthering our understanding of the role macroeconomics and other externalities play in agricultural commodity markets and its impact on aggregative measures of farm sector performance. I was particularly pleased to see David Orden's recognition of Ed Schuh's pioneering work.

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