IJFAEC
International Journal of
Food and Agricultural Economics

THE IMPACT OF THE RECENT FEDERAL RESERVE LARGE-SCALE ASSET PURCHASES ON THE AGRICULTURAL COMMODITY PRICES: A HISTORICAL DECOMPOSITION

Sayed H. Saghaian

University of Kentucky, Department of Agricultural Economics, Lexington, Kentucky, USA, Email: ssaghaian@uky.edu

Michael R. Reed

University of Kentucky, Department of Agricultural Economics, USA

Abstract

In this study, we evaluate the effects of the recent Federal Reserve's purchases of long-term assets on prices of agricultural commodities. The first large-scale asset purchases began at the end of 2008, after the Great Recession, and the second purchases began in November of 2010. The commodities included in this analysis are meats (beef, pork, and broilers), cereal grains (corn, soybeans, wheat, and rice), and softs (sugar, coffee, cocoa, and cotton). Using historical decompositions, we find significant increases in the nominal agricultural prices of ten out of 12 agricultural commodities under investigation from the second large-scale asset purchases (in 2010) but the first set large-scale asset purchases had only two positive effects.

Keywords: *Agricultural commodities; quantitative easing; monetary policy; great recession; historical decomposition*

1. Introduction

The United States (U.S.) is still dealing with the lingering effects of the Great Recession of 2007/2009, the worst recession since the Great Depression. The Federal Reserve has followed unprecedented expansionary monetary policies in order to stimulate the economy, stabilize financial markets, and restore confidence in the economy. The short-term federal funds interest rate was lowered to near zero (around 0.25 percent) in December 2008, and the Fed signaled that the rate would be kept at near zero for a long time. As the unemployment rate remained high and recession worries continued, the Fed implemented an unusual monetary policy action in order to provide additional stimulus to the economy; namely, purchasing large amounts of assets, such as long-term Treasury and mortgage-backed securities, to get liquidity into the economy. The motivation for these purchases was to decrease interest rates faced by households and businesses in order to increase private investment and consumption spending. This policy is now generally called quantitative easing (QE). The first large-scale asset purchases (LSAPs) were announced at the end of 2008 and the purchases continued through the first half of 2010. When fears from contractionary fiscal policies commenced, a second round of LSAPs was announced in November 2010. These asset purchases continue at this writing.

The LSAPs signal that the U.S. government is committed to an expansionary monetary policy in order to stimulate economic growth and lower unemployment generated from the Great Recession. Because the economic crisis was caused by a steep lowering of asset values and the need for consumers to lower debt levels, the typical instruments to combat slower

economic growth have not worked. Most observers agreed that the economy needed stimulus, but there has been fear that these atypical expansionary policy actions (LSAPs) could lead to inflation. The Federal Reserve Chairman has consistently stated that inflation fears are unwarranted and the Fed is watching wages and prices to make sure that QE is not inflationary. Yet Figures 1 and 2 show that agricultural prices have seen great volatility since December 2008 and it is not clear that monetary policy and QE has had no inflationary impacts, at least with respect to agricultural commodities. Commodity prices increased 42 percent throughout 2009, following the first round of asset purchases, and rose another 37 percent between the Fed Chairman's speech on August 10, 2010 and the end of March 2011 (Kozicki et al., 2012).
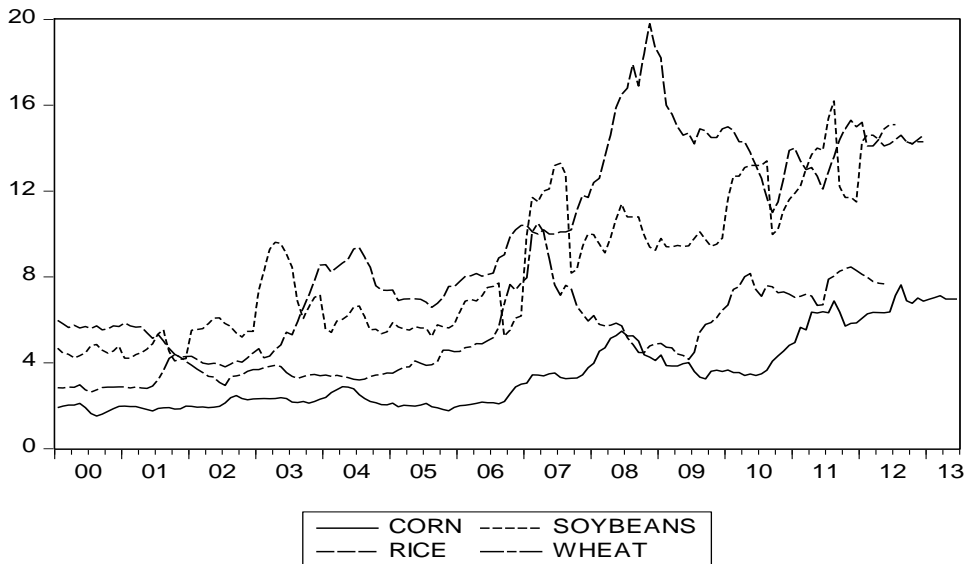
Figure 1. Prices of Cereal Grains: Corn, Soybeans, Rice, and Wheat, 2000:01-2012:12.

Figure 2. Prices of Meats: Beef, Broiler, and Pork, 2000:01-2012:12.

Agricultural prices are particularly sensitive to monetary policy because they are more flexible than manufactured good or service prices (Frankel, 1986)[1]. Many of them are storable and subject to large fluctuations due to weather and demand shocks. Their demand and supply elasticities are small in absolute value, enhancing price volatility. So it is very difficult to distinguish short-run price changes from longer-run inflationary (or deflationary) tendencies. Because of this food (and energy) prices are normally excluded from the core inflation data used for inflation targeting. However, it is argued that short-term agricultural prices could be used to measure whether monetary policy is loose (Frankel, 2008).

The objective of this study is to investigate the impacts of recent LSAPs on short-run agricultural commodity prices. Has this expansionary monetary policy had effects on commodity prices? The commodities included in this analysis are meats (beef, pork, and broilers), grains (corn, soybeans, wheat, and rice), and softs (sugar, coffee, cocoa, and cotton). An historical decomposition analysis is used to estimate the dynamic short-run effects of the two LSAP announcements on each commodity price over a seven-month time horizon after each event. The findings are linked to differing characteristics of the markets for these agricultural commodities. This decomposition allows depiction of price adjustment paths by commodity and these differing paths are discussed in relation to commodity characteristics, such as storability, seasonality of production, demand and supply elasticities, and interest rate sensitivity. The analysis provides insight into the short-run impacts of monetary shocks on various agricultural prices.

As stated earlier, agricultural commodities are unique because their prices are quite flexible, many are seasonally produced (or even perennially produced), and they are storable. Frankel and Rose (2010) argue that they are a hybrid of goods and assets due to their storable nature and the concomitant effects of interest rates on these demands. They are goods in the sense that they are produced and consumed based on prices; yet they are assets because some agricultural commodities are held in inventory in anticipation of price appreciation. This makes their prices react differently than other products when interest rates (and other monetary policies) change.

In the present study corn, soybeans, wheat, rice, and cotton are annually produced commodities that are easily stored. Beef is somewhat storable in that animals can be held back or advanced through the production process more rapidly than pork or poultry, which have more regimented production schedules. All of these products are exported by the U.S. and so subject to changing market demands due to exchange rate changes. Coffee (Arabica and Robusta) and cocoa are perennial crops that are more difficult to store and the large majority of U.S. consumption is imported. Sugar is another net import that is annually produced and storable. These commodities could well have differing dynamic responses to monetary policy changes and LSAPs.

---

[1] Originally, Hicks' (1974) and Okun's (1975) works showed that prices in some sectors of the economy were sticky while prices in other sectors were flexible. They argued that the prices of most goods and services are not free to respond to changes in demand in the short–run. This is due to imperfect information, the costs of changing prices, explicit contracts, etc. Most of the prices of manufacturers and services (heterogeneous goods) fall under this category.

2. Background Information and Literature

There is already a growing body of literature focusing on the effects of the recent LSAPs (Kozicki et al., 2012; Glick & Leduc, 2011; Hancock & Passmore, 2011; Krishnamurthy & Vissing-Jorgenson, 2011; Wright, 2011; Doh, 2010; D'Amico & King, 2010; Gagnon et al., 2010; Hamilton & Wu, 2010; Joyce et al., 2010; Neely, 2010). Since the LSAPs happened in two different economic circumstances (one during financial turbulence and the other when the U.S. economy was growing slowly), we investigate the effects of LSAPs on commodity prices during both rounds of QEs announcements, and compare those results.

LSAPs announcements are considered anticipated shocks because their expectations are formed, *a priori*, by the Federal Reserve Chairman's speeches and Fed announcements. The impacts of those announcements depend on the state of the economy at the time, as well as agents' risk perceptions. The first round of QEs (QE1 in 2008-2010) was announced at the end of 2008 (early in the Great Recession), during unprecedented financial turmoil and uncertainty when the U.S. economy was in disarray. The QE2 announcement (2010-2011) occurred when financial turmoil had eased and the U.S. (and much of the world economy) was showing some signs of recovery. These two events could have much different impacts on commodity prices because of macroeconomic conditions and idiosyncrasies within the markets for individual commodities. Glick and Leduc (2011) argue that QE1 sent the signal that much lower growth was expected, along with jointly lower interest rates, inflation, and dollar value. The signal from QE2 was that growth was occurring, but not fast enough to lower unemployment; the panic and turmoil was gone but there was a concern that the economy needed to improve.

No study has investigated the effects of both LSAPs on agricultural prices, though there has been a long history of empirical analyses of monetary policy on commodity prices. Some empirical studies have documented a statistically significant relationship between monetary policy and prices of agricultural commodities, including Bordo (1980), Chambers (1984), Devadoss and Meyer (1987), Orden and Fackler (1989), Barnett et al. (1986), Robertson and Orden (1990), and Dorfman and Lastrapes (1996). While other studies have shown that monetary changes leave agricultural prices unaffected, including Lapp (1990), Belongia (1991), and Bessler (1984). These conflicting results are due to different methods and model specifications, periods of study, and data sets used.

The conflicting findings could also result from their measure of monetary policies. Some agricultural economists have used changes in M1 as a measure of monetary policy changes (Rausser et al., 1986; Bessler, 1984; Chambers, 1984), while others have used M2 as a measure of the level of domestic credit or monetary base (Chambers & Just, 1982). The argument is that shocks in M1 are too narrowly defined and may not truly represent exogenous monetary actions. This is due to the notion that other structural forces such as other financial market shocks and money demand shocks also lead to changes in broad monetary aggregates (Bernanke & Blinder, 1991; Christiano et al., 1996). This is in contrast to arguments that M1, which excludes M2 balances typically not associated with the transactions function, is a better measure of monetary shock because theory suggests using the measure of the money stock most closely related to the rate of spending in the economy (Batten & Belongia, 1986). Historical decompositions of monetary policy announcements do not require an operational measure of money supply. Instead one simply needs to identify the timing of the monetary policy change.

3. Impacts of Monetary Policy on Agricultural Prices

An increase in the U.S. money supply increases agricultural and commodity prices through an array of different transmission channels (Kozicki, et al. 2012; Glick & Leduc

4

2011). One is through depreciation of the U.S. currency which will increase the price of U.S. exportables and importables. Quantitative easing is usually followed by depreciation of U.S. dollar. Since all commodities are traded internationally and priced in U.S. dollars, a weaker dollar increases international demand, increasing prices. QE also increases aggregate demand and promotes U.S. economic growth, which increases domestic demand for commodities and their prices. Both of these effects are through commodities as goods.

Other impacts of money supply increases come through agricultural commodities as assets. Expansionary monetary policy usually leads to lower interest rates, which in turn, decreases the cost of carrying inventories and boosts inventory demand for commodities (Frankel, 2008). That, in turn, leads to an increase in the price of storable commodities. For instance Frankel and Rose (2010) argue that lower interest rates may also encourage oil producing countries to keep oil under the ground for a longer period of time. This could reduce supply and lead to a rise in oil prices, with concomitant effects on other commodity prices.

Another channel is through portfolio reallocation. LSAPs reduce long-term Treasury yields, which can lead to a reallocation of investor portfolios and an increase demand for other assets such as commodities (Glick & Leduc 2011). Chambers (1984) developed a theoretical model based on the interdependence between agricultural and financial markets. He showed that a contractionary open market operation depressed the agricultural sector in the short run leading to lower relative prices, incomes, and returns to factors specific to agriculture. Further, he showed that the short-run effects were not neutral since agricultural prices fell relative to nonagricultural prices.

A factor that influences agricultural prices comes through the 'overshooting hypothesis' and the time adjustment path of prices to a new steady state. The overshooting literature begins with Dornbusch's (1976) seminal article. He showed exchange rates tend to overshoot if there is a sticky-price sector (in his case the exchange rate). A monetary expansion reduces interest rates and leads to the anticipation of a depreciated currency in the long run. These factors reduce the attractiveness of domestic assets, lead to a capital outflow, and cause the spot exchange rate to depreciate.

Frankel (1986) applied this model to a closed economy where one sector was "fix-price" manufacturers and services, where prices adjust slowly, and the other was "flex-price" agriculture sector, where prices adjust instantaneously in response to a money supply change. In this model, agricultural prices can increase more than proportionally to the change in the money supply; that is, they can overshoot their new long-run equilibrium whenever there is a positive monetary shock because of the fix-price nature of the manufactured goods and services sectors.

Saghaian, et al. (2002) showed that agricultural commodity prices are relatively flexible and respond more quickly to monetary shocks than prices of other goods. That is because commodities are relatively homogeneous, storable, and traded on auction markets where prices change often. In contrast, prices of heterogeneous goods, such as manufacturers and services, are relatively sticky and do not respond quickly to exogenous monetary shocks. Thus, these flexible good prices increase faster and further given money supply increases (Frankel 1986, 2008). As a result, QE leads to higher inflationary expectations that manifest quicker in agricultural commodity prices.

All these transmission channels indicate LSAPs can lead to higher commodity prices (Glick & Leduc 2011). The exact structural relationships resulting in this linkage between monetary policy and commodity prices differ among the channels. This is a challenge because different conceptualizations will imply different structures and therefore different empirical models. In this research, we use historical decomposition to analyze the effects of LSAPs. This technique does not require a structural specification of the underlying macroeconomic channels.

We use historical decomposition graphs to investigate the effects of LSAPs on prices of 12 agricultural commodities in the immediate neighborhood (time interval) of QE1 in 2008-2009 and QE2 in 2010-2011. Historical decomposition partitions the moving average series into two parts: one that incorporates the change (in monetary policy) and another that estimates the counterfactual (no monetary policy change). Historical decompositions graphs depict the impact of LSAPs on agricultural commodity prices in a neighborhood of those two events.

4. Data Description

The commodities included in this analysis are meats (beef, pork, and broilers), cereal grains (corn, soybeans, wheat, and rice), and softs (sugar, coffee, cocoa, and cotton). The dataset is monthly for the 2000:01 through 2013:06 time periods. Beef data are in U.S. cents per pound and the source is USDA Market News. Pork data are in U.S. cents per pound for 51-52% lean hog. Prices were found on index mundi web site, courtesy of IMF. Broiler price data were from USDA ERS and are a sales-weighted average of whole chicken prices and chicken part prices.

Corn, soybeans, wheat and rice price data are from the USDA Economic Research Service. Corn and soybeans prices are the monthly prices received by producers in the marketing year from 2000 to 2013 in dollars per bushel. Wheat prices are average price received by farmers for all wheat in dollars per bushel. Rice prices are the average price received by farmers for rough rice in dollars per cwt. Sugar prices are from index mundi (courtesy of the World Bank) in U.S. cents per pound. Cocoa bean prices are also from index mundi (courtesy of the International Cocoa Organization) in U.S. dollars per metric ton. Coffee price data are from the International Coffee Organization in U.S. cents per pound. Arabica and Robusta coffee varieties are included in the analysis because of their different consumption profiles. Cotton price data are for Upland cotton in U.S. cents per pound, and are from USDA market news.

5. Empirical Method

The challenge in analyzing macroeconomic linkages to agricultural prices is to eliminate the simultaneous (supply-demand) linkages among commodities so that the relationship between individual commodity prices and macroeconomic variables can be isolated. If daily or weekly grain prices are dominated by revised storage estimates, crop yield projections, and weather fears, it is difficult to isolate the effects of more encompassing variables such as LSAPs. Examining the time-path of commodity prices can show how they react to monetary policy actions, while also taking into consideration the simultaneity among the prices.

Historical Decomposition Graphs

Historical decomposition is often applied to macroeconomic shocks. Measuring the magnitude of price transmission due to the QEs can be handled by historical decomposition graphs. In this application of historical decompositions, we decompose commodity prices to determine the impact of QEs on prices in a neighborhood (time interval) of each event (Chopra & Bessler 2005; Saghaian et al., 2007). These decomposition functions track the evolution of LSAPs through the system and trace forecasted prices in the absence of LSAP versus actual prices which include the effects of LSAPs. Comparing the forecasted prices without LSAP with the actual prices provides an estimate of LSAP effects. Historical decomposition graphs are based on partitioning the moving average series into two parts:

$$P_{t+j} = \sum_{s=0}^{j-1} \psi_s U_{t+j-s} + \left[X_{t+j}\beta + \sum_{s=j}^{\infty} \psi_s U_{t+j-s} \right] \tag{1}$$

Where P_{t+j} is the multivariate stochastic process for an agricultural price, U is its multivariate noise process, X is the deterministic part of P_{t+j} and s is a counter for the number of time periods (RATS software 2006, Fackler & McMillin 2002). The first sum represents that part of P_{t+j} due to innovations that drive the joint behavior of commodity prices for period $t+1$ to $t+j$, the horizon of interest. The second part is the forecasted price series based on information available at time t, the date of an event (in this case the LASP) -- that is, how prices would have evolved if there had been no changes (RATS 2006). The noise process is included in both parts, but for two different time periods. It drives the moving average for the two partitions, one for the process that incorporates the change, and another for the purpose of forecast estimates.

6.   Empirical Results

Figures 3 shows the historical decomposition graphs of the agricultural commodity prices under investigation for a seven–month time horizon, using RATS software. The left column shows the results for QE1 in 2008-2009, and the right column shows those for QE2 in 2010-2011. The solid lines are the actual prices, which include the impact of the LSAPs and the dashed lines are the predicted prices excluding the effects of LSAPs. The actual prices begin two months before the LSAP announcement and proceed for an additional seven months. The LSAP effects are shown for the seven months after the announcement.

The dynamic impacts of LSAPs can spread over many time periods or dissipate quickly. However, we focus on prices in the near future because we are more interested in the contemporaneous nature of their impacts. Further, it is likely that other effects would normally occur after a few months to cloud the impacts of the monetary shock. For this study, we have emphasized a seven–month time period for forecasting and testing the impact of LSAPs while utilizing all the observations to estimate the moving average process.

The historical decomposition results show that QEs impacted commodity prices differently and the magnitude of price effects were also substantially different for the commodity prices chosen. The effects of QE1 on the prices in 2008-2009, when the economy was in the middle of the financial crisis and substantial economic uncertainty, show very little positive impact of the QE for most agricultural commodities. The actual commodity prices (the solid lines) that include the impact of the QE are below or very close to the dashed lines for the most commodities, i.e., the predicted prices that exclude the effects of the QE. The actual prices of all the cereal grains under study and meats, except broilers, have downward trends in the time interval right after the announcement, even though the Fed had engaged in an unprecedented expansionary monetary policy. These results are consistent with the results of Glick and Leduc (2011). They found that the easy monetary policy in 2008-2009 lowered commodity prices.

These results are influenced by the state of the economy before the Great Recession of 2007, when there were exceptionally high oil and other commodity prices, and the Fed was mostly concerned with inflationary expectations. The commodity price boom of 2007 and early 2008 had ended and the lowering of commodity prices (likely due to bouncing back from their very high levels due to overshooting) dominated the short-run price movements in late 2008 and early 2009. Only prices of broilers show a positive trend among the meats, which could be due to substitution toward poultry (the cheapest meat) as consumer incomes plunged, savings rates increased, and great job uncertainty prevailed for others. Rice and wheat prices were higher at first, but they fell soon after QE1 began. Both of these

commodities had expectations of higher availability due to expected production increases (rice) and high carryover stocks (wheat).

The other cases where QE1 clearly had effects were for prices of sugar, Arabica coffee, and cocoa. The QE in 2008 had positive effects on those prices immediately after the announcement. This situation can be explained by the fact that those commodities are mostly imported under very inelastic demand conditions. Expansionary monetary policies depreciated the U.S. dollar and in turn, increased prices of imports. Among the softs, only the prices of low-quality Robusta coffee show a negative trend. This could be due the fact that Robusta coffee supplies were continuing to increase because of production and export increases from Vietnam, a major Robusta coffee producer. These supply effects dominated the upward pressure exerted from a depreciated U.S. dollar.

A historical decomposition of macroeconomic variables just after QE1 lends insight into these results. Despite QE1's expansion in liquidity to the system, the decomposition graphs show little difference between the actual and forecasted values for the macroeconomic variables[2]. The upward trends in M1 and M2, and the downward trend the federal funds rate and the value of the dollar were due to other aspects of monetary policy; not QE1. Thus, the money supply didn't increase and interest rates were not affected by QE1, so most commodity prices did not react in a positive manner.

The historical decomposition graphs for QE2 in 2010-2011 tell a very different story. Looking at the historical decomposition graphs in the right column of figure 3, we see a jump in actual prices (solid lines) of ten out of 12 agricultural commodities under investigation. The results for QE2 effects on agricultural commodity prices are contrary to Glick and Leduc (2011); they found commodity prices falling again with the new round of easing monetary policy.

The price jumps of commodities under investigation started in the September to November 2010 period, when the Federal Open Market Committee (FOMC) began issuing statements about the need for more stimuli. The second statement concerning the Fed's potential for another LSAP was released to the press on August 10, 2010, the Chairman's August 27 speech relating to the new round of LSAPs, there was the FOMC's September 21 statement on this issue, the Chairman's October 15 speech again on these issues, and finally the FOMC's statement formal announcement of the new LSAP on November 3, 2010.

The historical decomposition graphs reveal that prices for corn, soybeans, rice, cotton, and Robusta coffee began to increase in September of 2010. Prices of sugar and Arabica coffee started rising in October, while the price for beef began slowly increasing in September and then sharply in November. Pork prices started rising in November 2010. Hence, there is a short period (two-month) time-lag in price increases among these commodities after indications that QE might take place. The prices for the storable, seasonally produced commodities began to increase first, but the positive price impacts spread to other commodities soon. Increases in corn and soybeans products were transmitted into beef and pork prices because those grains are important inputs into livestock production.

A historical decomposition of macroeconomic variables just after QE2 also lends insight into these results. QE2's expansion in liquidity to the system was successful in increasing M1 (slightly), decreasing the value of the dollar, and lowering the federal funds rate. The drop in the exchange rate was particularly precipitous. The decomposition shows that M2 was not affected by QE2 (not much deviation between the actual M2 and its predicted value). Thus, the money supply increased (as measured by M1), interest rates fell, and so most

---

[2] The historical decomposition graphs for the macroeconomic variables are available from the authors upon request.

commodity prices reacted positively. Goods where trade is more important (grains and softs) increased earlier.

Two commodities were not positively influenced by QE2, wheat and broilers. Poultry prices did not increase and this could be partially due to the results from QE1 when poultry was one of the few commodities where price increased. As the prospects for economic growth improved, prices for beef and pork improved relative to poultry. Furthermore, the effects of lower interest rates on poultry prices are smaller relative to other meats. Wheat stocks at that time (as stated earlier) were very high due to increases in world-wide production, so prices continued to fall despite money supply increases. Wheat stocks as an asset did not appear to have a sufficient return to improve its price prospects.

7. Summary and Conclusions

The Federal Reserve Board implemented unprecedented expansionary monetary policy programs in two different occasions, by purchasing long-term securities and other assets, in order to decrease long-term interest rates to stimulate the economy. The first round of those policies led to reduction in long-term interest rates (Gagnon at al. 2010). This paper examined the impacts of LSAP monetary policy on U.S. agricultural commodity prices for these two QEs, using historical decomposition graphs.

Monetary policy affects commodity prices through various channels. When the Federal Reserve lowers interest rates to stimulate the economy by buying bonds and other assets, demand for commodities could rise, increasing commodity prices (Frankel 2008). Like other financial market prices, commodity prices are relatively flexible, adjusting quickly in response to macroeconomic changes. Any effects of monetary policy announcements on commodity prices likely occur within a short period around a particular news-related event. The event days are when the Federal Reserve's Open Markets Committee meets and financial markets acquire new information about the course of monetary policy.

This paper attempted to visually demonstrate the effects of those monetary policy changes on commodity prices. Our results show money supply changes affected agricultural prices, causing large swings in prices during the first seven months after the LSAPs. Yet these effects differ by commodity depending on the supply-demand situation, production process, and storability. The difference in results between QE1 and QE2 also shows that the macroeconomic situation can have a bearing on the translation of monetary policy into commodity prices. Many of the commodities that first showed positive effects from QE2 were storable, seasonally produced goods.

Overshooting of agricultural prices may also partially explain the differences in these results. Saghaian et al. (2002) showed that traded goods overshoot less than non-traded goods because the overshooting exchange rate from a positive money shock dampens the commodity price overshooting. Saghaian, et al. (2006) found that prices for livestock overshoot more than grains because they are less traded internationally and their demand is less interest rate sensitive. Thus, one would expect that commodities where exports account for a higher share of output (such as corn or soybeans) would have prices overshoot less. This study did not find a definite hierarchy in the effects of QE2 based on the extent of international trade. Beef and pork prices did not react more than cotton and Arabica coffee, but they did react more than soybeans.

Other factors that could influence monetary impacts include biological lags, the vertical nature of production (including the percentage of fixed assets), and product differentiation. Commodities with long biological lags, highly vertical production systems, and less product differentiation (beef, cocoa, Robusta coffee) should have more price overshooting and longer adjustment times. Producers have less control over their supply or demand conditions in the short-run, so if macroeconomic factors move the market in one way, it takes more time to

adjust to a new equilibrium. The most differentiated product in the sample of commodities is Arabica coffee, which had a rather large increase in price due to QE2 over the seven-month time frame. Beef, which has the longest biological lag among the commodities analyzed, reacted positively to the QE2 shock while broilers did not, possibly because it takes more time for economic decisions to be manifested in output changes. This result for beef happened despite its less vertically integrated production structure and fewer fixed assets in the production process, which would tend to result in less overshooting and faster adjustments. Note that there are likely to be conflicting influences for all commodities.

Overall the two LSAPs events had different impacts on the commodity prices under investigation. As was indicated earlier, the impacts of those announcements depend on the state of the economy at the time, the characteristics of the products, as well as perceptions of risks associated with the expansionary policy actions. With QE1 most prices were unaffected or fell with the announcement, while QE2 had just the opposite impact. With QE2, actual prices (solid lines that include the impact of the LSAP) were all higher (except for broilers and wheat) than forecast prices (dashed lines that exclude the effects), and the forecast prices did not get close to actual prices during the seven-month time horizon considered in this study.

The conclusion from this study is that the new monetary policy changes can have important effects to agricultural commodity prices and can cause wide swings. Smooth steady increases in the money supply allow fundamental supply and demand factors to be the predominant force behind price movements. Abrupt changes in the money supply might not affect agricultural commodity prices much in the long-run, but those money supply changes can initiate large price movements in the short-run, destabilizing agricultural markets. If farmers are risk averse, they will prefer that monetary policy concentrate on stable changes in the money supply that will provide little stimulus for agricultural prices to change dramatically. Farmers that understand the dynamics of overshooting and are willing to take risks might find that they can sell their produce when prices are above their equilibrium values (due to overshooting) and avoid those times when prices are overshooting at low levels.

References

Batten, D.S. & M.T. Belongia (1986). Monetary Policy, Real Exchange Rates, and U.S. Agricultura Exports. *American Journal of Agricultural Economics*, 68, 422-427.

Barnett, R., D. Bessler, & R. Thompson (1983). The Money Supply and Nominal Agricultural Prices. *American Journal of Agricultural Economics*, 65, 303-307.

Belongia, M.T. (1991). Monetary Policy and the Farm/Nonfarm Price Ratio: A Comparison of Effects in Alternative Models. *Federal Reserve of St. Louis Review*, 73, 30-46.

Bernanke, B.S. & A.S. Blinder (1991). The Federal Funds Rate and the Channels of Monetary Transmission. *American Economic Review*, 82, 901-921.

Bessler, D.A. (1984). Relative Prices and Money: A Vector Autoregression on Brazilian Data. *American Journal of Agricultural Economics*, 66, 25-30.

Bordo, M.D. (1980) . The Effects of Monetary Change on Relative Commodity Prices and the Role of Long-Term Contracts. *Journal of Political Economy*. 88(6), 1088-1109.

Chamber, R.G. & R.E. Just (1982). An Investigation of the Effect of Monetary Factors on Agriculture. *Journal of Monetary Economics*, 9, 235-247.

Chambers, R.G. (1984). Agricultural and Financial Market Interdependence in the Short Run. *American Journal of Agricultural Economics*, 66, 12-24.

Chopra, A. & Bessler, D.A. (2005). Impact of BSE and FMD on beef industry in U.K. Paperpresented at the NCR-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management, St. Louis, Missouri, April 18-19.

Christiano, L., M. Eichenbaum, & C. Evans (1996). The Effects of Monetary Policy Shocks: Evidence from the Flow of Funds." *Review of Economics and Statistics*, 78, 16-34.

D'Amico, S., & King, T.B. (2010). Flow and Stock Effects of Large Scale Asset Purchases. Federal Reserve Board Finance and Economics Discussion Paper 2010-52.

Devadoss, S. & W.H. Meyers (1987). Relative Prices and Money: Further Results for the United States. *American Journal of Agricultural Economics*, 69, 838-42.

Doh, T. (2010). The Efficacy of Large-Scale Asset Purchases at the Zero Lower Bound. *Federal Reserve Bank of Kansas City Economic Review*.

Dorfman, J.H., & W. D. Lastrapes (1996). The Dynamic Responses of Crop and Livestock Prices to Money-Supply Shocks: A Bayesian Analysis Using Long-Run Identifying Restrictions. *American Journal of Agricultural Economics*, 78, 530-541.

Dornbusch, R. (1976). Expectations and Exchange Rate Dynamics. *Journal of Political Economy*, 84, 1161-1176.

Fackler J.F. & W.D. McMillin (2002). Evaluating Monetary Policy Options. *Southern Economic Journal*, 68(4), 794–810.

Frankel, J.A., & A.K. Rose (2010). Determinants of Agricultural and Mineral Commodity Prices. *Faculty Research Working Paper Series*, Harvard Kennedy School, RWP10-038, September.

Frankel, J.A. (2008). The Effect of Monetary policy on Real Commodity Prices. In John Y. Campbell (Ed.). *Asset Prices and Monetary Policy*, (pp. 291-333). University of Chicago Press.

Frankel, J.A. (1986). Expectations and Commodity Price Dynamics: The Overshooting Model. *American Journal of Agricultural Economics*, 68, 344-348.

Gagnon, J.E., Raskin, M., Remache, J., & Sack, B.P. (2010). Large-Scale Asset Purchases by the Federal Reserve: Did They Work? Federal Reserve Bank of New York Staff Report No. 441.

Glick, R., & Leduc, S. (2011). Are Large-Scale Asset-Purchases Fueling the Rise in Commodity Prices? Federal Reserve Bank of San Francisco Economic Letter. 2011-10, April 4.

Hamilton, J. D. & J. Wu (2010). The Effectiveness of Alternative Monetary Policy Tools in a Zero Lower Bound Environment, Working paper, University of California, San Diego.

Hancock, D. & W. Passmore (2011). Did the Federal Reserve's MBS Purchase Program Lower Mortgage Rates? Finance and Economics Discussion Series, 2011-01.

Hicks, J. (1974). *The Crisis in Keynesian Economics*, Basic Books, New York.

Joyce, M., Lasaosa, A., Stevens, I., & Tong, M. (2010). The Financial Market Impact of Quantitative Easing, Bank of England Working Paper No. 393-2010.

Kozicki, S., E. Santor, & L. Suchanek (2012). Large-Scale Purchases: Impact on Commodity Prices and International Spillover Effects. Bank of Canada, May 2012, 1-31.

Krishnamurthy, A., & Vissing-Jorgensen, A. (2011). The Effects of Quantitative Easing on Interest Rates. Working Paper, Northwestern University, Kellogg School of Business.

Lapp, J.S. (1990). Relative Agricultural Prices and Monetary Policy. *American Journal of Agricultural Economics*, 72, 622-630.

Neeley, C. (2010). The Large-Scale Asset Purchases Had Large International Effects, Federal Reserve Bank of St. Louis Working Paper 2010-018C.

Okun, A. (1975). Inflation: Its Mechanics and Welfare Costs. *Brooking Papers on Economic Activity*, 2, 351–390.

Orden, D. & P.L. Fackler (1989). Identifying Monetary Impacts on Agricultural Prices in VAR Models. *American Journal of Agricultural Economics*, 71, 495-502.
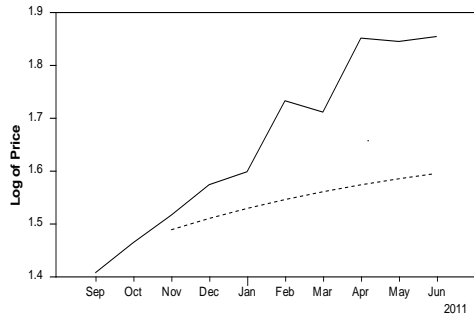
RATS User's Guide, version 6, 2006, Estima.

Rausser, G.C., J.A. Chalfant, H.A. Love, & K.G. Stamoulis (1986). Macroeconomic Linkages, Taxes, and Subsidies in the U.S. Agricultural Sector. *American Journal of Agricultural Economics*, 68, 399-412.

Robertson, J.C. & D. Orden (1990). Monetary Impacts on Prices in the Short and Long Run: Some Evidence from New Zealand. *American Journal of Agricultural Economics*, 72, 160-171.

Saghaian, S.H., L. Maynard, & M.R. Reed (2007). The Effect of *E. Coli* 0157:H7, FMD and BSE on Japanese Retail Beef Prices: A Historical Decomposition. *Agribusiness: An International Journal*, 23(1), 131-147.

Saghaian, S.H., M. Hasan, & M.R. Reed (2006). Monetary Policy Impacts on U.S. Livestock-Oriented Agricultural Prices. *Progress in Economic Research,* Volume 9 (pp. 45-62.). Nova Science Publishers, Inc., Hauppauge, NY.

Saghaian, S.H., M.R. Reed, & M.A. Marchant (2002). Monetary Impacts and Overshooting of Agricultural Prices in an Open Economy. *American Journal of Agricultural Economics,* 90-103.

Wright, J. H. (2011). What Does Monetary Policy Do to Long-Term Interest Rates at the Zero Lower Bound? NBER Working Paper 17154-2011.
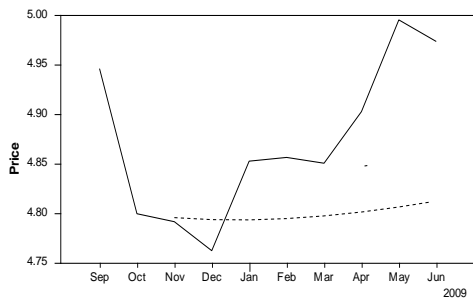
Appendix

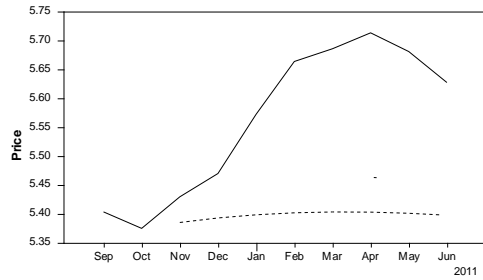**Historical Decomposition of USROBUSTA**
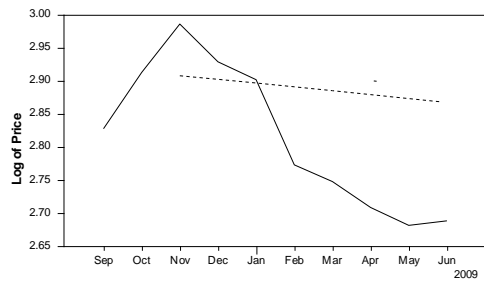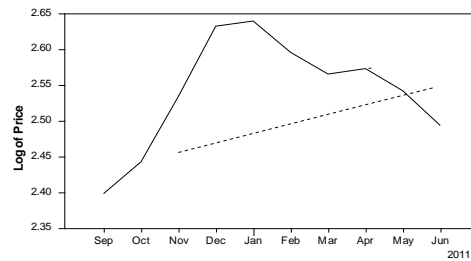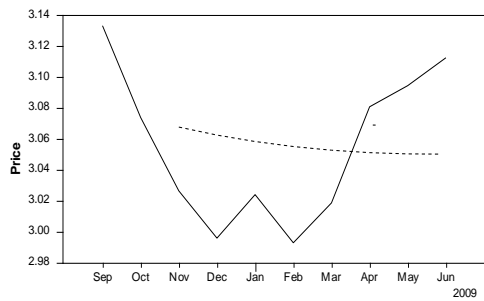
Historical Decomposition of USROBUSTA

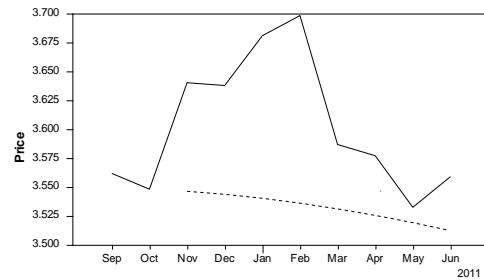**Historical Decomposition of USARABICA**

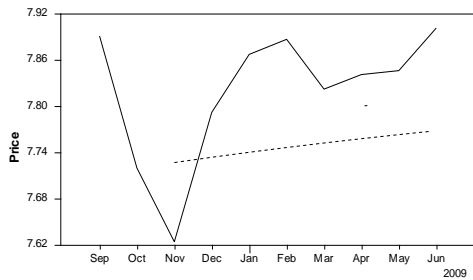**Historical Decomposition of USARABICA**
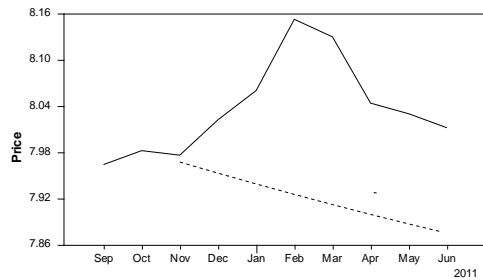
Historical Decomposition of USSUGAR
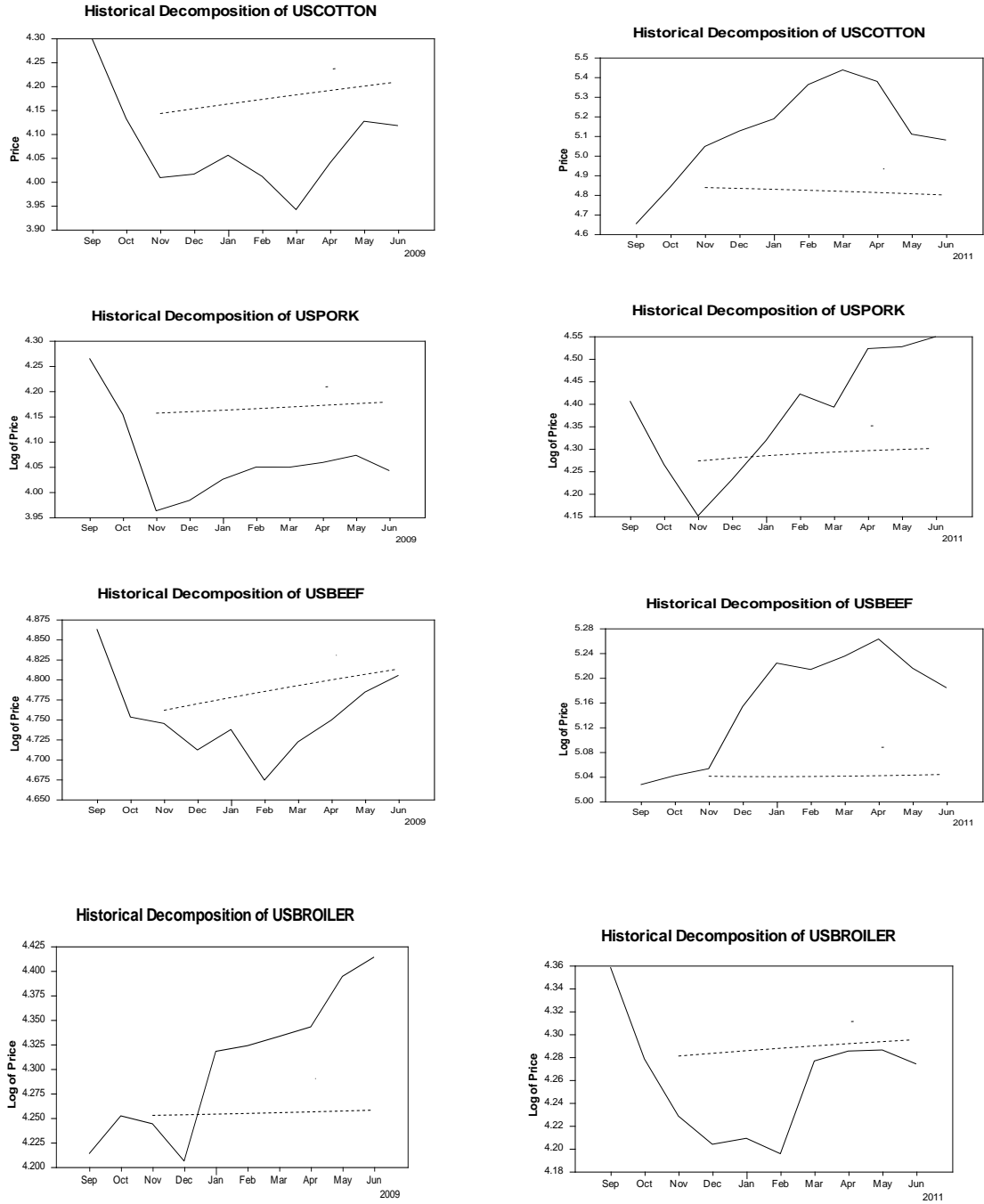
Historical Decomposition of USSUGAR

Historical Decomposition of USCOCOA

Historical Decomposition of USCOCOA

14

Actual Prices (including the events): _____

Forecasted prices (excluding the events): ----------------------

Figure 3: The Effects of the Recent Federal Reserve's Purchases of Long-Term Assets on Prices of Agricultural Commodities.

15