Monetary Impacts on Agriculture: The Effects of the Anticipated and Unanticipated Components of Money Growth*

by

Chang Kwack and David Orden**

August, 1986

*Presented at the annual meeting of the American Agricultural Economics Association, Reno, Nevada, July 1986. An earlier version of this paper was presented at the annual meeting of the Eastern Economics Association, Philadelphia, Pennsylvania, April 10, 1986.

This research has been supported by the Agriculture and Rural Economics Division (ARED), Economic Research Service, United States Department of Agriculture under Cooperative Agreement 58-319S-5-00402.

**Graduate Research Assistant and Assistant Professor, respectively, Department of Agricultural Economics, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

Monetary Impacts on Agriculture:
The Effects of the Anticipated and Unanticipated
Components of Money Growth

Abstract

The effects of anticipated versus unanticipated money growth on growth of nonfarm aggregate output and real farm prices, output, income and exports are evaluated in a quarterly model. The results suggest significant impacts of both components of money on the aggregate economy and provide mixed evidence of monetary impacts on agriculture.

Monetary Impacts on Agriculture: The Effects of the Anticipated and Unanticipated Components of Money Growth

I. Introduction

The issue of possible nonneutral effects of monetary policy on agriculture, particularly agricultural prices, has long been of concern to agricultural economists. A recent paper by Barnet, Bessler, and Thompson (1983), for example, utilized Granger causality tests to investigate relationships between money and nominal farm-level and consumer food prices. Their analysis suggested a significant causal relationship from money to prices when M2 was utilized to measure the money supply. No such relationship was detected between prices and M1 or the monetary base.

In this paper, we extend the analysis of monetary impacts on agriculture to investigate the effects of anticipated versus unanticipated money growth. This distinction between components of money growth has been crucial to controversy within macroeconomics. Our results suggest that neither anticipated nor unanticipated M1 has significant effects on real prices received by farmers for crops or the real value agricultural exports. We find possible, limited evidence of monetary impacts on real prices received by farmers for livestock, on farm sector real gross domestic product and, particularly, on real farm income. By way of comparison, we find stronger evidence that nonfarm real gross domestic product is affected by both anticipated and unanticipated components of money. Thus, the results we present, though suggesting nonneutral monetary effects, provide only limited evidence of monetary impacts specifically on agriculture.

II. Macroeconomic Controversy

The classical notion of a dichotomy between real economic variables, such as real output or relative prices, and nominal economic variables, such as the quantity of money or the general price level, has been an important point of controversy in macroeconomics. Despite the conceptual appeal of this claim (at least as a long-run concept), a substantial body of empirical analysis has emerged which shows a relationship between nominal and real variables. For example, for the U.S., Vining and Elwertowski (1976) describe a positive relationship between variability among relative prices and the level of stability in the rate of inflation. Fischer (1982) also reports a relationship between the inflation rate and the variance of relative prices.

One approach to explaining the linkages between real and nominal variables is to introduce informational and adjustment frictions in a model of the economy, while retaining the basic classical theory. Phelps (1970) suggested a simple model along this line. In his model, aggregate information does not flow instantaneously. Agents in local markets cannot distinguish perfectly between current movements in relative prices and current movements in the aggregate price level. This is because these agents have information about current and past local prices, but only have lagged information about prices in other markets.

Under this circumstance, economic agents have to forecast the current aggregate price level which is not observable. Rational expectations provides an expectation formation scheme such that the unobservable subjective expectations of individuals are exactly the true mathematical conditional expectations given the model of the economy (Mishkin 1982). The expectation scheme is rational in the sense that agents utilize all the available information and do not make systematic errors.

In an equilibrium model with rational expectations agents react only to the unanticipated component of money. To illustrate, suppose there is a sudden increase in the aggregate price level due, but not known to be due, to an increase of the money supply. Agents will observe an increase in their output prices which will be perceived as possibly reflecting general inflation and possibly an increase in their relative price. For this reason, even if their expectations are rational, the agents will respond to some extent to the price change. In contrast, an aggregate price increase known to be due to a change in the money supply will not induce real responses. This distinction between the effects of anticipated and unanticipated money is crucial under the rational expectations, equilibrium model hypothesis. Testing neutrality of anticipated money, which is our objective, is actual testing one aspect of rational expectations in this context.[1]

III. Previous Empirical Studies

To date there has been little research to differentiate between the effects of anticipated versus unanticipated money on the agricultural sector. Those few studies that have been undertaken vary widely in methodology and focus. Bond, Vlastuin, and Crowley (1983) find evidence that both anticipated world money supply and unanticipated monetary shocks have positive effects on the relative prices of traded food commodities. However, their sample period was only 1975,1 through 1982,3 which is a rather short period over which to estimate parameters for their 16 independent variables. Enders and Falk (1984) and Azzam and Pagoulatos (1985) find some evidence in support of the

---

[1]Complete tests of rational expectations consist of the tests of rationality and neutrality (see Leiderman 1980).

hypothesis of neutrality of anticipated money with respect to the hog sector. Belongia (1985) presents more general evidence suggesting only limited monetary impacts on relative farm prices. This study extends these results to further investigate possible impacts on agriculture of both anticipated and unanticipated money.

IV. Measurement of Anticipated and Unanticipated Money Growth

In order to test the hypothesis of neutrality empirically it is necessary to differentiate between anticipated and unanticipated components of money growth. The first step of this analysis is to specify a money growth regression equation. The one-step-ahead money forecasts and the residuals from this equation, respectively, are then taken as anticipated and unanticipated components of money.[2]

In this study, Granger causality tests are employed to carry out the specification of the money growth equation. The idea of Granger causality is that a variable Z is said to Grange cause another variable M, if M can be predicted better from past values of Z and M than from past values of M alone (Granger 1981).

To specify a quarterly money growth equation, the growth rate (first order log differences) of U.S. M1 is regressed on its own 4 lags, and 4 lags of the inflation rate, the unemployment rate, the interest rate on 3-month maturity Treasury bills, the high employment government surplus, the actual

---

[2]Thus, we follow a two-step procedure: first estimating the money growth equation and second using the expected values and residuals as regressors in equations measuring monetary impacts on real variables. An alternative is nonlinear joint estimation of the parameters of the two equations. We choose the simpler approach for pragmatic reasons. We recognize some of its limitations but also take note that choice between these two alternatives has not been the source of differences in interpretation of past studies along the lines we are pursuing. For further discussion, see Kwack.

federal government surplus, and the U.S. balance of payments on current account.[3] Prior to estimation all right-hand-side data series were transformed to attain stationarity: the first three series were expressed as log differences and the latter three series as percentage changes. The estimation was carried out with data from 1960,1-1983,3.

Hypothesis tests for the lag coefficients in the initial regression suggested that only lagged money and Treasury-bill variables have effects on money forecasts that were significant at the 5-percent level. On this basis a final money growth equation was estimated. The equation is:

$$(1)\quad M1_t = \underset{}{0.005} + \underset{(2.42)}{0.27}M1_{t-1} + \underset{(2.28)}{0.26}\,M1_{t-2} + \underset{(1.24)}{0.14}\,M1_{t-3} + \underset{(0.12)}{0.01}M1_{t-4}$$

$$-\underset{(-5.45)}{0.036}TBR_{t-1} - \underset{(-0.33)}{0.003}TBR_{t-2} - \underset{(-0.03)}{0.0002}TBR_{t+3} - \underset{(-0.16)}{0.001}TBR_{t-4},$$

R^2=0.40, $\bar{R}^2$=0.34, D-W=2.00, Q(27)=19.25.

where M1 and TBR are, respectively, first order log differences of the M1 measure of money and the 3-month maturity Treasury-bill rate, and t-statistics are reported below the coefficients.[4]

---

[3]The empirical results we present focus on U.S. money growth. While not limiting the implications of our results to a closed economy (since U.S. monetary policy operates in an open economy) this is somewhat restrictive. The crucial distinction between the effects of anticipated and unanticipated money growth in a rational expectations equilibrium model would generalize to a multi-country model: only unanticipated domestic or foreign money growth would have real effects. With agriculture's exposure to trade, the foreign money effects could be substantial and it would be interesting to extend our analysis to take them into consideration. This was our initial intention, but we have not yet been able to pursue it.

[4]An important issue in an empirical evaluation of the real impacts of anticipated versus unanticipated money is whether the separate effects can be identified (see McCallum). Significance of the interest rate variable in the money growth equation provides a basis for this identification in the subsequent output and price equations estimated in this study. The identifying restriction--that the interest rate does not enter the output equation separately from the money growth variables--has been widely used in

V. Real Effects of Anticipated and Unanticipated Money

Using the above distinction between components of money growth, the effects of anticipated and unanticipated money on prices received by farmers for crops deflated by the GNP deflator (PC) in first order log difference form were examined for the period 1962,1 through 1983,3. The resulting equation is:

$$(2)\quad PC_t = \text{constant} + \sum_{j=0}^{8} b_j AM1_{t-j} + \sum_{j=0}^{8} c_j UM1_{t-j}$$

$$\text{constant} = -0.04 \quad R^2=0.23,\ \bar{R}^2=0.01,\ \text{D-W}=1.92,\ Q(27)=15.52,$$

where AM1 and UM1 stand for, respectively, anticipated and unanticipated components of money. Both current and lagged values of the money components are included in the price equation. The joint significance test for the b_j's fails to reject the null hypothesis, b_js=0 (j=0...8), at the 5-percent significance level. The statistics was F (9,59)=1.00. The joint significance test for the c_j's also fails to reject the null hypothesis, c_j's=0 (j=0...8), at the 5-percent significance level. The test statistics was F(9,59)=0.91. Therefore, neither anticipated nor unanticipated money appears to have a significant impact on real crop prices. The parameter estimates, their t-statistics and the hypothesis tests are reported in Table 1.

One problem with any empirical analysis of monetary impacts on real variables is that economic theory provides no unambiguous criterion for the number of lags of the money variables to be included in the estimated equations. Mishkin (1982) asserts that inclusion of too few lags may lead to

---

the macroeconomic literature.

Table 1. Effects of Anticipated and Unanticipated Money on Deflated Prices Received by Farmers for Crops

8 Lag Model

	AM1			UM1	
Lag	Coefficient	T-Statistic	Lag	Coefficient	T-Statistic
0	1.38	0.69	0	1.58	1.34
1	-4.11	-1.73	1	0.97	0.80
2	1.93	0.80	2	0.97	0.81
3	-1.44	-0.53	3	0.06	0.05
4	0.55	0.21	4	-0.67	-0.54
5	2.06	0.79	5	-1.37	-1.10
6	-0.54	-0.22	6	0.46	0.37
7	3.79	1.59	7	-1.03	-0.77
8	0.06	0.03	8	-1.68	-1.26

16 Lag Model

	AM1			UM1	
Lag	Coefficient	T-Statistic	Lag	Coefficient	T-Statistic
0	2.87	1.12	0	2.04	1.49
1	-3.78	-1.28	1	-0.70	-0.49
2	4.98	1.56	2	-0.07	-0.05
3	-1.18	-0.34	3	0.12	-0.08
4	3.56	1.01	4	-1.53	-0.91
5	0.69	0.20	5	-1.76	-1.05
6	0.10	0.03	6	2.68	1.60
7	6.22	1.84	7	0.15	0.09
8	-0.52	-0.15	8	-2.91	-1.75
9	1.38	0.41	9	-0.69	-0.42
10	1.63	0.48	10	2.30	1.37
11	-0.42	-0.12	11	1.56	0.96
12	-3.85	-1.15	12	-2.22	-1.36
13	-0.79	-0.24	13	0.90	0.49
14	3.07	0.91	14	2.77	1.13
15	-1.73	-0.53	15	-3.49	-1.43
16	-2.99	-1.02	16	-4.50	-1.89

Hypothesis	F-Statistic	Significance Level
BJ'S=0(J=0...8)	F(9,59) = 1.00	0.45
CJ'S=0(J=0...8)	F(9,59) = 0.91	0.53
BJ'S=0(J=0...16)	F(17,35) = 1.11	0.38
CJ'S=0(J=0...16)	F(17,35) = 0.98	0.50

incorrect test statistics and inappropriate conclusions. He finds that the conclusion from an 8-lag quarterly model that only unanticipated money affects aggregate U.S. output (e.g., Barro and Rush 1980) is not robust. In a model that includes a greater number of lags (20 quarters) only anticipated money has significant real impacts.

To investigate the robustness of the empirical results from our 8-lag model, we also estimated parameters of a model including 16 lags of each component of money.[5] Summary statistics for the resulting regression equation are:

$$\text{constant} = -0.14 \quad R^2=0.47, \quad \bar{R}^2=0.02, \quad \text{D-W}=2.00, \quad Q(24)=19.33$$

and the parameter estimates and their t-statistics are also reported in Table 1. As shown, with current and 16 lags each of AM1 and UM1 the results of the joint hypothesis tests for the b_j's and the c_j's are not changed from the 8-lag model. The R^2 measure indicates that the additional variables do not have much explanatory power.

In order to compare monetary impacts on agriculture to aggregate monetary impacts, we also considered monetary impacts on the nonfarm sector. Nonfarm gross domestic product (NFGDP) deflated by the GNP deflator and in first order log difference form was used as a measure of aggregate nonfarm output. Regressing NFGDP on lags of anticipated and unanticipated money over 1965,1 through 1983,3 resulted in the equation:

$$(3) \quad NFGDP_t = \text{constant} + \sum_{j=o}^{8} b_j AM1_{t-j} + \sum_{j=o}^{8} c_j UM1$$

[5] If we follow Barnett, Bessler and Thompson's suggestion on lag length we would include at most 4 lags. The best fit in terms of R^2 is obtained with only 2 lags. For the 2-lag model the joint significance tests for the c_j's is significant at the 5-percent level. The test statistic was $F(3,79)=2.86$. The regression results are constant=-0.001, $R^2=0.12$, $\bar{R}^2=0.05$, D-W=1.82, $Q(27)=13.45$.

constant=-0.004 R^2=0.60, $\bar{R}^2$=0.47, D-W=1.90, Q(24)=51.13.

The joint significance test for the b_j's fails to reject the null hypothesis, b_j's=0(j=0...8), at the 5-percent significance level. The test statistic was F(9,53)=1.16. On the other hand, the joint significance test for the c_j's rejects the null hypothesis, c_j's=0(j=0...8), at the 5-percent significance level. The test statistic was F(9,53)=7.03. These results suggest that only unanticipated money has real impacts on NFGDP. The parameter estimates, their t-statistics and the hypothesis test results are reported in Table 2.

Again, allowing 8 more lags of AM1 and UM1 in the NFGNP equation results in a regression with summary statistics:

constant=-0.004, R^2=0.81, $\bar{R}^2$=0.64, D-W=1.87, Q(24)=40.19.

With 16 lags, the joint significance test for the b_j's rejects the null hypothesis, b_j's=0 (j=0...16), at the 5-percent significance level. The test statistic was F(17,37)=2.85. The test for the c_j's also rejects the null hypothesis, c_j's=0 (j=0...16), at the 5-percent significance level. The test statistic was F (17,37)=6.43. These results indicate that both anticipated and unanticipated money have real impacts on NFGDP. The parameter estimates, their t-statistics and the hypothesis test results are also shown in Table 2.

Comparing the two NFGDP regressions shows a substantial improvement in R^2 and $\bar{R}^2$ in the model with longer lags. This suggests there is explanatory power in the additional variables. The short-lag model favors the assertion that only unanticipated money has real effects on the economy, while the long-lag model suggests that both anticipated and unanticipated money have real

Table 2. Effects of Anticipated and Unanticipated Money on Real Nonfarm Gross Domestic Product

8 Lag Model

	AM1			UM1	
Lag	Coefficient	T-Statistic	Lag	Coefficient	T-Statistic
0	0.42	1.23	0	0.58	2.90
1	-0.17	-0.42	1	-0.55	-2.65
2	-0.54	1.36	2	0.97	4.81
3	-0.17	-0.35	3	-0.56	-2.72
4	0.82	1.75	4	-0.21	-1.01
5	-0.73	-1.58	5	-0.55	-2.59
6	0.44	1.01	6	-0.16	-0.73
7	-0.28	-0.68	7	-0.52	-2.29
8	-0.17	-0.48	8	-0.37	-1.64

16 Lag Model

	AM1			UM1	
Lag	Coefficient	T-Statistic	Lag	Coefficient	T-Statistic
0	0.48	1.41	0	0.72	4.01
1	0.22	0.57	1	-0.63	-3.30
2	0.61	1.47	2	0.80	4.19
3	-0.02	-0.05	3	-0.54	-2.83
4	1.03	2.24	4	-0.13	-0.58
5	-1.04	-2.27	5	-0.49	-2.22
6	0.62	1.37	6	-0.04	-0.20
7	0.04	0.10	7	-0.44	-1.99
8	-0.14	-0.33	8	-0.45	-2.05
9	-0.85	-1.90	9	-0.48	-2.19
10	0.04	0.09	10	0.36	1.65
11	-0.55	-1.22	11	0.28	1.30
12	0.29	0.66	12	-0.41	-1.86
13	-0.30	-0.68	13	-0.20	-0.86
14	1.24	2.81	14	0.38	1.20
15	-1.15	-2.66	15	-0.94	-2.93
16	-0.12	-0.30	16	-0.44	-1.41

Hypothesis	F-Statistic	Significance Level
BJ'S=0(J=0...8)	F(9,47) = 1.16	0.34
CJ'S=0(J=0...8)	F(9,47) = 7.03	0.13×10^{-5}
BJ'S=0(J=0...16)	F(17,31) = 2.85	0.004
CJ'S=0(J=0...16)	F(17,31) = 6.43	0.12×10^{-5}

effects. This latter result contradicts the hypothesis of neutrality of anticipated money with respect to aggregate nonfarm output derived from application of rational expectations in a classical macroeconomic model.

Taken together, the preceding price and output results suggest that while unanticipated money growth--and possibly also anticipated money growth--has real impacts on the U.S. economy, these impacts are not evident in relative crop prices. To further pursue the analysis of nonneutral monetary impacts on agriculture we also evaluated the effects of anticipated and unanticipated money on four other aggregate sectoral measures: real prices received for livestock, farm sector real gross domestic product, net real farm income, and the real value of agricultural exports. Regression results for these dependent variables are reported in Tables 3-6. When appropriate these regressions are corrected for serial correlation of the residuals.[6]

The regression results for the four additional agricultural variables are somewhat more suggestive of monetary impacts on agriculture than are the results for real crop prices. Though neither monetary variable is significant in the short-lag equation for livestock prices, anticipated money is only marginally insignificant in the long-lag model. Only unanticipated money is significant, and only in the short-lag model, in the regressions for farm sector real gross domestic product. On the other hand, in the regressions for real farm income anticipated money is significant at the 5-percent level and unanticipated money is significant at the 10-percent level in the short-lag regression. Finally, neither monetary variable is significant in either regression for the real value of agricultural exports.[7]

---

[6]Regressions without correction for serial correlation were reported in earlier versions of this paper. The correction for serial correlation does affect the significance level of some F statistics but does not alter the overall conclusions from the analysis.

VI. Summary and Conclusions

The issue of nonneutral monetary impacts on agriculture is an important policy concern. In this paper we have pursued one approach to providing empirical evidence concerning these potential impacts. Money growth is differentiated into anticipated and unanticipated components--a distinction motivated largely by the claim of rational expectations equilibrium macroeconomic models that only unanticipated money has real impacts. The effects of each component of money growth on nonfarm aggregate output and five aggregate measures for the farm sector are then evaluated. Our results suggest that money is not always neutral. Unanticipated money growth, and possibly anticipated money growth as well, has a significant effect on nonfarm gross domestic product. On the other hand, we find only limited evidence of monetary impacts specifically on agriculture. These results merit further consideration, particularly in comparison to implications about monetary impacts derived from other empirical approaches.

---

[7]Upon completing this paper, we received a related paper by Huffman and Langley. They also employ a two-step estimation procedure but use annual data (for the period 1950-1980) and an equation somewhat different from ours to distinguish between anticipated and unanticipated money. They then evaluated the impacts of anticipated and unanticipated money growth on percentage rates of change in nominal agricultural and nonagricultural prices and agricultural and nonagricultural output. They include interest rate and energy price variables in their price equations but, after experimentation, not in their output equations and utilize seemingly unrelated regressions (SUR) to estimate the parameters of these equations.

It is interesting to compare our results to those from Huffman and Langley. In terms of output, the results are similar: both studies find greater monetary impacts on nonfarm output than farm output. Huffman and Langley also find significant effects of anticipated money on nonfarm nominal prices, but reject the hypothesis of short-run monetary impacts on agricultural prices. Even so, by examining individual coefficients, they conclude their results are somewhat supportive of overshooting of agricultural prices (i.e. agricultural prices rising more than nonagricultural prices in response to a monetary expansion and falling more in response to a contraction). Our results from the long-lag model for livestock prices might also be interpreted as supportive of such overshooting in response to anticipated money growth, but our results for crop prices are not.

References

Azzam, A. and E. Pagoulatos. "Unanticipated Money Growth and Agricultural Supply Decisions," selected paper presented at AAEA annual meeting, Ames, Iowa, 1985.

Barro, R. J. and M. Rush. "Unanticipated Money and Economic Activity," in Rational Expectations and Economic Policy (ed., S. Fischer). Chicago: Univ. of Chicago Press, 1980.

Barnett, R. C., D. A. Bessler, and R. L. Thompson. "The Money Supply and Nominal Food Prices," Amer. J. Agr. Econ. 65(1983):303-307.

Belongia, M. "Relative Farm Prices and the Long-Run Neutrality of Monetary Surprises." Mimeograph, Federal Reserve Bank, St. Louis, 1985.

Bond, G., C. Vlastuin, and P. Crowley. "Money and Primary Commodity Prices: A Global Perspective." Presented at the Econ. Society of Australia, 1983.

Enders, W. and B. Falk. "A Microeconomic Test of Neutrality," Review of Econ. and Statist. 66(1984):666-669.

Fischer, S. "Relative Price Variability and Inflation in the United States and Germany." European Econ. Review 18 (1982): 381-441.

Granger, C. W. J. "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods." Rational Expectations and Econometric Practice (ed., R. E. Lucas and T. J. Sargent) Minneapolis: Univ. of Minnesota Press, 1981.

Huffman, Wallace E. and Suchada Langley. "The Differential Effects of Relative Expected Prices on the Agricultural and Nonagricultural Sectors: The Role of U.S. Monetary Policy," presented at the annual meeting of the American Economic Association, New York, December 1985.

Kwack, Chang Keun. An Assessment of the Impact on Agricultural Prices and Output of Anticipated Versus Unanticipated Monetary Variability, M.S. thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, March 1986.

TABLE ~~3-8.~~ 3 EFFECTS OF ANTICIPATED AND UNANTICIPATED MONEY ON REAL PRICES RECEIVED BY FARMERS FOR LIVESTOCK

8 LAG MODEL

	AM1			UM1			ERRORS	
LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC
0	2.57	1.10	0	1.51	1.28	1	-0.001	-0.01
1	-2.60	-0.97	1	-0.85	-0.69	2	0.18	1.19
2	2.87	1.03	2	1.25	1.03	3	-0.12	-0.79
3	-0.19	-0.06	3	0.51	0.42	4	-0.02	-0.14
4	3.35	1.15	4	0.31	0.25			
5	-1.53	-0.55	5	-1.61	1.25			
6	-0.32	-0.13	6	0.94	0.72			
7	0.32	0.13	7	-0.65	-0.48			
8	-2.03	-0.97	8	-1.59	-1.18			

16 LAG MODEL

	AM1			UM1			ERRORS	
LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC
0	5.49	2.24	0	2.35	1.89	1	-0.11	-0.60
1	-1.51	-0.54	1	-1.93	-1.44	2	0.15	0.77
2	4.89	1.58	2	-0.68	-0.52	3	-0.19	-0.97
3	-1.32	-0.40	3	0.26	0.20	4	-0.01	-0.05
4	4.51	1.37	4	1.79	1.15			
5	-1.39	-0.44	5	-1.21	-0.78			
6	-0.26	-0.08	6	1.31	0.86			
7	2.18	0.71	7	0.51	0.33			
8	-2.25	-0.75	8	-2.08	-1.38			
9	-0.01	-0.002	9	-1.57	-1.04			
10	-1.20	-0.39	10	-0.14	-0.09			
11	1.21	0.39	11	0.55	0.37			
12	-3.46	-1.12	12	-2.10	-1.39			
13	-5.09	-1.69	13	-1.70	-0.99			
14	4.14	1.35	14	0.57	0.25			
15	-1.47	-0.49	15	-1.49	-0.66			
16	2.31	0.88	16	-6.86	-3.20			

HYPOTHESIS	F-STATISTIC	SIGNIFICANCE LEVEL
BJ'S=0(J=0...8)	F(9,55) = 0.69	0.71
CJ'S=0(J=0...8)	F(9,55) = 0.65	0.75
BJ'S=0(J=0...16)	F(17,31) = 1.62	0.12
CJ'S=0(J=0...16)	F(17,31) = 1.35	0.23

SUMMARY STATISTICS

8-LAG MODEL. CONSTANT = -0.08 R**2=0.23, RBAR**2=-0.07, D-W=2.00, Q(27)=34.66.

16-LAG MODEL. CONSTANT = -0.11 R**2=0.60, RBAR**2=0.12, D-W=1.97, Q(24)=15.13.

TABLE ~~3~~ 4. EFFECTS OF ANTICIPATED AND UNANTICIPATED MONEY ON FARM SECTOR REAL GROSS DOMESTIC PRODUCT

8 LAG MODEL

	AM1			UM1			ERRORS	
LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC
0	1.77	0.90	0	2.94	2.66	1	0.27	1.87
1	-5.40	-2.37	1	-1.52	-1.26	2	0.03	0.19
2	-0.23	-0.10	2	-0.31	-0.27	3	-0.07	-0.41
3	1.65	0.66	3	2.21	2.02	4	-0.37	-2.23
4	2.12	0.87	4	1.59	1.45			
5	1.90	0.78	5	-3.63	-3.27			
6	2.12	0.94	6	0.18	0.16			
7	-1.63	-0.76	7	-0.46	-0.39			
8	-1.04	-0.55	8	-1.44	-1.23			

16 LAG MODEL

	AM1			UM1			ERRORS	
SP 1 A								
LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC
0	3.72	1.49	0	2.87	2.14	1	0.26	1.43
1	-4.85	-1.73	1	-2.42	-1.65	2	0.08	0.35
2	0.93	0.31	2	-1.14	-0.81	3	-0.11	-0.52
3	1.60	0.50	3	1.97	1.49	4	-0.34	-1.63
4	2.45	0.76	4	2.44	1.59			
5	2.61	0.82	5	-2.93	-1.91			
6	0.89	-0.29	6	-0.67	-0.44			
7	1.56	0.51	7	-0.16	-0.10			
8	-3.25	-1.09	8	-1.51	-1.00			
9	4.55	1.50	9	-0.54	-0.36			
10	-1.75	-0.58	10	-1.89	-1.26			
11	-0.75	-0.24	11	0.90	0.62			
12	-1.96	-0.62	12	0.10	0.66			
13	-1.98	-0.65	13	0.55	0.32			
14	1.97	0.65	14	-0.85	-0.36			
15	-0.55	-0.19	15	-2.72	-1.23			
16	1.20	0.46	16	-1.94	-0.91			

HYPOTHESIS	F-STATISTIC	SIGNIFICANCE LEVEL
BJ'S=0(J=0...8)	F(9,47) = 1.50	0.17
CJ'S=0(J=0...8)	F(9,47) = 2.60	0.02
BJ'S=0(J=0...16)	F(17,31) = 0.87	0.61
CJ'S=0(J=0...16)	F(17,31) = 1.31	0.25

Summary Statistics

8-Lag Model. constant = -0.02 R**2=0.51, RBAR**2=-0.28, D-W=2.10, Q(27)=16.91.

16-Lag Model. constant = -0.07 R**2=0.63, RBAR**2=-0.18, D-W=2.03, Q(24)=14.26.

TABLE ~~1-6~~ 5. EFFECTS OF ANTICIPATED AND UNANTICIPATED MONEY ON REAL FARM INCOME

8 LAG MODEL

	AM1		UM1		
LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC
0	-1.60	-0.34	0	8.17	2.93
1	-4.24	-0.76	1	0.31	0.11
2	-8.32	-1.49	2	-0.27	-0.94
3	13.45	2.41	3	3.67	1.29
4	0.38	0.98	4	0.25	0.45
5	-2.13	-0.35	5	-7.79	-2.64
6	6.36	1.13	6	-0.98	-0.33
7	-13.08	-2.44	7	-2.01	-0.64
8	7.27	1.48	8	-0.23	-0.78

16 LAG MODEL

	AM1		UM1			ERRORS	
LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC
0	1.60	0.24	0	6.96	1.91	1	0.29	1.62
1	-0.46	-0.86	1	-1.08	-0.28	2	-0.06	-0.27
2	-0.33	-0.80	2	-1.69	-0.45	3	-0.17	-0.80
3	12.89	1.22	3	3.63	0.25	4	-0.06	-0.31
4	1.08	-0.13	4	2.88	0.48			
5	7.41	0.98	5	-4.84	-1.13			
6	-0.91	-0.82	6	-0.68	-1.48			
7	-1.96	-0.23	7	-2.85	-0.69			
8	-2.11	-0.25	8	1.09	0.27			
9	18.77	1.24	9	3.16	1.28			
10	-9.73	-1.18	10	-11.79	-2.82			
11	-2.76	-0.31	11	4.73	1.87			
12	12.48	1.47	12	2.76	0.41			
13	-11.86	-1.38	13	-1.21	-0.25			
14	9.86	1.16	14	-2.86	-0.47			
15	-11.86	-1.38	15	-7.23	-1.22			
16	3.45	0.46	16	6.46	1.18			

HYPOTHESIS	F-STATISTIC	SIGNIFICANCE LEVEL
BJ'S=0(J=0...8)	F(9,59) = 2.77	0.009
CJ'S=0(J=0...8)	F(9,59) = 1.94	0.06
BJ'S=0(J=0...16)	F(17,35) = 1.41	0.20
CJ'S=0(J=0...16)	F(17,35) = 1.33	0.15

Summary Statistics

8-Lag Model. constant = 0.01 R**2=0.44, RBAR**2=-0.28, D-W=1.86, Q(27)=17.38.

16-Lag Model. constant = -0.04 R**2=0.70, RBAR**2=-0.32, D-W=1.89, Q(24)=18.87.

TABLE ~~3-9.~~ 6. EFFECTS OF ANTICIPATED AND UNANTICIPATED MONEY ON THE REAL VALUE OF AGRICULTURAL EXPORTS

8 LAG MODEL

AM1			UM1			ERRORS		
LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC
0	-5.39	-1.23	0	-0.51	-0.21	1	-0.46	-3.21
1	-0.86	-0.17	1	2.71	1.09	2	0.09	0.53
2	-2.19	-0.42	2	-2.22	-0.92	3	-0.06	-0.34
3	4.14	0.73	3	-1.24	-0.50	4	-0.03	-0.21
4	-1.28	-0.23	4	1.58	0.62			
5	5.50	1.02	5	-2.73	-1.06			
6	-1.42	-0.28	6	-2.65	-1.02			
7	6.52	1.33		0.84	0.31			
8	2.05	0.49	8	-3.89	-1.45			

16 LAG MODEL

AM1			UM1			ERRORS		
LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC	LAG	COEFFICIENT	T-STATISTIC
0	-4.93	-0.91	0	-3.03	-1.02	1	-0.64	-3.16
1	-1.60	-0.26	1	0.63	0.21	2	0.38	1.55
2	4.40	0.67	2	-2.44	-0.82	3	-0.39	-1.69
3	4.46	0.65	3	-4.93	-1.76	4	-0.15	-0.79
4	1.98	0.29	4	-1.08	-0.30			
5	8.96	1.32	5	-2.98	-0.86			
6	0.69	0.10	6	-0.25	-0.75			
7	7.94	1.21	7	0.93	0.28			
8	2.48	0.38	8	-6.64	-2.01			
9	7.60	1.16	9	4.86	1.49			
10	-10.62	-1.58	10	-0.81	-0.25			
11	15.30	2.29	11	0.57	0.18			
12	-14.49	-2.21	12	0.98	0.30			
13	8.34	1.29	13	-0.67	-0.18			
14	0.64	0.97	14	0.48	0.99			
15	2.90	0.44	15	3.32	0.68			
16	-8.18	-1.42	16	-10.09	-2.15			

HYPOTHESIS	F-STATISTIC	SIGNIFICANCE LEVEL
BJ'S=0(J=0...8)	F(9,55) = 0.88	0.55
CJ'S=0(J=0...8)	F(9,55) = 0.89	0.54
BJ'S=0(J=0...16)	F(17,31) = 1.28	0.26
CJ'S=0(J=0...16)	F(17,31) = 1.11	0.39

Summary Statistics

8-Lag Model. constant = -0.11 R**2=0.34, RBAR**2=-0.07, D-W=2.00, Q(27)=14.49.

16-Lag Model. constant = -0.37 R**2=0.60, RBAR**2=-0.11, D-W=1.98, Q(24)=14.09.