Effects of Fiscal Policies on U.S. Agriculture

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ABSTRACT

According to the Macro Rational Expectation (MRE) hypothesis, only the unanticipated macroeconomic policy has impacts on real economic variables, and the anticipated policy changes have no real impacts. This study analyzes the effects of the anticipated and unanticipated components of fiscal policy on the U.S. farm real GNP by testing the neutrality and rationality propositions of the MRE hypothesis. The test results show that both the rationality and neutrality propositions are rejected. The empirical findings indicate that the anticipated fiscal policy does have significant effects on farm output. Examination of a specific sector sheds light in understanding the nature of the market and in ascertaining the reasons for the cause of the nonneutrality.

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I. Introduction

According to the policy ineffectiveness proposition[1], any macroeconomic policies, whether monetary or fiscal, designed to change the level of aggregate demand will not influence real economic variables such as real prices and real output. However, random components of macroeconomic policies will have real effect (Begg, 1982; Maddock and Carter, 1982). Stated differently, systematic (therefore, anticipatable) macroeconomic policies will have no effects on real economic variables; only the unsystematic or random (thus, unanticipatable) component of macroeconomic policies will influence the real economic variables. Theoretical studies that demonstrated this proposition for *monetary policy* include Lucas (1972), Barro (1976), Sargent and Wallace (1975), and McCallum (1978), and for *fiscal policy* include McCallum and Whitaker (1979).

The theoretical results of the policy ineffectiveness proposition depend crucially on the assumptions of market clearing, perfectly flexible prices, rational expectations by agents, and public's having complete information of governmental decision-making processes. Numerous studies have cast doubt whether these assumptions reflect the real world phenomena (see Poole, 1976). For example, most modern economies are comprised of markets in which prices are not freely flexible because of sales contracts, labor contracts, and government price-fixing policies (Gordon, 1982). Also, the assumption that agents in all markets use rational expectations is questionable (Mishkin, 1989, p. 642). Consequently, considerable controversy over this proposition exists in the literature. For instance, several theoretical studies that refuted this hypothesis include, among others, Fischer (1977), Phelps and Taylor (1977), Canzoneri (1978), Gordon (1982), and Blinder and Mankiw (1984). Also, numerous empirical studies that produced results contradicting the conclusion of this proposition encompass, among others, Mishkin (1982), Gordon (1982), Laumas and McMillin (1984).

The impacts of monetary policy on the agricultural sector have been studied extensively. For instance, Bessler (1984), using vector autoregression, tested the hypothesis that relative prices (ratio of agricultural prices to industrial prices) respond positively to money supply shocks for the Brazilian economy. He concluded that agricultural prices do not adjust faster than industrial prices to money supply shocks. On the other hand, Devadoss and Meyers (1987) found that in the U.S. economy agricultural prices respond faster than industrial prices to the unanticipated money growth. In a recent study, Devadoss (1991) specifically tested the monetary neutrality proposition on U.S. agriculture and found that the anticipated money supply had significant effects on farm output. Although the effects of monetary policies on the agricultural sector were extensively examined, the effects of fiscal policies using the neutrality proposition framework, to our knowledge, have not been investigated. The focus of this study is to analyze the effects of systematic and unsystematic components of government expenditures on the real output of the U.S. farm sector. More specifically, this study tests the neutrality and rationality propositions of the MRE hypothesis[2] on the farm real GNP.

Section II describes the model and the methodology used for testing the policy ineffectiveness proposition. Section III discusses the fiscal policy forecasting equation. Section IV presents the empirical results of the policy ineffectiveness proposition. The final section provides concluding remarks and policy implications of the findings.

II. Test Procedures

The object of this section is to describe the methodology employed in testing the MRE hypothesis. The framework for testing the MRE hypothesis involves estimation of a system of policy forecasting equations and reduced-form output equations. Barro (1977) used a two-step procedure to test the neutrality proposition only. In this procedure, the policy forecasting equation is estimated by using ordinary least squares (OLS), and the predicted and residual series from this regression are used, respectively, as the perceived and unperceived policies in the output equation, which is also estimated by OLS. Mishkin (1982) notes that the two-step procedure ignores possible covariances between the parameters across the policy and output equations. If the covariances between these parameters are nonzero, then the estimates obtained from the two-step procedure are not efficient, and the test statistics will render invalid inferences. Furthermore, the two-step procedure does not allow one to explicitly test the rationality proposition. In light of these statistical problems, Mishkin (1982) developed a joint estimation procedure for testing the MRE hypothesis. This procedure estimates the policy forecasting equation and the output equation as a joint nonlinear system. This procedure, unlike the two-step procedure, can be used to test both the neutrality and rationality propositions.[3] In the current study, Mishkin's joint estimation procedure is used.

The specification used to forecast the fiscal policy is given by the following equation:

$$F_t = X_{t-1}\,\gamma + u_t, \qquad (1)$$

where F_t is the fiscal policy measure in t; X_{t-1} is the vector of observable macro variables pertinent to forecasting F_t; γ is the corresponding coefficient vector; and u_t is the disturbance term assumed to be generated by a temporally independent white noise process, and thus, uncorrelated with X_{t-1}. The forecasting equation is used to decompose the fiscal policy into the anticipated (systematic) and unanticipated (unsystematic) components. The anticipated fiscal policy, denoted as F_t^a, is the expected value of F_t conditional on information available at t-1. Thus, F_t^a is equal to $X_{t-1}\,\gamma$. The unanticipated fiscal policy is equal to $F_t - X_{t-1}\,\gamma$. The unanticipated fiscal policies arise from the fact that fiscal policy is conducted by a protracted sequence of committee deliberations and political process, which is not totally deterministic (Canzoneri, 1978).

If the neutrality proposition holds, then the real output will depend only on unanticipated policy measures, and the output equation can be written as:

$$y_t = \delta + \sum_{i=0}^{n} \beta_i (F_{t-i} - X_{t-1-i}\,\gamma) + v_t, \quad (2)$$

where y_t is the log of farm real GNP;[4] n is the number of lags of unanticipated fiscal policy; δ is the intercept term; β_i (i = 0,1, ..., n) are the coefficients; and v_t is the random term.

If the neutrality does not hold, however, the output will depend on both the anticipated and unanticipated policy measures, and equation (2) can be written as:

$$y_t = \delta + \sum_{i=0}^{n} \beta_i (F_{t-i} - X_{t-1-i}\,\gamma^*) + \sum_{i=0}^{n} \alpha_i (X_{t-1-i}\,\gamma^*) + v_t, \quad (3)$$

where $\gamma = \gamma^*$ and α_i (i = 0,1, ...,n) are the coefficients of the anticipated fiscal policy. Equations (1) and (2) constitute the most constrained system, whereas equations (1), and (3) with $\gamma = \gamma^*$ not imposed constitute the most unconstrained system of the model.

Since the joint estimation procedure allows for covariances between parameters across equations (i.e., "information crossovers" between the forecast and output equations), the estimates of γ, β, and α are efficient, and the test statistics are also valid.

Tests of joint hypothesis, i.e., joint tests of the rationality and the neutrality propositions are conducted by constructing a likelihood ratio statistic from the constrained (1) and (2) system and the unconstrained (1) and (3) system with $\gamma = \gamma^*$ not imposed. Tests of neutrality only, under the maintained hypothesis of rationality, are analyzed by computing the likelihood ratio statistic where the constrained system is (1) and (2) and the unconstrained system is (1) and (3) with $\gamma = \gamma^*$ imposed. Finally, the rationality proposition, without maintaining the neutrality, is tested by examining the likelihood ratio statistic where the constrained system is (1) and (3) with $\gamma = \gamma^*$ imposed and the unconstrained system is (1) and (3) with $\gamma = \gamma^*$ not imposed. The joint hypothesis, neutrality and rationality propositions are tested by estimating the appropriate constrained and unconstrained systems. From the estimated results of the corresponding constrained and unconstrained systems, the likelihood ratio statistic is constructed as:

$$2T\,[\log(SSR^c) - \log(SSR^u)], \tag{4}$$

where SSR^c is the sum of squared residuals from the constrained system; SSR^u is the sum of squared residuals from the unconstrained system; and T is the number of observations in each equation. The test statistic is asymptotically distributed as $\chi^2(q)$ under the null hypothesis, where q is the total number of restrictions imposed.

III. Fiscal Policy Forecasting Equation

This section deals with specification and estimation of the forecasting equation, also known as feedback rules, for fiscal policies. Since an appropriate fiscal policy feedback rule should be based on all the available information, the fiscal policy measure was regressed on its own past values and other pertinent fiscal policy response macroeconomic variables. These variables include the real gross national product (GNP) growth, three-month treasury bill rate, inflation rate, nominal GNP growth, money supply growth, unemployment rate, exchange rate, balance of payments on current accounts, etc. Because fiscal policies are formulated based on the past behavior of the macroeconomic variables, seven lags were chosen for each of these variables. This approach prevents the researchers from searching for alternative specifications that would produce results confirming any priori belief. The procedure used to determine the significance of these variables in the fiscal policy forecasting equation is the multivariate Granger tests. An F-test under the null hypothesis that seven coefficients of the individual policy response variables are jointly zero is carried out. On the basis of this criterion, the lagged fiscal policy, money supply growth, unemployment rate, inflation, and three-month treasury bill rate were included in the forecast equation.

The OLS estimates of the feedback rules based on quarterly data from 1949:1 to 1990:4, with t-statistics in parentheses, are

$$F_t = \underset{(-0.50)}{-0.172}$$

$$\underbrace{\underset{(-3.69)}{-0.332F_{t-1}}\underset{(-0.55)}{-0.054F_{t-2}}\underset{(-0.67)}{-0.063F_{t-3}}\underset{(-0.74)}{-0.068F_{t-4}}\underset{(0.06)}{+0.005F_{t-5}}\underset{(0.18)}{+0.015F_{t-6}}\underset{(-0.83)}{-0.06F_{t-7}}}_{F(7,132)\,=\,2.24}$$

$$\underbrace{\underset{(0.80)}{+0.123MG_{t-1}}\underset{(1.13)}{+0.192MG_{t-2}}\underset{(-0.17)}{-0.028MG_{t-3}}\underset{(-2.25)}{-0.38MG_{t-4}}\underset{(3.82)}{+0.669MG_{t-5}}\underset{(-2.45)}{-0.423MG_{t-6}}\underset{(0.87)}{+0.126MG_{t-7}}}_{F(7,132)\,=\,3.37}$$

$$\underbrace{\underset{(-1.30)}{-0.429UN_{t-1}}\underset{(0.79)}{+0.471UN_{t-2}}\underset{(0.57)}{+0.367UN_{t-3}}\underset{(0.36)}{+0.22UN_{t-4}}\underset{(-1.06)}{-0.606UN_{t-5}}\underset{(0.74)}{+0.403UN_{t-6}}\underset{(-1.16)}{-0.36UN_{t-7}}}_{F(7,132)\,=\,2.21}$$

$$\underbrace{\underset{(1.65)}{+0.303IN_{t-1}}\underset{(-1.75)}{-0.326IN_{t-2}}\underset{(-2.12)}{-0.395IN_{t-3}}\underset{(1.10)}{+0.206IN_{t-4}}\underset{(-1.56)}{-0.276IN_{t-5}}\underset{(-1.40)}{-0.254IN_{t-6}}\underset{(0.80)}{+0.143INz_{t-7}}}_{F(7,132)\,=\,3.18}$$

$$\underbrace{\underset{(-0.78)}{-0.108IR_{t-1}}\underset{(1.11)}{+0.207IR_{t-2}}\underset{(-0.51)}{-0.100IR_{t-3}}\underset{(2.90)}{+0.583IR_{t-4}}\underset{(0.21)}{+0.045IR_{t-5}}\underset{(1.61)}{+0.334IR_{t-6}}\underset{(-2.71)}{-0.472IR_{t-7}}}_{F(7,132)\,=\,3.00}$$

$$R^2 = 0.55, \qquad DW = 2.02,$$

where F = fiscal policy measure, MG = M1 money supply growth, UN = unemployment rate, IN = percentage change in the GNP deflator, IR = change in the three-month treasury bill rate, and DW = Durbin Watson statistic. The fiscal policy measure is generated by deflating the change in the real middle-expansion trend *budget surplus* with potential GNP.[5]

This measure of fiscal policy is independent of the particular position of the business cycle, and thus, is abstracted from the automatic stabilizing feature of the fiscal policy (Laumas and McMillin, 1984).

Quarterly data are used for the empirical analysis. Data for GNP deflator, government expenditure, revenues, and farm sector real GNP are collected from the National Income and Product Accounts of the United States and various issues of the Survey of the Current Business published by the U.S. Department of Commerce. The data for the money supply and the three-month treasury bill rate are obtained from the St. Louis Federal Reserve Bank. The unemployment rate is collected from the International Financial Statistics.

The F-statistics reported with the feedback rules test the explanatory power of the seven lagged values of each variable in predicting the fiscal policy. The approximate critical value of F-statistics at the 5% level is 2.05 and at the 1% level is 2.70. The seven lags money supply growth, inflation rate, and treasury bill rate are significant at the 1% level. The seven lagged values of the fiscal policy measure and unemployment rate are significant at the 5% level. The lagged values of the fiscal policy capture the persistence effects not explained by other independent variables. Sargent and Wallace (1975) and Barro (1977) have posited that the government expenditures and money supply growth have strong interactions. These interactions are evident from the fact that the lagged values of the money supply growth are significant in predicting the fiscal policy. The coefficients of the lagged unemployment rate reflect the counter cyclical response of fiscal policy to the unemployment rate. The lagged values of the inflation rate capture the policy changes pursued by the federal government in response to inflationary pressures. The treasury bill rate captures the policy changes in the fiscal actions pursued by the government in response to interest rate changes. The specification employed for the feedback rules is used in the joint estimation procedure.

With longer time series data as in this study, it is possible that the parameters may not be temporally stable because of policy shifts such as the Federal Reserve Operation Procedures changes in 1979. In view of these policy changes, temporal stability of the coefficient estimates was tested for various sample periods using the Chow test. The results reveal that the null hypothesis of stable parameters could not be rejected at the 5 percent level.[6]

The predicted values from the feedback rules are defined as the anticipated policy measures, and the residuals are treated as the unanticipated measures. The anticipated and unanticipated policy components are used as explanatory variables in the farm real GNP equation in testing the MRE hypothesis.

IV. Farm Output Equation

This section presents the results of the MRE hypothesis tests and the effects of the perceived and unperceived parts of the fiscal policy actions on farm output. The farm output equation is jointly estimated with the forecasting equation as explained in Section II. The time period of the output equation estimation is 1954:1 to 1990:4.[7] The farm output equation is estimated using a polynomial distributed lag (PDL) with a fifth-order polynomial and an endpoint constraint. Earlier studies found that the test results are affected by the lag length (the value of n in equations (2) and (3)) of the anticipated and unanticipated policy measures (Mishkin, 1982). For instance, Mishkin opts for a longer lag by noting that exclusion of relevant variables will result in invalid test statistics; in contrast, inclusion of irrelevant variables will at worst only decrease the power of tests and expound rejections even more telling, but will not yield incorrect test statistics. In light of this suggestion, we estimate the model with a lag length of 20. This lag length is also in line with the recent experiences of the impacts of the macro policies on the farm sector. For example, the budget deficit problems which began in the early 1980s had continued effects on the farm sector, and led to mid and late 1980s recession in the agricultural economy (Devadoss, et al., 1990).

The likelihood ratio statistic of the joint hypothesis, computed using the log likelihood formula given in (4), is $\chi^2(39) = 255.36$, which is significant at the 1% level. This test statistic shows that the MRE hypothesis is strongly rejected. Further tests were conducted to ascertain whether the rejection of the joint hypothesis is due to neutrality or rationality constraints. The computed likelihood ratio statistics for the rationality and neutrality tests are, respectively, $\chi^2(34) = 165.24$ and $\chi^2(5) = 66.32$, which are significant at the 1% level. These test results indicate that both the rationality and neutrality hypotheses are not supported.

Rejection of the rationality proposition in the agricultural market is not surprising because farmers do not use rational expectations in making their production decisions. Generally, farmers tend to follow static or adaptive expectations. Furthermore, most farmers, unlike stock brokers, do not have necessary education skills and the information network to readily access all the available information in forming rational expectations and making production decisions. Also, because of the disperse and isolated location of farms, information reaches farmers with considerable time lag. Furthermore, commodity prices in the United States are heavily influenced by the demand and supply conditions in the world market. Agricultural export companies may know the changes in the demand and supply conditions in the world market. However, farmers, who are the producers, in general do not have good knowledge of the developments in the world market. In summary, farmers are not adequately equipped to operate under rational expectations.

Rejection of the neutrality proposition provides evidence that contemporaneous and lagged anticipated fiscal policies do matter in effecting the farm output. The reasons why neutrality is not supported can be understood by closely examining the movements of farm output prices in the farm sector. Conventional wisdom would suggest that agricultural commodity prices are perfectly flexible (Bordo, 1980). However, many farm programs in the United States are designed to stabilize prices of agricultural commodities such as feed grains and wheat through buffer stock programs. For example, the price stabilization programs such as the loan rates and Farmer Owned Reserve (FOR) programs stabilize the nominal prices of agricultural commodities within the lower and upper price bounds. Specifically, the loan rates program provides downside price protection, whereas the FOR program limits the upward movements of prices (Wright, 1985). Thus, these programs restrict the movements of agricultural commodity prices. Consequently, these programs, by imparting some rigidity to the commodity prices, cause these prices to adjust sluggishly and limit the response of nominal prices to any exogenous shocks such as aggregate demand shocks. For example, Rausser et al. (1986) note that there is an asymmetry in the effect of macro policy on agricultural markets because of U.S. agricultural policies that support prices for major commodities.

Sluggishness in nominal prices is expected to cause large movements in relative prices. Consequently, the anticipated fiscal policy will influence the real output if prices do not adjust instantaneously. The strong rejection of neutrality proposition provides the empirical evidence to substantiate that the systematic fiscal policies do affect the real farm output. A deeper understanding of the neutrality test results can be accomplished by studying the estimated output equations, which are discussed next.

Table 1 reports the results of the effects of the unanticipated fiscal policy on farm output, obtained from nonlinear joint estimation of the policy forecasting equation (1) and the output equation (2) by imposing cross-equation restrictions that γ is equal in both the equations. The joint nonlinear estimates of the forecast equation corresponding to the model in table 1, and also to the model in table 2, are available from the author upon request.

Table 1. Nonlinear Joint Estimates of Output Equation with Unanticipated Fiscal Policy as Explanatory Variables

δ = 4.191(0.017)**

β_0 = -0.025(0.006)**
β_1 = -0.033(0.006)**
β_2 = -0.037(0.007)
β_3 = -0.038(0.007)**
β_4 = -0.036(0.007)**
β_5 = -0.031(0.007)**
β_6 = -0.024(0.007)**
β_7 = -0.016(0.006)
β_8 = 0.005(0.006)
β_9 = 0.005(0.006)
β_{10} = 0.016(0.005)**
β_{11} = 0.026(0.006)**
β_{12} = 0.035(0.006)**
β_{13} = 0.043(0.007)**
β_{14} = 0.048(0.008)**
β_{15} = 0.052(0.008)**
β_{16} = 0.052(0.008)**
β_{17} = 0.049(0.008)**
β_{18} = 0.042(0.007)**
β_{19} = 0.032(0.006)**
β_{20} = 0.018(0.004)**

$\sum_{i=0}^{20} \beta_i$ = 0.175(0.028)**

R^2 = 0.753 SE = 0.063

Notes: The model is estimated using the system in equations (1) and (2) by imposing cross equation restriction that γ is equal in both the equations. The asymptotic standard errors are given in the parentheses.

** significant at the 1% level

The results in table 1 indicate that the fit of the equation is good as evidenced by the significance of many of the estimated coefficients and high explanatory power indicated by the R^2. The signs of the estimated coefficients in the first eight quarters, from quarter zero to seven, are negative, and in the rest of the quarters are positive. The estimates, except in the quarters seven, eight, and nine, are significant. The significance of the estimated coefficients of longer lags indicate the appropriateness of including 20 lags in the model. The negative impacts of the unanticipated policy measures in the first eight quarters are related to the output price stickiness imparted by U.S. commodity price stabilization programs. The commodity prices, because of their sluggishness, do not adjust freely to aggregate demand shocks, creating unfavorable relative prices, which causes the farm output supply to decline. The unanticipated shocks by nature are unexpected, and farmers operating in long and rigid production cycles are not able to adjust their production decisions instantaneously to any surprises. Thus, the rigid production cycle, combined with sluggish price adjustments, cause the commodity supply to respond negatively to unanticipated fiscal policy.

Despite the significant effects of unanticipated fiscal policy stimulus, the policy ineffectiveness proposition is not supported, as shown by the neutrality test results. A closer examination of the estimates of the farm output equation with anticipated and unanticipated policy measures provides further insights into the neutrality rejections. Table 2 presents the estimated results of the farm output equation with inclusions of the anticipated policy measure as additional explanatory variables. Specifically, the model in table 2 is the result of nonlinear joint estimation of the feedback rules (1) and the output equation (3) with cross-equation restrictions that γ is equal in both the equations. The results indicate that the model fits the data well as reflected by the relatively high R^2.

Table 2. Nonlinear Joint Estimates of Output Equation with Unanticipated and Anticipated Fiscal Policies as Explanatory Variables

$\delta = 4.171(0.199)^{**}$

β_0 = -0.024(0.006)**	α_0 = 0.015(0.010)
β_1 = -0.017(0.006)**	α_1 = 0.032(0.015)*
β_2 = -0.013(0.008)	α_2 = 0.047(0.021)*
β_3 = -0.01 (0.01)	α_3 = 0.062(0.027)*
β_4 = -0.008(0.013)	α_4 = 0.076(0.032)*
β_5 = -0.006(0.015)	α_5 = 0.088(0.036)*
β_6 = -0.003(0.017)	α_6 = 0.099(0.04)*
β_7 = -0.002(0.019)	α_7 = 0.109(0.043)*
β_8 = 0.003(0.02)	α_8 = 0.117(0.045)*
β_9 = 0.007(0.022)	α_9 = 0.122(0.046)**
β_{10} = 0.011(0.022)	α_{10} = 0.124(0.046)**
β_{11} = 0.015(0.22)	α_{11} = 0.123(0.045)**
β_{12} = 0.018(0.022)	α_{12} = 0.119(0.042)**
β_{13} = 0.021(0.021)	α_{13} = 0.111(0.039)**
β_{14} = 0.022(0.020)	α_{14} = 0.1 (0.035)*
β_{15} = 0.022(0.019)	α_{15} = 0.086(0.031)*
β_{16} = 0.021(0.016)	α_{16} = 0.070(0.025)**
β_{17} = 0.019(0.014)	α_{17} = 0.052(0.019)**
β_{18} = 0.015(0.011)	α_{18} = 0.034(0.015)*
β_{19} = 0.001(0.008)	α_{19} = 0.018(0.01)
β_{20} = 0.005(0.005)	α_{20} = 0.006(0.006)
$\sum_{i=0}^{20} \beta_i$ = 0.107(0.296)	$\sum_{i=0}^{20} \alpha_i$ = 1.609(0.595)**
$R^2 = 0.8$	SE = 0.057

Notes: The model is estimated using the system in equations (1) and (3) by imposing cross equation restriction that γ is equal in both equations. The asymptotic standard errors are given in the parentheses.

* significant at the 5% level
** significant at the 1% level

As one would expect from the neutrality results, many of the anticipated fiscal policy coefficients are significant. Most of the coefficients of the systematic fiscal policy are greater than the absolute values of the corresponding coefficients of the unsystematic fiscal policy. These results corroborate the earlier findings by Laumas and McMillin (1984) for the aggregate output in the United States. Their study concluded that systematic fiscal policy does influence the aggregate output. The estimated coefficients of systematic fiscal policy are positive in all the quarters. Except for three coefficients (α_0, α_{19}, and α_{20}), all are significant. Consequently, the sum of the effects of the anticipated fiscal policy is also positive and significant. The significant sum of the coefficients suggests that a sustained increase in F has a lasting effect on real farm output. These results suggest that an anticipated increase in the budget surplus raises real farm output. These results occur because systematic changes in the fiscal policy are anticipated and incorporated in the production decisions. Even though commodity prices are sluggish, producers in anticipation of systematic changes in the fiscal policies make production adjustments to eliminate any negative impacts of the anticipated fiscal policy. The effects of the anticipated fiscal policy have a triangular shape, with the largest effect occurring at the eleventh quarter (coefficient of β_{10}).

The pattern of unanticipated coefficients in table 2 is similar to that of the results in table 1 in that the sign of the coefficients is negative in the first eight quarters and positive in the rest of the quarters. However, unlike the results in table 1, most of the coefficients in table 2 are not significant. This is because the anticipated fiscal policy measure explains most of the variations in the output.

V. Summary and Conclusions

The test of the macro rational expectation hypothesis at the sectoral level is needed because, as Blinder and Mankiw (1984) illustrated, evaluation of macroeconomic policy impacts at the aggregate level may provide a misleading picture of the disaggregate level impacts. This is because the aggregate analysis of the MRE can mask the true impacts of the macroeconomic policies in a specific sector since the underlying structure of the individual sector may differ, and also each market may experience a differing degree of input and output price flexibilities. Also, a examination of specific sector would allow us to study the nature of the industry and ascertain the reasons for the cause of the nonneutrality.

In this study, empirical tests of the MRE hypothesis of fiscal policy on farm output are conducted. The test procedure uses a joint nonlinear estimation of real output and fiscal policy forecasting equations. The results reveal that the MRE hypothesis is strongly rejected. Separate tests of neutrality and rationality hypotheses are also unfavorable in supporting these hypotheses. Thus, the chief conclusion of this study is that the anticipated fiscal policy does matter in effecting the farm output. The empirical results corroborate the theoretical findings of the nonneutrality models of Fischer (1977) and Phelps and Taylor (1977), which incorporate nominal price rigidities.

The implication of this result is that since the agricultural sector is influenced by anticipated macroeconomic policies, analysis of agricultural market dynamics should take these effects into account. Also, the farm policy decision makers should consider the macroeconomic shocks in formulating price support and storage policies. This is particularly important in view of the increased integration between the farm and nonfarm sectors. Thus, the macroeconomic disturbances are vital to agricultural policy developments. These results support the view of Modigliani (1977) who, in his American Economic Association presidential address, argued against the policy ineffectiveness proposition and supported active stabilization policy.

Endnotes

1. This proposition is also known in the macroeconomics literature as Macro Rational Expectation (MRE) hypothesis (Modigliani, 1977; Mishkin, 1982), Monetary Neutrality Proposition (Lucas, 1972; Barro, 1976), and Natural Rate Hypothesis (Sargent and Wallace, 1975). These terms are used interchangeably in this study.

2. Mishkin (1982) demonstrated that MRE hypothesis can be decomposed into the rationality and neutrality tests and developed a methodology, which he termed as the joint estimation procedure because the policy forecasting equation and the real economic variable equation are jointly estimated, to test the MRE hypothesis and also rationality and neutrality separately.

3. Mishkin (1983) provides a more detailed discussion of the methodology by clearly documenting the estimation procedures and various steps involved in testing the MRE hypothesis.

4. It is important to note that the variable y_t, the farm sector real GNP, as recorded by the U.S. Department of Commerce in The National Income and Product Accounting is the output produced by the farm sector; y_t does not include government payments that farmers receive through farm programs. This is because government payments are merely income transfers from government to farmers, not part of the farm output produced and, thus, excluded from the farm sector real GNP. It is true that farm program payments will increase the income of farmers, but our focus in this study is to examine the effects of the government expenditure as a fiscal policy tool only on the output produced by the farm sector.

5. Data for the real middle-expansion budget surplus was calculated by deflating the difference between the nominal receipts and expenditures by the GNP deflator. The potential GNP was generated from the predicted values from the regression of the log of real GNP on a constant and a time trend with first-order autocorrelation correction.

6. For instance, the Chow test for the sample split at 1969:4 produced F-statistics of 0.57 and 1.10 for the money growth and fiscal policy equations, respectively. These computed F-statistics are not significant, indicating that parameter estimates of feedback rules are stable.

7. Though the data starts at 1949:1, because of the long lags of anticipated and unanticipated policy measures in the farm output equation and the additional seven lags in the policy forecasting equation, the starting period for the estimation is 1954:1.

References

Barro, R. J. (1976) Rational expectations and the role of monetary policy. Journal of Monetary Economics, **2**, 1-32.

Barro, R. J. (1977) Unanticipated Money Growth and Unemployment in the United States. American Economic Review, **67**, 101-115.

Begg, D. K. H. (1982) The Rational Expectations Revolution in Macroeconomics: Theories and Evidence. Baltimore: The Johns Hopkins University Press.

Bessler, D. A. (1984) Relative prices and money: a vector auto regression on Brazilian data, American Journal of Agricultural Economics, **66**, 25-30.

Blinder, A. S. and Mankiw, N. G. (1984) Aggregation and stabilization policy in a multicontract economy, Journal of Monetary Economics, **13**, 67-86.

Canzoneri, M. B. (1978) The role of monetary and fiscal policy in the new neoclassical models, Southern Economic Journal, **44**, 642-47.

Devadoss, S. (1991) Tests of monetary neutrality on farm output, Western Journal of Agricultural Economics, **16**, 163-73.

Devadoss, S. and Meyers, W. H. (1987) Relative prices and money supply: further results for the United States, American Journal of Agricultural Economics, **69**, 838-42.

Devadoss, S., Meyers, W. H. and Starleaf, D. (1990) Impacts of U.S. monetary policies on the farm sector: an econometric analysis, Applied Economics, **22**, 253-77.

Fischer, S. (1977) Long-term contracts, rational expectations, and the optimal money supply rule, Journal of Political Economy, **85**, 191-205.

Gordon R. (1982) Price inertia and policy ineffectiveness in the United States, 1890-1980, Journal of Political Economy, **90**, 1087-1117.

Laumas, G. S. and McMillin, W. D. (1984) Anticipated fiscal policy and real output, Review of Economics and Statistics, **66**, 468-71.

Lucas, R. E., Jr. (1972) Expectations and the neutrality of money, Journal of Economic Theory. 103-124.

Maddock, R. and Carter, M. (1982) A child's guide to rational expectations. Journal of Economic Literature, **XX**, 39-51.

McCallum B. T. (1978) Price level adjustments and the rational expectations approach to macroeconomic stabilization policy, Journal of Money, Credit, and Banking, **10**, 418-

36.

McCallum, B. T. and Whitaker, J. K. (1979) The effectiveness of fiscal feedback rules and automatic stabilizers under rational expectations, Journal of Monetary Economics, 1171-186.

Mishkin, F. (1982) Does anticipated monetary policy matter? An econometric investigation, Journal of Political Economy, **90**, 22-51.

Mishkin, F. (1983) A Rational Expectations Approach to Macroeconometrics: Testing Policy Ineffectiveness and Efficient-Markets Model. Chicago: University of Chicago Press.

Mishkin, F. (1989) The Economics of Money, Banking, and Financial Markets, 2nd ed. Scott Foresman Publisher.

Modigliani, Franco. (1977) The Monetarist Controversy or, Should We Forsake Stabilization Policies? American Economic Review, **67**, 1-19.

Phelps, E. and Taylor, J. (1977) Stabilizing powers of monetary policy under rational expectations, Journal of Political Economy, **85**, 163-90.

Poole, W. (1976) Rational expectations in the macro model, Brookings Papers on Economic Activity, **2**, 463-505.

Sargent, T. J. and Wallace, N. (1975) Rational expectations, the optimal monetary instruments and optimal money supply rule, Journal of Political Economy, **83**, 241-54.

Tegene, A. and Kuchler, F. (1991) An Error Correcting Model of Farmland Prices, Applied Economics, **23**, 1741-1747.

U.S. Department of Commerce. (1986) The National Income and Product Accounts of the United States Statistical Tables, 1929-82. Washington, DC.

U.S. Department of Commerce. Survey of Current Business, various issues, Washington, DC.

Wright, B. D. (1985) Commodity Price Stabilization in Farm Programs, in U.S. Agricultural Policy: The 1985 Farm Legislation, Ed. by Bruce Gardner. Washington D.C.: American Enterprise Institute.