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Agricultural and Financial Market
Interdependence: Another View

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Empirical estimates presented by Chambers offer the
most recent argument that restrictive monetary policy
has significant negative effects on farm income, net
agricultural exports and relative prices of farm
products at the retail level. It is our view,
however, that this study, and a considerable
proportion of the previous evidence linking monetary
policy to fluctuations in agricultural income, prices
and trade are based on a fundamentally inappropriate
application of static comparisons to problems of
dynamic adjustment. Consequently, standard
hypotheses of monetary economics are misinterpreted
and judgments about the effects of restrictive
monetary policy often are incorrect. While Chambers'
recent article is the motivation for this note, our
more general purpose is to review and clarify what we
believe are persistent errors in the application of
monetary theory to issues in the agricultural
sector.[1/]

Following the main points in Chambers'
paper, we limit the discussion to three issues.
First, we posit that the dynamic influences of
monetary policy need to be examined in the context of
growth rates--not levels--of monetary aggregates.
Second, even though Chambers admits his model is
short-run in nature, we discuss why the issue of
money neutrality is relevant only with respect to
long-run changes in variables. Finally, we find that
specifying variables in growth rates produces results
in substantial disagreement with those reported by
Chambers and found in other similar studies.

LEVELS VERSUS GROWTH RATES IN MONETARY ANALYSIS

The problem with models that use levels of
money stock can be isolated quickly if several basic
propositions are understood. First, recall that the
quantity theory expresses the domestic rate of
inflation as $\dot{P} = \dot{M} + \dot{V} - \dot{y}$, where dots over variables
represent rates of change and P, M, V and y
represent, respectively, the aggregate price level,
money, velocity and real income. Second, if
short-run variations in real income and velocity from
their trend paths and the consequent transitory
effects on real values are ignored, the quantity

theory expression for inflation hypothesizes that (a) there is a one-to-one long-run correspondence between the _rate_ of inflation and money growth and (b) inflation has no long-run effects on real magnitudes (i.e., money is neutral). Both propositions have been supported generally (see Friedman and Schwartz for a survey) and with respect to agricultural prices (Belongia and King). Third, a monetary analysis of exchange rates links changes in this relative price of two currencies to changes in the differential between expected _rates_ of inflation in those two countries (e.g., Mussa).

With this as background, consider an analysis of exchange rates and agricultural trade based on _levels_ of the money stock. A 10 percent reduction in the _level_ of the money stock during one year would be a 17 percent reduction in the annual rate of money growth from the current trend path of M1. Moreover, the quantity theory would predict further 10 percent annual domestic _deflations_ in all subsequent years this policy was followed. Therefore, if the rates of inflation in other countries were zero, the dollar would be expected to appreciate 10 percent per year under this type of monetary policy; the appreciation of the dollar would

be larger, of course, if foreign rates of inflation
were positive. However unrealistic this outlook for
domestic monetary policy and inflation might seem in
comparison with historical data, this is exactly the
type of policy simulated in a number of studies of
money's influence on agriculture.[2]

The misleading nature of the estimated
effects of "restrictive" monetary policy on
agricultural trade and prices might be seen more
clearly, however, if this definition of restrictive
policy is compared to actual data trends. Between
1970 and 1983, M1 grew at an average annual rate of
6.9 percent; since 1976, M1 has expanded at a 7.7
percent rate. The level of M1 has not declined
(Chambers' definition of tight monetary policy) since
1933. Simulations based on reductions in the level
of a monetary aggregate impose a money growth path
consistent with The Great Depression but wholly at
odds with recent experience. These comparisons
illustrate why representing the dynamics of monetary
policy in growth rate form offers interpretations of
real world adjustments and policy prescriptions
substantially different from those based on static
comparisons in which the Fed, through lumpy and
periodic open market operations changes the level of
the money stock in a once-and-for-all manner.

TESTING NEUTRALITY: NOMINAL VERSUS REAL MAGNITUDES

Neutrality of money typically is taken to mean that the growth rate of the nominal money stock has no <u>long-run</u> effects on velocity, real income and relative prices. This proposition can be tested in two ways. Writing $\dot{Y}_t = \alpha_o + \sum_{i=0}^{k} \beta_i \dot{M}_{t-i} + A^{-1}(L)X + \varepsilon_t$ where Y_t is some dependent variable expressed as a function of a distributed lag of money growth $(\dot{M})$, a distributed lag of other variables (in matrix X) and a random error term (ε_t), money is neutral if, for Y_t expressed in real terms, $\sum_{i=0}^{k} \beta_i = 0$.

Chambers reports, however, that money is non-neutral because reductions in the <u>level</u> of money reduce relative farm prices and farm income. Aside from the previous comments regarding tests of this hypothesis in terms of data levels, his analysis can be questioned for at least two other reasons. First, his figure 2 suggests <u>permanent increases</u> in both relative farm prices and nominal income even though his discussion (without empirical justification) concludes that the effects are negative. Second, because the analysis is short-run in nature, Chambers never tests the necessary long-run neutrality proposition that the cumulative sum effect of money growth on relative prices and nominal income should

be equal to zero and one, respectively.[3] From the
incomplete and, apparently, contradictory evidence
found in Chambers' figure 2 and elsewhere, his
conclusion that restrictive monetary policy depresses
nominal farm income and relative prices appears
unfounded.[4]

NEW RESULTS BASED ON A DATA RESPECIFICATION

Chambers uses vector autoregression
techniques to investigate relationships among M1,
farm proprietor's income (FI), net agricultural
exports (NET) and the relative price of food products
(RP); the latter is measured as the ratio of the
Consumer Price Index for food to the CPI for all
items less food. His reported results can be
questioned, however, for at least two reasons.
First, vector autoregression is a statistical tool
intended primarily for use when the researcher admits
no (or little) a priori knowledge of structural
relationships in a model; given the attention to
mathematical detail and model structure in the first
half of Chambers' article, the use of vector
autoregression to estimate relationships seems
inconsistent. Second, at least some econometricians
claim that, while vector autoregression can improve

forecasts and offer inferences on causal ordering, it is of little use in testing hypotheses regarding structural relationships (e.g., Leamer). For both reasons, the reported empirical relationships between money and agricultural variables and the relatively strong policy prescriptions offered by Chambers seem unfounded. It is our interest, therefore, in testing the robustness of Chambers' results if all nominal variables are expressed in growth rate form.

As a quick check of this proposition we report tests of Granger causality between M1 and the same three agricultural variables used in Chambers' study. Since causality tests are known to be sensitive to the number of lags chosen for right-hand-side variables, models using all combinations of lags—up to a maximum of 12 months—were estimated. The result of this estimation is a 12-by-12 matrix of F-statistics relating to the null hypothesis that some Y_t is caused by some variable, X_t. Although conclusions based on this approach to testing face a number of statistical criticisms (e.g., Lovell), the percentage of significant F's and a pattern of significant F's relating only to specific lag lengths nonetheless provide some insight on the relationship between M1

and the selected agricultural variables. We use the same time series as Chambers of monthly data between May 1976 and May 1982.

With respect to M1 causing farm income or agricultural trade, the conclusion from this testing is uniformly that no statistical relationship exists. None of 144 F-statistics is significant for M1 causing either variable. Similarly, M1 can be judged to cause changes in relative prices in only three of 144 cases. With fewer than 0.1 percent of these F-statistics significant, it appears reasonable to conclude that the growth rate of M1 has little influence on these agricultural variables. These results—based on a data specification consistent with monetary theory—differ sharply from the strong relationships reported by Chambers.

CONCLUSIONS

Recent work by Chambers represents the latest effort to link monetary policy to agricultural variables. His work, however, uses an inappropriate specification of a monetary variable and confuses several fundamental hypotheses of monetary economics. Moreover, his estimation technique is inappropriate for drawing inferences on structural relationships between monetary policy and

agriculture. This work--like much of the previous

work on linkages between money and

agriculture--offers statistical correlations that are

of little practical value for policy prescription.

FOOTNOTES

[1]/ Other studies finding statistical

correlations between levels of agricultural variables

and levels of the money stock include Chambers

(1981), Chambers and Just (1982).

[2]/ In earlier work, Chambers (1981) and Chambers

and Just found that various agricultural price

variables were related statistically to the level of

the money stock. The latter study, for example,

found that a "sustained ten percent reduction in

domestic credit (read: ten percent reduction in the

level of M2) eventually evokes more than a seventeen

percent change in the level of wheat price, a seven

percent change in corn price and an eleven percent

change in soybean price (p. 244)." Although Gardner

found these estimates "implausible," he never offered

a specific reason for this judgment. These estimates

are implausible, however, because a simulated 10

percent reduction in the level of M2 is a 20 percent

decline in M2 from its trend growth path in the first

year and further 10 percent declines in subsequent

years. This restrictive pattern of money growth is

comparable to the monetary contraction of the Great

Depression in which M2 declined at an annual rate of

9.8 percent. Under this type of monetary policy, the

fallout from a worldwide depression would overshadow

the effects on agricultural prices estimated by

Chambers and Just.

[3]/ In one study where neutrality was tested with respect to the all-food CPI and major commodity groups of the food CPI, Belongia found unanticipated changes in money growth to have non-neutral effects on relative food prices in the first month but to have zero net effect after a three month lag.

[4]/ One would hypothesize, a priori, a one-to-one negative response of nominal farm income to slower rates of growth of money. Again, from the equation of exchange, $\dot{M} + \dot{V} = GNP$; for V stable, slower money growth implies slower growth for nominal GNP. If money is neutral, the growth rate of nominal farm income—a component of nominal GNP—should decline by an amount comparable to the reduction in the growth rate of money. The interesting test, of course, is whether real farm income responds to a change in nominal money balances.

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