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Author(s): Allen Sinai and Houston Stokes

Source: *Journal of Money, Credit and Banking*, Vol. 9, No. 2 (May, 1977), pp. 372-373

Published by: [Ohio State University Press](#)

Stable URL: <http://www.jstor.org/stable/1991988>

Accessed: 02/01/2015 16:30

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Real Money Balances as a Variable in the Production Function

A Further Reply by Allen Sinai and Houston Stokes

1. Introduction

In two comments with identical titles and much the same material, Prais [4,5] attacks the evidence presented by the authors [6] on the role of real money balances in production. This note refers the reader to an earlier reply [7], not cited by Prais [5]; provides additional empirical evidence on the issues she raises; and suggests directions for future research.

2. The Prais Criticisms

Prais states that the significance of real cash balances results only from the data transformation used to correct for autocorrelation [5, p. 536]. We have previously shown this argument to be incorrect [7, p. 248].¹

Prais then adds lagged real money balances to our regressions and obtains significant negative coefficients for them. Her interpretation of this rather curious specification is that it is a "possible correction of the original specification."² But the work cited by Prais [5, pp. 539–40] to corroborate the alternating signs of the money stock coefficients she finds is not relevant. The variable definitions for output and money differ from ours; periods of estimation and countries are unlike; and the equations of Andersen and Karnosky [1, pp. 157–59] also include high-employment government expenditures as an explanatory variable.³

¹In the regressions with a time trend [5, Table 1, p. 537], the coefficients of real money balances and time are highly collinear and insignificant. Thus, no negative or positive conclusions about the money balance variables can be drawn from them. Prais also is incorrect in arguing [5, p. 536] that our results show " M_1 alone is significant also after introduction of an exponential time trend." Referring the reader to Tables 2A and 3A, indicated as *our* results, *she* inserts asterisks by the money balance coefficients to designate significance at the 5 per cent level. However, Prais used a two-tailed test of the null hypothesis rather than the one-tailed test suggested by theory, as employed and reported in our work. The *t*-values for M_1 and M_2 in the equations with a time trend [5, p. 242] were 2.49 and 1.85, respectively, indicating significance at the 2.5 per cent and 5 per cent levels.

²See [7, pp. 248–49 and nn. 2–5] for a more detailed response to this element of Prais's work.

³Some work of Walters also is offered as support [5, pp. 539–40], but his results are *contradicted* by Prais's regressions [5, p. 438, n. 8]. In addition, Prais's note 9 is hardly satisfactory, since our dependent variable is deflated by the price of output and money balances is divided by a factor price index.

Allen Sinai is director of financial economics, Data Resources, Inc., and visiting associate professor, Sloan School, Massachusetts Institute of Technology. Houston Stokes is associate professor of economics, University of Illinois at Chicago Circle.

Prais concludes by calling for estimates within a framework of simultaneous equations in order to test the significance of money in the production function. With this we can heartily agree [7, p. 250].

Some evidence is available on such an approach. Khan and Kouri [3] reported the results of *FIML* estimation of a simultaneous equations model where the demand for money was included. Their findings supported our hypothesis [7, p. 250] that real money balances are a productive input [3, Table 1, p. 245].

Butterfield [2] presents the results of estimating the elasticity of substitution between money balances, labor, and producers' goods in a system including a Diewert generalized Leontief production function; factor demand equations for labor, capital, and money; and a product price relation. Using nonlinear estimation techniques, he finds significant substitution between money balances and the other productive inputs. The elasticities of substitution are 0.179 between labor and money and 0.035 between producers' goods and money.

3. Conclusion

The model used by Butterfield seems appropriate to us. His work provides further evidence that real money balances have been omitted mistakenly from the production function. Additional work specifically dealing with the corporate sector, cross-section rather than time-series tests, and estimates of the role for money balances in production functions of other countries would be useful. Also, exploration of the possibility that real cash balances are proxying for a more generalized liquidity function should be undertaken.

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