Applied Economics Letters, 2007, 77, 1–4

Routledge
Taylor & Francis Group

The buffer stock model of money demand: evidence from panel data

Jan Tin

U.S. Bureau of the Census, 6066 Oust Lane, Woodbridge, VA 22193, USA
E-mail: jantin4@hotmail.com

One of the tenets of the buffer stock model of money demand is that transactions money balances are shock absorbers and transitory money balances would dissipate in the long run as actual money demand adjusts to its desired level following an unanticipated income shock. However, poor performance of the standard partial dynamic aggregate money demand model since the middle 1973s has seriously challenged the validity of the buffer stock model. Utilizing panel data, this study empirically shows that the speed of adjustment is fast at the microeconomic level, and the long-run parametric estimates are not as implausible as those suggested in past aggregate studies on money demand.

I. Introduction

Based on Friedman's (1956) concept of money as 'a temporary abode of purchasing power' and the permanent income hypothesis, the buffer stock model of money demand expounded by Darby (1972), Laidler (1984), Cuthbertson and Taylor (1986, 1989, 1992), Mizen (1994), and others predicts that transactions money balances act as a buffer against unanticipated income shocks. Since the middle 1970s, however, empirical studies on the partial dynamic model of aggregate money demand indicate that the speed of adjustment has become extremely slow or even negative, and long-run parametric estimates have become implausibly large (Carr and Darby, 1981; Judd and Scadding, 1982). Consequently, in recent years many monetary economists have called for a re-examination of the microfoundations of aggregate money demand in general and the buffer stock model of money demand in particular (Barnett, 1997; Cuthbertson, 1997; Laidler, 1997; Mizen, 1997).

Utilizing panel data from the Survey of Income and Program Participation (SIPP), this study revitalizes the long neglected tradition of cross-sectional studies and examines the empirical contents of the buffer stock model of money demand. When money demand data are free from the assumption of a representative agent and the identification problem, regression results reveal that the annual speed at which the demand for noninterest-earning checking accounts adjusts to the desired level is much faster than those found in past aggregate money demand studies. On average, about 66% of the adjustment process would be completed within a year for noninterest-earning checking accounts among heterogeneous households. Long-run elasticities of permanent income and the rate of interest are not as large as their aggregate counterparts.

II. The Model

The microeconomic counterpart of the long-run buffer stock model of aggregate money demand originated by Darby (1972) can be expressed in log-linear form as

$$\log m_t^* = \beta_0 + \beta_1 \log y_t^p + \beta_2 \log i_t + \alpha' S_t \qquad (1)$$

Applied Economics Letters ISSN 1350–4851 print/ISSN 1466–4291 online © 2007 Taylor & Francis
http://www.tandf.co.uk/journals
DOI: 10.1080/13504850701735765

where m_t^* is real desired money demand during period t, y_t^P is real permanent income, i_t is the rate of interest or the opportunity cost of holding money, and S_t is a set of demographic variables representing the life-cycle motive (Modigliani and Brumberg, 1954). The restrictions, $\beta_1 > 0$ and $\beta_2 < 0$, are expected to hold. The signs of α's vary with demographic variables. If α's $= 0$, Equation 1 reduces to its aggregate counterpart under the assumption of a representative economic agent.

The short-run buffer stock model of money demand can be derived by adopting the real partial adjustment hypothesis of Chow (1966) and Friedman's postulate that changes in actual money demand are related to changes in permanent and transitory money balances. That is,

$$\log m_t - \log m_{t-1} = \lambda(\log m_t^* - \log m_{t-1}) + \delta \log y_t^T, \quad 0 < \lambda \leq 1 \tag{2}$$

where y_t^T is transitory income and λ is the speed of adjustment. The restriction, $\delta > 0$, holds. Equation 2 shows that the deviation of the current level of money demand from its previous level is a fraction of the deviation of desired money demand from the previous level of actual money demand plus the fraction of transitory income held as transitory money balances at time t. Solving Equation 2 for the log of m_t^* and substituting the result back into Equation 1 gives

$$\log m_t = \theta_0 + \theta_1 \log y_t^P + \theta_2 \log i_t + \theta_3' S_t + \delta \log y_t^T + (1 - \lambda) \log m_{t-1} + e_t \tag{3}$$

where $\theta_0 = \lambda\beta_0$, $\theta_1 = \lambda\beta_1$, $\theta_2 = \lambda\beta_2$ and $\theta_3' = \lambda\alpha'$. The error term, e_t, is assumed to possess the first-order serial correlation,

$$e_t = \rho e_{t-1} + \varepsilon_t \tag{4}$$

where ρ is the first-order serial correlation coefficient and ε_t is an error term with zero mean and constant variance. Equations 1 and 3 show that, given knowledge of the reduced-form parameters, the long-run elasticities of permanent income and the rate of interest can be obtained by dividing their short-run counterparts by the speed of adjustment.

III. Data Source and Definitions

With the exception of the Consumer Price Index (CPI) compiled by the US Bureau of Labor Statistics, all data are obtained from the 2001 SIPP conducted by the United States Bureau of the Census from 2001 through 2003. In this study, householders are defined as those who own or rent their homes and are at least 15 years old. Since the 2001 SIPP collects 36 months of longitudinal information on the income of each interviewed household, permanent income can be estimated by taking the average of each household's 36 monthly incomes. Estimates of transitory income can then be approximated by subtracting permanent income from measured income. Real monthly income is equal to nominal monthly income deflated by the monthly CPI for households that were interviewed during the entire survey. Current income is the sum of real labour income and nonlabour income. Labour income consists of wages, salaries and self-employment income, while nonlabour income consists of interests and dividends from financial assets, retirement incomes, Social Security income, government transfers and other incomes.

As shown in Equation 3, at least two periods of money demand data are required before any regression can be conducted. In this study, money demand is defined as noninterest-earning checking accounts contained in waves 3 and 6 collected in 2001 and 2002 by SIPP interviewers, respectively. Current and lagged money demand data are obtained from waves 6 and 3, respectively. The rate of return is estimated by taking the ratio of gross return on interest-earning checking accounts, regular or passbook savings, money market deposit accounts and certificates of deposit to the total amount of these assets reported by each household. For simplicity, the life-cycle motive is represented by age, education, marital status (married = 1; 0 otherwise), and number of children (with children = 1; 0 otherwise).

IV. Regression Results

Maximum likelihood estimation results are presented in Table 1. The first regression in Table 1 is conducted without including the life-cycle motive as a factor determining money demand, while the second regression is conducted after introducing the life-cycle motive into the analysis. As shown in the first regression, the coefficient of lagged money is positive and significant with a magnitude of approximately 0.39, suggesting that, on average, the annual speed of adjustment is 0.61. Similarly, the coefficient of lagged money in the second regression is significant with a value of 0.34, implying that the annual speed of adjustment is 0.66. Thus, more than 60% of the adjustment process would be completed within a year in both regressions if any of the determinants is disturbed. Other findings show that

Table 1. Findings for households possessing noninterest- and interest-yielding monetary assets

Explanatory variables	Without life-cycle motive		With life-cycle motive	
Constant	−0.6573	(3.40)	−3.4469	(6.13)
Permanent income	0.3114	(6.12)	0.5083	(7.84)
Transitory income	0.0038	(1.99)	0.0039	(2.05)
Rate of return	−0.0640	(3.12)	−0.0531	(2.63)
Lagged money	0.3875	(17.44)	0.3396	(15.12)
Age			0.0124	(4.88)
Education			0.0476	(3.83)
Marital status			−0.4436	(5.33)
Children			−0.0993	(1.18)
ρ	−0.0549	(1.03)	−0.0572	(1.07)
R square	0.1963		0.2280	
Sample size	1757		1757	

Note: t-Statistics are in parentheses.

a rise in permanent income by 100% would increase short-run demand for non-interest-yielding checking accounts by 31% in the first regression and 51% in the second regression. However, a rise in transitory income by 100% only increases short-run money demand by less than 1% in each regression. A rise in the rate of return on interest-earning monetary assets would reduce money demand by about 6% in the first regression and 5% in the second regression. The coefficients of demographic variables in the second regression are mostly significant, reflecting that the life-cycle motive is an important factor determining money demand.

Furthermore, dividing the short-run elasticities of permanent income and the rate of interest in the second regression by the speed of adjustment yields the corresponding long-run permanent income and interest elasticities of 0.77 and −0.08. There is no evidence that the long-run elasticities have become extremely large. Summary statistics show that serial correlation is not a problem. The values of R^2 indicate that the second regression outperforms the first regression.

V. Conclusions

The extremely slow or negative speed of adjustment found in past aggregate money demand studies in general and the buffer stock model in particular implies that actual money demand would adjust either extremely slowly to or never reach its long-run equilibrium. At the aggregate level, these past findings are detrimental to the buffer stock model which relies so heavily on the partial dynamic adjustment mechanism for transitory money demand to dissipate in the long run. Nevertheless, past studies on aggregate money demand are plagued by the assumption of a representative consumer, the identification problem, the simultaneous equation problem, or the use of proxies. Findings in this study show that when money demand data are no longer inflicted by the assumption of a representative economic agent or the identification problem, the speed of adjustment is fast and consistent with both the partial dynamic adjustment hypothesis and the buffer stock model of money demand.

Acknowledgements

The author would like to thank the editor and referees for their valuable suggestions. The views expressed are those of the author and do not necessarily reflect the views of the Department of Commerce or the Census Bureau.

References

Barnett, W. A. (1997) Which road leads to stable money demand, *The Economic Journal*, **107**, 1171–85.

Carr, J. and Darby, M. (1981) The role of money supply shocks in the short run demand for money, *Journal of Monetary Economics*, **8**, 181–99.

Chow, G. C. (1966) On the long-run and short-run demand for money, *Journal of Political Economy*, **74**, 111–31.

Cuthbertson, K. and Taylor, M. P. (1986) Monetary anticipation and the demand for money in the UK: Testing rationality in the shock-absorber hypothesis, *Journal of Applied Econometrics*, **1**, 355–65.

Cuthbertson, K. and Taylor, M. P. (1989) Anticipated and unanticipated variables in the demand for M1 in the UK, *The Manchester School of Economic and Social Studies*, **57**, 319–39.

Cuthbertson, K. and Taylor, M. P. (1992) A comparison of the rational expectations and general to specific approach to modelling the demand for M1, *The Manchester School*, **60**, 1–22.

Cuthbertson, K. (1997) Microfoundations and the demand for money, *The Economic Journal*, **107**, 1186–201.

Darby, M. (1972) The allocation of transitory income among consumer assets, *American Economic Review*, **62**, 928–41.

Friedman, M. (1956) The quantity theory of money: a restatement, *Studies in the Quantity Theory of Money*, (Ed.) M. Friedman Chicago University Press, Chicago, pp. ■■–■■.

Judd, J. P. and Scadding, J. L. (1982) The search for a stable money demand function: a survey of the post-1973 literature, *Journal of Economic Literature*, **20**, 993–1023.

Laidler, D. (1997) Notes on the microfoundations of monetary economics, *The Economic Journal*, **107**, 1213–23.

Laidler, D. (1984) The buffer stock notion in monetary economics, *Economic Journal*, **94**, 17–33.

Mizen, P. D. (1994) *Buffer Stock Models of the Demand for Money*, Macmillan, London.

Mizen, P. D. (1997) Microfoundations for a stable demand for money function, *The Economic Journal*, **107**, 1202–12.

Modigliani, F. and Brumberg, R. (1954) Utility analysis and the consumption function: an interpretation of the cross-section data, in *Post-Keynesian Economics* (Eds.) K. Kurihara, Butgers U. Press, New Brunswick, NJ.