Is the Japanese economy in a liquidity trap?

George Hondroyiannis\textsuperscript{a}, P.A.V.B. Swamy\textsuperscript{b}, George S. Tavlas\textsuperscript{c,\dagger}

\textsuperscript{a}Bank of Greece and Harokopio University, 21 E. Venizelos Ave., GR-102 50 Athens, Greece
\textsuperscript{b}US Comptroller of the Currency, Washington, DC, USA
\textsuperscript{c}International Monetary Fund and Bank of Greece, Athens, Greece

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Abstract

A random coefficient estimation procedure is used to estimate the time profile of the interest rate elasticity of Japanese money demand. Contrary to the prediction of the liquidity trap hypothesis, the absolute value of the elasticity is found to decline at lower levels of interest rates. © 2000 Elsevier Science S.A. All rights reserved.

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JEL classification: C20; E41

1. Introduction

Although the theory of the liquidity trap had been an active area of investigation through the mid-1970s, in the subsequent 20 or so years very little research addressed the issue.\textsuperscript{1} Recently, however, there has been a renewed interest in the subject in light of Japan’s economic performance.\textsuperscript{2} McKinnon and Ohno (1997), Plender (1998) and Wolf (1998) have argued that, with nominal short-term interest rates near zero, the Japanese economy is in a liquidity trap. In this connection, Krugman (1998) argued that the liquidity trap is not a historical myth, but that it is something that can and does occur and it is important to try to understand it. Using an intertemporal framework with rational expectations, he shows that “a liquidity trap is always the result of a credibility problem: the
public believes that the current monetary expansion will not be sustained” (1998, p. 166). The central bank can get the economy out of a liquidity trap if it can credibly promise a future rise in prices. In the context of the Japanese economy, Krugman argued that if a monetary expansion is perceived to be permanent, it will raise prices and “bootstrap the economy out of the trap” (1998, p. 161).

Friedman (1997) and Goodfriend (1997) also argued that sustained monetary expansion will spur the Japanese economy to recovery. According to Friedman (1997, p. A22), the Bank of Japan can increase the money supply by buying bonds on the open market, thereby adding to banks’ reserves and enabling them to expand their liabilities by loans and open market purchases. Goodfriend (1997, pp. 293–94) argued that “determined open market purchases” by the Bank of Japan would push up bond and equity prices and depreciate the exchange rate, thus stimulating aggregate demand.

The liquidity trap hypothesis was formulated by Keynes (1936, p. 233), who suggested that at low levels of the rate of interest the demand for money could become highly, or even perfectly, elastic with respect to the interest rate. If so, at low levels of the interest rate any increase in the money supply will be hoarded so that monetary policy is impotent. This view underlies recommendations that Japan rely on fiscal measures to emerge from its recession.

Is the Japanese economy mired in a liquidity trap? This paper provides some evidence on the issue. We follow the approach of the earlier (i.e., up to the mid-1970s) empirical literature dealing with the existence of a liquidity trap in the context of the US economy during the 1930s. This literature focused on the issue of whether the demand for money became more interest sensitive during the 1930s (when interest rates were at low levels) relative to other decades. We depart from the earlier approach, however, by estimating money demand functions using a random coefficient (RC) estimation procedure which provides a time profile of the interest elasticity of money demand. Section 2 discusses RC estimation. Section 3 presents the empirical findings. Section 4 concludes.

2. The RC model

The money-demand specification estimated is:

$$\ln(m_t) = \alpha_0 + \alpha_1 \ln(r_t) + \alpha_2 \ln(y_t) + u_t,$$

where $m_t$ is the stock of real money balances, $r_t$ is an interest rate, $y_t$ is real income, and $u_t$ is an error term. The money series used is M2 plus certificates of deposits, which has been the aggregate used for policy projections by the Bank of Japan since 1978 (Tavlas and Ozeki, 1992). To obtain real money balances, the money series has been deflated by the GDP deflator. Income is real GDP. Two interest rate series were used in alternate specifications of Eq. (1) — the money market rate and the deposit rate. Note that the interest rate variable enters Eq. (1) in log form, unlike some studies that include the level of interest rates in money demand specifications. Two main reasons underlie this choice of log formulation. First, including the log of the interest rate permits direct estimation of the interest elasticity. Second, as Zellner (1998, p. 98) argued, using the level of interest rates “implies that the elasticity of demand for money is more elastic at high than at low interest rates, contrary to what

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3An overview of the earlier literature is provided in Swamy et al. (unpublished manuscript).

4Most of the earlier empirical literature on the liquidity trap used a short-term interest rate.
Keynes and others thought reasonable.” All data are seasonally adjusted from the IFS. The estimation period is quarterly over 1967:1–1997:2 (the latest quarter for which all the data were available to us on an IFS tape).

Swamy and Tavlas (1995, 1999) and Chang et al. (1999) show that Eq. (1) can be used to derive an equation which relaxes the following restrictions: (i) \( \alpha_0, \alpha_1, \text{and} \alpha_2 \) are constants; (ii) \( u_t \) represents excluded variables; (iii) the functional form of Eq. (1) is log-linear; and (iv) the data on \( r_t \) and \( y_t \) do not contain measurement errors. An equation which relaxes these restrictions is:

\[
\ln(m_t) = \gamma_{0t} + \gamma_{1t} \ln(r_t) + \gamma_{2t} \ln(y_t), \quad t = 1,2, \ldots, T \tag{2}
\]

where the real-world interpretations of the coefficients are as follows, \( \gamma_{0t} \) is the sum of three parts: (a) the intercept of the ‘true’ money demand model; (b) the joint effect on the ‘true’ value of \( \ln(m_t) \) of a portion of excluded variables; and (c) the measurement error in \( \ln(m_t) \). The coefficient \( \gamma_{1t} \) (or \( \gamma_{2t} \)) is also the sum of three parts: (a) a direct effect of the ‘true’ value of \( \ln(r_t) \) (or \( \ln(y_t) \)) on the ‘true’ value of \( \ln(m_t) \); (b) a term capturing omitted-variables bias; and (c) a mismeasurement effect due to mismeasuring \( \ln(r_t) \) (or \( \ln(y_t) \)) (see Chang et al., 1999).

An assumption that is consistent with the real-world interpretations of the coefficients of Eq. (2) is that each of these coefficients is time-varying and a linear function of concomitants plus an error (see Chang et al., 1999). Concomitants may be viewed as variables that are not included in the equation used to estimate money demand, but help deal with the correlation between the \( \gamma \) values and the explanatory variables.\(^6\) The following concomitants were used: the yield on 10-year government bonds, industrial production and an index of share prices on the Tokyo stock exchange.\(^6\) Our discussion presented in the next section is based on our estimates of

\[
\frac{1}{T} \sum_{t=1}^{T} \gamma_{0t}, \frac{1}{T} \sum_{t=1}^{T} \gamma_{1t}, \text{and} \frac{1}{T} \sum_{t=1}^{T} \gamma_{2t}.
\]

As shown in Swamy and Tavlas (1995), the variation of the coefficients (including that of the intercept) under RC estimation incorporates the effects of omitted variables. Therefore, the effects of such dynamic factors as technical changes in the payments system over time and adjustment lags and expectations lags are captured in the indirect effect (i.e., the term capturing omitted-variables bias) component of each of the coefficients of the included variables. Consequently, Eq. (2) is a dynamic specification, with the effects of such dynamic influences as lagged variables captured in the coefficients of the included variables. Finally, it can also be demonstrated that, under the RC procedure, the error term in Eq. (2) is the sum of three components and this sum takes account of both heteroskedasticity and serial correlation.

3. Empirical results

Table 1 presents estimation results. The table reports the average of the coefficients during the estimation period. Eq. (2a) uses the money market rate as the opportunity cost variable and Eq. (2b)
uses the deposit rate. In Eq. (2a) both real income and the money market rate are significant. The income elasticity is slightly above unity and the interest elasticity is slightly negative. Similar remarks pertain to Eq. (2b) except that the interest rate variable is not significant and its coefficient is less in absolute value than the coefficient on the money market rate in Eq. (2a).

As discussed in Christou et al. (1998), RC estimation stresses out-of-sample forecasting performance. In order to assess the ability of the equations to forecast, the equations were estimated over 1967:1–1995:2 and then used to forecast real money balances over 1995:3–1997:2. The root mean square errors (RMSE) of the forecasts are presented in the final column of Table 1. The RMSEs are rather small, particularly since the specifications do not include lagged-dependent variables that characterize partial adjustment models of money demand. Thus, the RMSE’s suggest that the RC model is well-specified.

To evaluate the relevance of the liquidity trap hypothesis, our interest is in the time profile of the interest rate elasticity. Does this elasticity become larger in absolute value (i.e., more negative) at lower levels of the interest rate as the theory of the liquidity trap predicts? Figs. 1 and 2 show the time-profiles of the money market rate and deposit rate elasticities (left scale), respectively, as well as of the levels of the relevant interest rates (right scale). As shown in Fig. 2, the deposit rate has declined from a peak of around 4.6% in 1991:4 to about 0.3% in 1997:2. Over the same period, the money market rate has fallen from about 8% in 1991:1 to 0.5% in 1997:2 (Fig. 1). The charts also show that the interest elasticity has been declining in absolute value, contrary to the liquidity trap hypothesis. The elasticity of the money market rate has declined steadily in absolute value throughout the estimation period, from $-0.10$ at the beginning of the period to about $-0.01$ at the end of the period. The elasticity of the deposit rate began to decline in the late 1980s, when it was about $-0.02$; by early 1997 it had fallen to about $-0.003$.

The decline in the absolute value of the interest elasticity of money demand can be attributed to the deregulation of the Japanese financial system, a process which began in the early 1980s and continued throughout that decade (Tavlas and Ozeki, 1992). Prior to the early 1980s, government ceilings on deposit rates restricted movements in those rates. In such conditions, changes in the opportunity cost of holding money were equal to changes in market interest rates, so that money demand was more responsive than otherwise to changes in market rates. Financial deregulation has resulted in an increased share of financial instruments within the aggregate M2 plus CDs that offer market-

Table 1

<table>
<thead>
<tr>
<th>Model</th>
<th>Coefficients</th>
<th>Constant</th>
<th>Real GDP</th>
<th>Interest rate</th>
<th>RMSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eq. (2a)</td>
<td>$-8.85$</td>
<td>$1.15$</td>
<td>$-0.04$</td>
<td>$0.071$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>($-8.85$)</td>
<td>($14.57$)</td>
<td>($-2.48$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eq. (2b)</td>
<td>$-8.36$</td>
<td>$1.11$</td>
<td>$-0.01$</td>
<td>$0.065$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>($-7.48$)</td>
<td>($12.51$)</td>
<td>($-0.53$)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

determined rates, although the deregulation process has been a gradual one. The yields on those instruments are closely related to the rates on assets held by depository institutions, leaving the differential little changed when rates on the latter assets change. Because the opportunity cost of holding money balances is the spread between the own rate of return on money and the market rate on substitute financial assets, movements of deposit rates in the deregulated system result in variations in the opportunity cost of holding money that are less than variations in market rates (Judd, 1983, p. 35). Thus, the demand for deposits appears to have become less sensitive to the general level of interest rates in the deregulated financial system than it was in the earlier regulated system.

4. Conclusion

The annual rate of increase of M2 plus CDs averaged 8.2% between 1982:2–1987:2. During that period real GDP growth averaged 3.3%. Between 1997:3–1997:2, growth of M2 plus CDs averaged 3.1% while real GDP growth averaged 1.0%. With the discount rate at 0.5% and other interest rates

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7In the early 1990s, about two-thirds of bank deposits earned market-determined interest rates (Tavlas and Ozeki, 1992, p. 13).
slightly above zero, some commentators have argued that the Japanese economy is in a liquidity trap situation. The results presented in this paper do not support that view. The results suggest that, with the deregulation of the Japanese financial system, the interest rate elasticity of money demand has declined in absolute value in recent years, contrary to the liquidity trap hypothesis. The results support the view set forth by Friedman and by Krugman that sustained monetary expansion would be effective in pulling the Japanese economy out of recession.

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