**Estimation of the Liquidity Trap Using a Panel Threshold Model**

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This empirical study investigates, unlike previous studies, for the presence of a liquidity trap using firm-level data. The study focuses on the case of China. A panel threshold model is employed. The empirical estimation reveals that the interest elasticity of money demand declines as the interest rate falls, a finding indicating that China has not been in a liquidity trap.

*Keywords:* Liquidity trap; Panel threshold model; Demand for money

*J.E.L. classification:* E41; E31

**I. Introduction**

In His *General Theory*, Keynes (1936, p. 121) observed that “There is the possibility…that, after the rate of interest has fallen to a certain level, liquidity-preference may become virtually absolute in the sense that almost everyone prefers cash to holding a debt which yields so low a rate of interest. In this event the monetary authority would have lost effective control over the rate of interest.” Although a topic that is commonly discussed in macroeconomics classes as a “liquidity trap,” a “real world” liquidity trap appears to be a rare phenomenon.

Arguably, the first and second liquidity trap experiences occurred during the period 1929-1939 in the US and in the 1990s in Japan, respectively. According to Krugman (2009), however, there has in fact been a third experience with the liquidity trap. Krugman (2009) actually has asserted that this third liquidity trap experience became a problem spreading among most developed countries, as allegedly revealed by persistently low prevailing interest rates and a deteriorated world economy. On the other hand, Orphanides (2004) has asserted that short-term nominal interest rates approaching zero does not prove that an economy is in a liquidity trap.

One strategy for testing for the presence of a liquidity trap is to test whether the interest elasticity of money demand increases as interest rates fall (Laidler, 1966; White, 1972). However, this is a complicated task since the demand function of money is nonlinear. In the literature, to address this problem, a log-log specification for money demand functions has been widely used (Miyao, 2002; Fujiki and Watanabe, 2004; Bae et al., 2006). Nevertheless, such specifications provide a poor description of the economy during deep recessions, such as the one beginning in late 2007 and ending in 2009 (Fernández-Villaverde et al., 2015). Another problem associated with testing the presence of a liquidity trap is that the occurrence of a liquidity trap is a multifold result. Focusing only on money market tends to result in other major issues being overlooked. For instance, Sato (2008) shows that the bank loan market and interest rates determined in that market are more economically influential than the money market.

China’s economic growth has been sluggish for a long period of time. This weak economic performance creates doubt regarding the effectiveness of China’s central bank monetary policy since the beginning of 2008. Given the persistent slow growth in the China economy, it is incumbent on the Chinese government to better understand its economy and to propose a more appropriate monetary policy.

The purpose of this empirical study is to test empirically whether China’s central bank is challenged by a liquidity trap. To address the issues noted above in testing for the presence of a liquidity trap in China, we use a nonlinear panel threshold model, as proposed by Hansen (1999), rather than the widely adopted linear framework, which has proved to be an inappropriate model for studying the liquidity trap in deep recessions. Furthermore, rather focusing upon market interest rates based on the money market, this study focuses on the firm-level interest rates collected from the loan market in China instead. The estimations findings do not support the liquidity trap hypothesis for China.

1. **The Basic Model**

Lotti and Marcucci (2007) define the money demand model as follows:

 (1)

where

*αi* refers to firm specific effects;

*Mit* is the money holdings of firm *i* at date *t*;

*Yit*  is the volume of sales of firm *i* at date *t*, as a measure of the scale of relevant business activity;

*Rit* is the nominal interest rate;

*Wit* is the mean hourly wage of the workers involved in the production of transaction (relevant business) services;

is the time dummy variable that can be considered as an indicator of the firm’s degree of financial sophistication, as shown in Lotti and Marcucci (2007); and

*it* is the stochastic error term.

The liquidity trap hypothesis argues that the interest elasticity of money demand increases as interest rates fall. To test this hypothesis, we modify the model in equation (1) in two respects. First, to address the problem of endogeneity, we add the lagged explanatory variables. Second, we consider multiple thresholds. The resulting specification is, as follows:

  (2)

where  and  are the two threshold values to be estimated.

**III. Data and Results**

*Data*

We obtained the firm-level data between 2000 and 2007 from the annual surveys of Chinese manufacturing companies conducted by the National Bureau of Statistics of China. This database includes all state-owned and private firms with annual sales exceeding 5 million RMBs. Observations that are in conflict with generally accepted accounting principles are excluded. Our final balanced panel data include 16,069 firms and a total of 128,552 observations in the sample period.

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| **Table 1. Variable definitions** |
| Variable | Description |
| *Mit* | *Mit*  is computed as liquid assets for firm *i* less the sum of inventory plus accounts receivable for firm *i* at the end of year *t*. |
| *Yit* | total sales for firm *i* at the end of year *t*. |
| *Wit* | *Wit*  is measured as the total payroll (given by “total wages payable”), divided by the number of employees for firm *i* at the end of year *t*. |
| *Rit* | *Rit* is computed as the total financial expenditures divided by the total debt (given by “total liabilities”) for firm *i* at the end of year *t.* |

Following Hansen (1999), we first test for the number of thresholds. We estimate the model with two thresholds. In Table 2, we provide the *F*-statistics of the tests for threshold effects. The test results reveal the existence of at least two thresholds.

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| **Table 2. Results from the tests for threshold effects** |
| Test for single threshold |  |
| *F1* | 87.621 |
| P-value | 0.000 |
| Test for double threshold |  |
| *F*2 | 155.309 |
| P-value | 0.000 |
| **Table 3. Threshold estimates** |  |
|  Estimate | 95% confidence interval |
|  | -6.070 | [ -6.070 , -6.002 ]  |
|  | -4.463 | [ -4.513 , -4.439 ]  |

Figs. 1 and 2 plot the refinement estimators, and, respectively.[[1]](#footnote-1)





Finally, Table 4 provides the estimates for other variables.

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| **Table 4. Regression estimates: double - threshold model** |
| Regressor | Coefficient estimate | SE | P |
|  | 0.865 | 0.004 | 0.000 |
|  | 0.107 | 0.008 | 0.000 |
|  | -0.092 | 0.004 | 0.000 |
|  | -0.130 | 0.005 | 0.000 |
|  | -0.163 | 0.006 | 0.000 |

The estimation results for equation (2) indicate that the interest elasticity of the money demand declines as the interest rate declines at the 1% statistical significance level. This is consistent with findings of Laidler (1966). Hence, our findings dispute the liquidity trap hypothesis for the case of China during the 2000-2007 time period.

**IV. Conclusion**

This empirical study explores the possibility the presence of a liquidity trap in China using comprehensive firm-level data. Unlike previous studies, the nonlinear panel threshold model has been used to test the liquidity trap hypothesis. The empirical findings show that the interest elasticity of money demand does not increase as the interest rate falls. Therefore, the empirical evidence is inconsistent with the liquidity trap hypothesis for the 2000 through 2007 study period. Moreover, this study arguably adds an important nuance to our understanding of the Chinese economy. Namely, it suggests that an inference of the presence of a liquidity trap predicated on the prevalence of near zero short-term interest rates may be an illusion. Indeed, in China, greater monetary expansion could still be effective if the government shifts the targeted interest rates from the short-term government debt market to the long-term bank loan market.

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1. For detailed interpretation of the threshold model, readers can refer to Hansen (1999). [↑](#footnote-ref-1)