Modelling and forecasting the money demand in China: 
Cointegration and nonlinear analysis

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This paper deals with the demand for money, including narrow money ($M_1$) and broad money ($M_2$) in China. We use the cointegration and error-correction model to formulate the function of money demand and merge the short-run and long-run equations to give forecasts over different horizons. In particular, we combine very simple artificial neural networks (ANNs) with the cointegration and error-correction model to give a nonlinear model. These models are quarterly models, sampled from the first quarter of 1980 to the fourth quarter of 1994, and the multi-step forecasts are from the first quarter of 1990 to the fourth quarter of 1994. Both the fitted values and predictive values for $M_1$ and $M_2$ are satisfactory. Finally, we give forecasts for $M_2$ from the first quarter of 1995 to the second quarter of 1996.

Keywords: demand for money, cointegration and error-correction, artificial neural networks

1. Introduction

Since the inception of market-oriented reforms in 1978, the structure and mechanism of the financial system in China have undergone significant changes. After the establishment of the central-bank system in 1983, it is naturally the view of the banking system and financial sector to move to a system of monetary control by means of indirect, market-based instruments. This requires a thorough re-specification of the demand for different monetary aggregates. In order to use a given monetary aggregate as an intermediate target in implementing monetary policy, it is necessary for us to model a reasonable, stable and predictable money-demand function. As China is in a period of transition from the centrally planned economic system to a market-oriented one, it would be difficult to formulate a stable demand function for various monetary aggregates over the entire period after 1978.

This paper mainly deals with the demand for two major monetary aggregates in China, namely, narrow money ($M_1$) (currency plus demand deposits held by households and enterprises), and broad money ($M_2$) ($M_1$ plus time and saving deposits held by households and enterprises).
Generally speaking, two conceptually distinct justifications for holding money commonly appear in the literature [1–3]: one is transactions demand with money held as a medium of exchange, the other is asset (portfolio balance or speculative) demand with money as one of several possible assets in which wealth may be held.

The transaction-demand theory is based on the need for money as an inventory to smooth transactions. Thus, the aggregate real quantity of money demanded (i.e., nominal money demand \( M^d \) divided by an appropriate price level \( P \)) is an increasing function of some measure of the volume of real transactions \( Y \). Real Gross National Product (GNP) or real Gross Domestic Product (GDP) are usually common measures of the volume of transactions. Further, money demand declines as the opportunity costs of holding money increases. The measure of the opportunity costs is usually the returns from the alternative forms of wealth. So, we have

\[
M^d/P = h(Y, R),
\]

where \( R \) is a vector of interest rates on the alternative assets. \( h(\ast, \ast) \) is increasing in \( Y \) and decreasing in the elements of \( R \).

With the portfolio balance approach, money is one of the many alternative forms of holding wealth, and each form has its own explicit return and implicit return. Individuals choose the composition of their portfolio of assets so as to maximize the returns they expect from that portfolio. Different assets have different expected returns and different degrees of risk, and individuals choose their portfolio to trade off between higher returns with more risks and lower returns with fewer risks. The function is similar to (1.1), but wealth rather than income or expenditure is the scale variable, and some measure of the uncertainty of alternative assets’ returns and their expected returns both enter the functions. If \( R \) includes the money’s own return, the function is increasing in this return.

Although there are two main motives for money demand, the final function as in (1.1) may include both. In empirical analyses, some dynamic models are often used and we will discuss them later.

Before 1978, the Chinese economic system was a centrally planned economic system. Prices and interest rates were controlled by the government. Although China is in a transition from the centrally planned economy to a market-oriented economy at present, the motive for money demand mainly involves transaction demand [4–7]. With the acceleration of reforms in the banking systems and financial sectors, and the increasing monetization of the economy in China, individuals may have more liquid assets by choice and the money demand may include a portfolio balance.

Conventional money demand functions in China are specified by ordinary econometric methods in the following form:

\[
M_t = \alpha_0 + \alpha_1 P_t + \alpha_2 Y_t + \alpha_3 R_t + \alpha_4 M_{t-1} + \epsilon_t,
\]

where \( M \) = nominal money balance, \( P \) = general price level, \( Y \) = real income, \( R \) = interest rate of some deposits, and \( \epsilon \) = error term.