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The behavior of money demand in the Chinese hyperinflation☆

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ABSTRACT

In this paper I study the behavior of money demand during the episode of hyperinflation that occurred in China after World War II. I consider two popular and competing money demand specifications – the log–log and the semi-log – and show that the log–log performs better than the semi-log in its ability to track the behavior of the money demand. The choice between the two specifications is of great importance, as it implies that welfare cost estimates are very different for hyperinflation. The findings also contribute to the understanding of Cagan's paradox and the failure of Cagan inflationary finance models. The paradox might be attributable to the popular semi-log schedule for money demand, and the log–log schedule might be an appropriate form for the analysis of hyperinflation.

1. Introduction

The semi-log money demand function has been a workhorse in macroeconomics since it was introduced by Cagan's pioneering study of hyperinflation (Cagan, 1956). One useful result has come to be known as the Cagan rule, which establishes that the revenue maximizing inflation rate is equal to the inverse of the interest semi-elasticity of the demand for money. It is well-known, however, that during hyperinflation authorities tend to expand money supply at a rate well beyond this rule, which is known as "Cagan's paradox". Furthermore, economists have recognized that with perfect foresight the semi-log model is not able to generate monetary hyperinflation (Buiter, 1987).

This inability stimulates a re-specification of hyperinflation models (for example, Ashworth & Evans, 1998). Recently, Sokic (2012) shows that the possibility of explosive hyperinflation paths depends on money essentiality defined by Scheinkman (1980), and a class of inelastic money demand functions has been shown to be appropriate candidates to replace the semi-log function. Moreover, the choice of functional form is also a critical assumption in the monetary analysis of moderate inflation. As emphasized by Lucas (2000) and Ireland (2009), the semi-log and the log–log money demand specifications have very different implications for the welfare cost of modest inflation.

The subject of this paper is twofold. First, I estimate two popular and competing money demand specifications, the semi-log schedule and the log–log schedule. I examine the two schedules, to find which one fits the empirical data better for the case of the Chinese hyperinflation. Second, I discuss the implications of the two schedules for welfare cost and inflationary finance in hyperinflation. It is found that the log–log model performs better than the semi-log model due to its ability to track the behavior of the money demand in

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the Chinese hyperinflation episode of post-World War II. In addition, a finding that the log–log specification describes the cointegrated relationship linking two non-stationary variables, the real money balance and the inflation rate, coupled with a finding that the semi-log specification fails to describe the same sort of relationship, provides statistical evidence supporting the log–log form as a good fit to the Chinese hyperinflation. It is also found that for each money demand specification, it makes little difference whether the welfare cost is estimated on the basis of the Lucas's approach or the Bailey's approach. However, the choice between the log–log and the semi-log is of great importance, as they imply very different welfare cost estimates, for either moderate inflation or hyperinflation. At moderate inflation I suggest a significant welfare cost for the log–log model, but a negligible welfare cost for the semi-log model. In contrast, when inflation explodes, the welfare cost estimates from the log–log model are much lower than those from the semi-log model. Thus, it is critical to choose the appropriate money demand specification for drawing valid conclusions on the welfare cost, for both moderate inflation – as analyzed by Lucas (2000) and Ireland (2009) – and hyperinflation. Furthermore, the log–log schedule I indicate is an appropriate candidate form to give an alternative to the failure of Cagan based inflationary finance model for the analysis of explosive hyperinflation.

This paper makes two contributions to the literature. First, it brings new monthly time series data that span an entire episode of the Chinese hyperinflation, and assesses the behavior of money demand. Hyperinflation cases have been studied intensively as they present a "natural" experiment that provides a unique opportunity to study monetary phenomena. To date, however, the hyperinflation occurred within China after World War II has been rarely studied by economists.[1] The scarcity of data has certainly proved a barrier for historical studies on China. This paper fills this gap by collecting the data of the Chinese hyperinflation and examining the behavior of money demand and the corresponding implications. Second, the empirical evidences contribute to the understanding of Cagan's paradox and the failure of Cagan inflationary finance models. The paradox can be attributable to the popular semi-log schedule for money demand. I provide a feasible solution, i.e., the log–log schedule with perfect foresight, to Cagan's paradox using China's historical evidence. Therefore, the log–log schedule is a more appropriate form for the analysis of explosive hyperinflation. Sokic (2012) has provided a theoretical justification for the log–log schedule. This paper offers empirical evidence that compliments the theoretical claims made by Sokic.

Section 2 provides a brief description of the Chinese hyperinflation, as well as the data set. Section 3 provides the results from OLS regressions on the semi-log and log–log money demand specifications. Section 4 provides some evidence supporting the log–log form as an appropriate functional form of money demand to the Chinese hyperinflation. Section 5 presents the implications of the two specifications for welfare cost and inflationary finance in hyperinflation. Concluding remarks are presented in the final section.

2. Data

The adoption of fiat money – the Nationalist Currency (NC hereafter) – in China in 1935 helped to spur China's inflation during the following war period. The inconvertibility of NC enabled the Chinese government to cover its fiscal deficit and to finance the Sino-Japanese War. In the last few months before the end of the Sino-Japanese War, China was on the verge of exhaustion. Immediately after the war the government optimistically embarked on grandiose schemes to bring relief and reconstruction to areas previously occupied by the Japanese. Meanwhile, military expenditures were maintained at a high level to contain the Communist expansion. The Nationalist government deficit was approximately double the tax revenues after 1946. The government continued to resort to direct borrowing from the central bank, which resulted in the increase in currency issue, and ultimately, hyperinflation. There were several reasons for the resumption of high inflation in spring 1946. However, the budget deficit and the subsequent increase in currency put into circulation remained of primary importance (Chang, 1958, p. 71). Table 1 shows the government expenditure, revenue, deficit and currency issue from 1946 to the first half year of 1948. Government expenditure in 1946 increased three-fold, resulting in a huge deficit, and military outlays stood at around 60 per cent of total government expenditure. Clearly, the deficit was covered in a large extend by printing money.

The currency reform was made on August 19, 1948, as the governors believed that price stability could be restored by a change in the currency standard. In the reform NC was superseded by a new note known as the Gold Yuan (GY). The new notes exchanged at the rate of GY$1 to NC$3,000,000. In addition, prices of all commodities were frozen at the levels on August 19, 1948 and could not be altered without the approval of the authorities. But the government continued to pour money into circulation to finance its expenditures by deficit spending. The circulation of GY was nearly eight times the prescribed maximum limit only 40 days after first being implemented in October 1948. As the government did not stop printing money, the reform failed to stabilize prices and the new currency depreciated faster than the old. The hyperinflation ended in the early 1950s following a change of the political system in China.

Persistent inflation caused the official currencies to be discarded both as stores of value and as units of account. People and firms customarily held reserves in US dollars, Chinese silver dollars, gold, or readily disposable commodities such as rice and flour. Even banks would purchase commodities to avoid holding an excessive amount of currency. The shopkeepers bought and sold with Chinese currency, but they computed prices by applying the daily exchange rate to a price on their books in US dollars. However, NC stayed in circulation as the primary media of exchange. According to Campbell and Tullock (1954), there are several reasons for this extraordinary receptiveness of Chinese currencies as media of exchange. First, regulations requiring the use of official currencies were strictly enforced. Second, taxes in China, except for the agricultural property tax, were paid in legal tender and goods and services distributed by the government were sold for the official medium. Third, since foreign trade was negotiated through government exchange

[1] Among the few are Chang (1958), Hu (1970, 1971), Tallman and Wang (1995), Tallman, Tang, and Wang (2003).