Abstract

For more than a decade the Japanese economy has been in the serious slump with very low interest rates and low price inflation or even deflation. The traditional IS-LM models analyze this kind of situation as a special case of macroeconomic phenomenon known as a “liquidity trap” assuming constant price levels. This paper tries to explain the dynamics of inflation and interest rates incorporating the Phillips curve into an IS-LM model. If the economy is around the steady state with not-low nominal interest rates, it may converge to its steady state or exhibit the cyclical behavior of inflation and interest rates. In contrast, if its nominal interest rates are close to zero, the economy’s behavior becomes very unstable. The economy may fall into so-called deflationary spirals. The effects of fiscal and monetary policies are also examined on the economy with low interest rates.
In the simplest case the economy we will investigate is summarized as the following system of differential equations:

\[
\dot{\pi}^e = \alpha \gamma [e_n a - e_r (i - \pi^e) - y_n], \quad (A)
\]

\[
i = \phi(i) \{\alpha (n_e + 1)[e_n a - e_r (i - \pi^e) - y_n] - (\mu - \pi^e)\}, \quad (B)
\]

where \(\pi^e\) is an expected inflation rate and \(i\) is a nominal interest rate. Equation (A) is a IS equation and (B) a LM equation in nature, and \(\lim_{i \to 0} \phi(i) = 0\).

First, we will show that there exist two stationary states: one with a high interest rate and the other with a low interest rate.

Second, applying the Hopf-Bifurcation theorem, we will show that there exist some non-constant periodic solutions around the stationary state with a high interest rate.

Third, we will examine the conditions under which the economy fall into the deflationary spirals that are characterized by price deflation and a continuous decline in GDP or Gross Domestic Product.

Finally, the effects of fiscal and monetary policies will be discussed. Especially, we will focus on what kinds of policies can pull the economy out of the deflationary spirals.