A model of inflation in Taiwan

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In this note I explain inflation in Taiwan from 1961 to 2010 using the same model as Chow (1987) and Chow and Wang (2010) for the explanation of inflation in China. The variables are a general price index \( P \), money supply \( M \) and real GDP \( Y \) as presented in Table 1. \( P \) is measured by \( P_1 \), the consumer price index or \( P_2 \), the GDP deflator. \( M \) is measured by \( M_2 \) or \( M_1 \).

The first step is to estimate a cointegration relation linear in \( P \) and \( M \). Inflation \( \Delta \ln P \) is explained by \( \Delta \ln (M/Y) \), \( \Delta \ln P(t-1) \) and the lagged residual of the cointegration relation.

Regressing \( \ln P_1 \) on \( \ln(M_2/Y) \) I obtain

\[
\ln P_1 = 4.2697(0.0166) + 0.4918(0.0111) \ln(M_2/Y) \\
R^2 = 0.9765; \quad s = 0.10544.
\]

(1)

Regressing \( \ln P_1 \) on \( \ln M_2 \) and \( \ln Y \) separately I find the coefficients to be of opposite sign and about the same order of magnitude, thus confirming the hypothesis that \( \ln(M_2/Y) \) is an appropriate variable for the cointegration relation. The null hypothesis that the coefficient of \( \ln Y \) is negative of the coefficient of \( \ln M_2 \) cannot be rejected at the 10% level. The result is shown in Eq. (2):

\[
\ln P_1 = 7.155(1.593) + 0.6354(0.08) \ln M_2 \\
- 0.8212(0.1822) \ln Y; \quad R^2 = 0.978; \quad s = 0.10302.
\]

(2)

We next estimate the error correction equation to explain inflation. As shown in Eq. (3), all coefficients are of the correct sign and statistically significant:

\[
\Delta \ln P_1 = -0.0019(0.0141) + 0.343(0.1462) \Delta \ln(M_2/Y) \\
+ 0.3148(0.1500) \Delta \ln P_1_{t-1} - 0.2029(0.0860) u_{t-1} \\
R^2 = 0.2596; \quad s = 0.0559.
\]

(3)

However the fit is not good, as seen by the low \( R^2 \) and the large standard error of the regression. The corresponding regression for China has an \( R^2 \) of 0.72. See Chow (2007, Eq. (7.2), p. 135).

The residuals of Eq. (3) to explain inflation for the years 1973–1974 are 0.011 and 0.264. For the year 1980 the residual is 0.128.

When \( M_2 \) is replaced by \( M_1 \) to explain inflation measured by \( P_1 \), the \( R^2 \) is slightly larger but the coefficient of \( \Delta \log(M_1/Y) \) is not significant. The slight increase in \( R^2 \) is associated with a larger partial correlation with \( u_{t-1} \):

\[
\Delta \ln P_1 = 0.0215(0.0113) + 0.0122(0.0856) \Delta \ln(M_1/Y) \\
+ 0.4246(0.1327) \Delta \ln P_1_{t-1} - 0.2467(0.0766) u_{t-1} \\
R^2 = 0.2803; \quad s = 0.0551.
\]

(4)

I next examine whether inflation as measured by the GDP deflator is more easily explained by performing the same analysis for \( P_2 \), while retaining \( M_2 \) as the measure of money supply. Regressing \( \ln P_2 \) on \( \log(M_2/Y) \) I obtain the following cointegration equation (4):

\[
\ln P_2 = 4.336(0.0164) + 0.4823(0.0109) \ln(M_2/Y) \\
R^2 = 0.9763; \quad s = 0.10388.
\]
The scatter diagram for this regression as displayed in Fig. 2 also shows that log P2 is well explained by log(M2/Y). Compared with Fig. 1, the step in 1974 is somewhat smaller.

The equation to explain inflation is

$$
\Delta \ln P_2 = -0.0033(0.0111) + 0.2821(0.1240)\Delta \ln(M_2/Y) + 0.4559(0.1508)\Delta \ln P_{1-1} - 0.1279(0.0722)u_{1-1} \tag{5}
$$

$$
R^2 = 0.3687; \quad s = 0.0431.
$$

All coefficients have the correct sign and are statistically significant. The $R^2$ of 0.3687 is larger than 0.2596 for Eq. (3) when P1 is used. The standard error of the regression is 0.0431 as compared with 0.0559 when P1 is used. The residuals of this regression to predict inflation for 1974, 1979 and 1980 are still large, but not as large as for Eq. (3). The residual in 1974 is 0.14 as compared with 0.26 when CPI is used.

The failure of our equation to predict inflation in 1974 and in 1980 is due to the oil crises. Kuo (1959, p. 64) describes the oil crises as follows.

"During 1961–1971, the real GDP grew at an average rate of 10.2%. Prices were stable, increasing at annual average of 1.6% as measured by the wholesale price index, 2.9% as measured by the consumer price index…. This outstanding performance was
interrupted by the 1973 oil crisis. The abrupt 22.9% rise in prices in 1973 was a severe shock .... In 1974 the inflation rate jumped to 40.6%, and the growth rate dropped to 1.1%”.

“The rise in oil prices in 1979 and 1980 again shocked the Taiwan economy. Prices rose at annual rates of 13.8% in 1979 and 21.5% in 1980 .... Thus the inflation rate during the second oil shock was about half of the first oil shock”.

These two oil crises can account for the large residuals in our equation to explain inflation during the corresponding years.

Conclusions

First, the model to explain inflation in China as presented in Chow (1987) and updated in Chow and Wang (2010) can also explain inflation in Taiwan from 1961 to 2010. All coefficients are of the correct sign and statistically significant. Second, the goodness of fit for Taiwan is not as good as for China mainly because the model fails to explain the large inflation rates during the oil crises of 1973 and 1979–1980.

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