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The empirics of inflation in China

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ABSTRACT

A model to explain inflation in China was first estimated in 1985 and is updated using annual data from 1952 to 2008. The rate of inflation is well explained by its own lag, the growth rate of the ratio of money supply to output and an error correction term. The parameters of the model remain constant in spite of substantial changes in China's economic institutions after 1979.

The quantity theory of money implies that $\log(P)$ is a linear function of $\log(M/Y)$ with intercept equal to log (velocity) and slope equal to one, where P, M and Y denote price level, money supply and real output respectively. In the course of economic development the increasing use of money would reduce velocity. A regression of $\log(P)$ on $\log(M/Y)$ based on time series data of several decades would tend to have a slope less than unity. Using such a regression as a cointegrating relation and its residual as an error, Chow (1987) explained annual inflation as measured by $\Delta \log(P)$ in China from 1952 to 1984 by $\Delta \log(M/Y)$, the lagged dependent variable and the lagged value of the residual of the cointegrating relation as an error correction. The regression was updated using data up to 2002 as reported in Chow (2007, p. 134). The current note shows that the same regression to explain inflation in China remains valid up to 2008. The parameters have remained constant as strongly supported by the Chow test when the sample is divided into the period from 1952 to 1978 when central planning was practiced and the period since 1979 when economic reform began. It is remarkable that this theory of inflation was valid when price control was practiced during the first period and has remained valid after substantial changes in economic institutions.

Chow (1987, equation (18)) first presented the above equation to explain annual inflation using data from 1952 to 1984. Note in Table 1 below that there was an inflation of 16.24 percent in 1961 (1.082/.9308 = 1.1624) due mainly to the great reduction of real GDP from 43.9 in 1960 to 30.9 in 1961 as a result of the economic failure of the Great Leap Forward Movement. Since economic reform began only in 1978, there were only five observations for the post-reform periods in the sample of Chow (1987). We update the data on P = retail price index, $M2$, Y = real GDP from *China Statistical Yearbook 2009*, covering years from 1952 to 2008. This paper aims to test the parameter stability of that model up to 2008. The data are presented in Table 1 below.

The Augmented Dickey–Fuller tests strongly suggest the presence of a unit root in $\log(P)$ and $\log(M2/Y)$. We further apply the Johansen cointegration test, which rejects the null hypothesis of no cointegrating relationship at 10% level. The p-value of the trace statistic is 0.0825. Based on the evidence that $\log(P)$ and $\log(M2/Y)$ are cointegrated, we obtain a superconsistent estimate of the cointegrating parameters based on Granger and Engle (1987) by a regression of $\log(P_t)$ on a constant and $\log(M2_t/Y_t)$,

$$\log(P_t^*) = -0.7017 + 0.3688 \log(M2_t / Y_t),\ \bar{R}^2 = 0.9726;\ s = 0.0952.$$

We plot the estimation result in Fig. 1.

Let $u_t = \log(P_t) - \log(P_t^*)$ be the estimated trend deviation of the log price level or the error correction term. We then regress $\mathrm{dlog}(P_t)$ on $\mathrm{dlog}(M2_t/Y_t)$, $\mathrm{dlog}(P_{t-1})$, and u_{t-1} where $\mathrm{dlog}(X_t)$ is defined as $\log(X_t) - \log(X_{t-1})$, following the regression of Chow (1987).

$$\begin{aligned}\Delta \log(P_t^*) &= 0.0006(0.00555) + 0.1550(0.0396)\Delta \log(M2_t / Y_t) \\ &\quad + 0.5324(0.0872)\Delta \log(P_{t-1}) - 0.1545(0.0471)u_{t-1}, \\ \bar{R}^2 &= 0.6293;\ s = 0.0325.\end{aligned}$$

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The number in parentheses after each coefficient is its standard error. The data on inflation and its predicted value are shown in Fig. 2.

The following reports the result of the Chow test for parameter stability using $t = 1979$ as the break point. The result provides extremely strong support for parameter stability of this equation.

Chow breakpoint test: 1979			
F-statistic	0.835138	Prob. *F*(4,47)	0.509767
Log likelihood ratio	3.776490	Prob. Chi-square(4)	0.437099

We further check whether the above finding is robust to a possible shift of the cointegrating relation by assuming a structural break in the first stage regression in 1979. By using the new error correction term

Table 1
Price level and its determinants (1952–2008).

Year	Index of retail price (*P*)	*M2*	Real GDP index (*Y*)
1952	0.8227	74.50314	22
1953	0.8506	82.00875	25.1
1954	0.8705	90.20963	26.6
1955	0.8793	94.85521	28.3
1956	0.8793	132.3043	32.3
1957	0.8926	139.0515	33.7
1958	0.8947	194.0242	41.2
1959	0.9028	226.401	44.6
1960	0.9308	256.6131	43.9
1961	1.082	286.1142	30.9
1962	1.1229	233.48	28.9
1963	1.0567	214.0444	32
1964	1.0177	214.5185	37.2
1965	0.9904	246.5319	43.5
1966	0.9875	285.2925	50.9
1967	0.9801	309.5001	44.5
1968	0.9809	335.6512	44.2
1969	0.9698	336.8679	52.7
1970	0.9676	320.8612	65
1971	0.9603	357.9469	69.5
1972	0.9581	404.8609	71.5
1973	0.9639	454.3348	77.5
1974	0.9691	494.3595	78.3
1975	0.9706	525.0772	84.9
1976	0.9735	573.4608	82.6
1977	0.9934	595.6617	89
1978	1	668.1896	100
1979	1.02	867.0332	107.6
1980	1.081	1178.303	116
1981	1.107	1453.783	122.1
1982	1.128	1761.087	133.1
1983	1.145	2247.387	147.6
1984	1.177	3171.021	170
1985	1.281	4188.024	192.9
1986	1.358	5460.866	210
1987	1.457	7154.482	234.3
1988	1.727	9378.91	260.7
1989	2.034	11836.63	271.3
1990	2.077	15293.4	281.7
1991	2.137	19349.9	307.6
1992	2.252	25402.2	351.4
1993	2.549	34879.8	400.4
1994	3.102	46923.5	452.8
1995	3.561	60750.5	502.3
1996	3.778	76094.9	552.6
1997	3.808	90995.3	603.9
1998	3.709	104498.5	651.2
1999	3.598	119897.9	700.9
2000	3.544	134610.3	759.9
2001	3.516	158301.9	823
2002	3.47	185007	897.8
2003	3.467	221222.8	987.8
2004	3.564	254107	1087.4
2005	3.593	298755.7	1200.8
2006	3.629	345603.6	1340.7
2007	3.767	403442.2	1515.5
2008	3.989	475166.6	1651.2

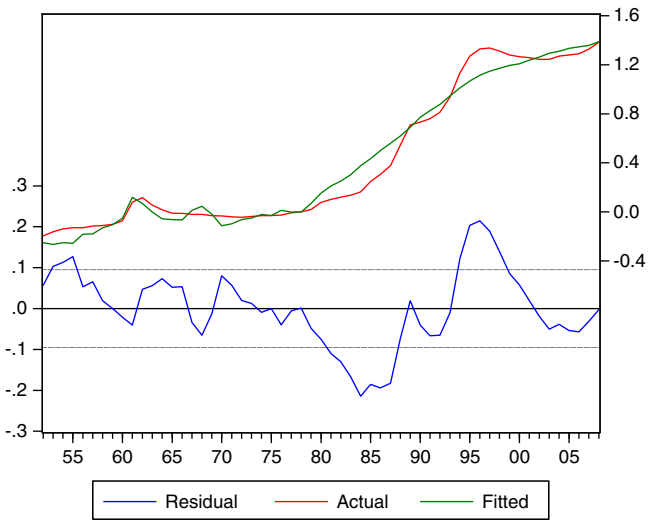

Fig. 1.

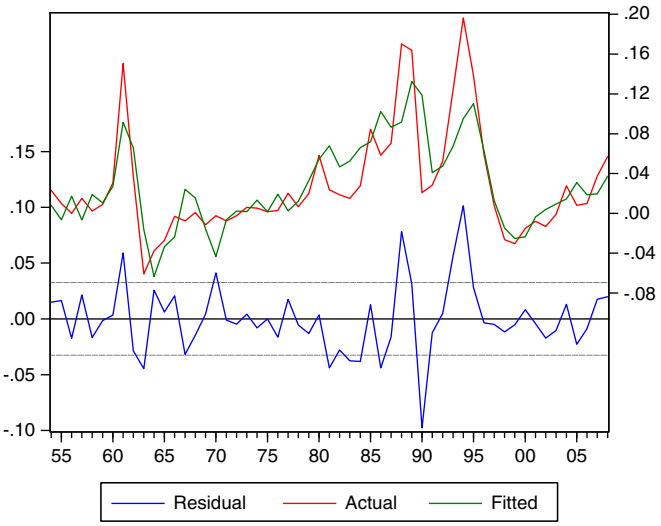

Fig. 2.

to predict inflation, we obtain the following equation to explain inflation.

$$\Delta \log(P_t^*) = -0.0015(0.0053) + 0.1633(0.0373)\Delta \log(M2_t / Y_t) + 0.6044(0.0846)\Delta \log(P_{t-1}) - 0.2429(0.0591)u_{t-1},$$

$$\overline{R}^2 = 0.6628; s = 0.031.$$

The Chow test continues to show strong support for parameter constancy.

Chow breakpoint test: 1979			
F-statistic	1.118969	Prob. *F*(4,47)	0.358892
Log likelihood ratio	5.003114	Prob. Chi-square(4)	0.286978

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