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Note on a model of Chinese national income determination

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A R T I C L E   I N F O

Article history:
Received 23 June 2009
Accepted 25 November 2009
Available online 1 December 2009

Keywords:
Consumption
Investment
China
Macroeconomy

JEL classification:
E20.011

A B S T R A C T

A macroeconomic model of Chow (1985) explaining aggregate consumption by the permanent income hypothesis of Robert Hall and aggregate investment by the accelerations principle was found to fit Chinese annual data from 1952 to 1982 well. This note shows that the same model can successfully explain Chinese annual data from 1978 to 2006.

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In Chow (1985) I tried to explain the two major components, consumption and investment, of real national income in China in the period 1952 to 1982. This note shows that the same model can explain China’s national income from 1978 to 2006.

The model of Chow (1985) starts with the national income identity

Yt = Ct + It, where Yt, Ct, and It denote respectively national income, consumption and investment in year t in constant prices. Xt = exports – imports is omitted as a component of consumption and investment in year t because during the sample period 1952–1982 this variable is less than half of 1% of Yt, except for 1982 when it equals 1.6%.

Consumption Ct is determined by the permanent income hypothesis of Hall (1978), namely, as a random walk with drift. To determine investment I assume that desired capital stock Kt equals a constant plus aYt, and that actual change in capital stock (Kt – Kt−1) equals a fraction b of the desired change in capital stock or b(Kt – Kt−1). Substituting the linear function of Y for Kt in this equation and solving for Kt give Kt = const. + abYt + (1 – b)Kt−1. Since gross investment It is defined as Kt – (1 – d)Kt−1 where d is the annual rate of depreciation, we can subtract (1 – d) times the equation for Kt−1 from the above equation for Kt to obtain an equation for investment

It = Kt – (1 – d)Kt−1 = const. + abYt – (1 – d)Yt−1 + (1 – b)It−1.

Given a small rate of depreciation which is equal to about 0.04 for the capital stock in China, investment It depends on the rate of change in output Y according to the accelerations principle.

I have estimated this same model using Chinese data from 1978 to 2006. Data on Y = GDP, C, and X = exports – imports (measured in 100 million RMB) in nominal terms are presented in Table 1. To obtain these variables in constant prices I have divided them by a price index. The price index, also presented in Table 1, is the ratio of the capital stock in China, investment

I have estimated this same model using Chinese data from 1978 to 2006. Data on Y = GDP, C, and X = exports – imports (measured in 100 million RMB) in nominal terms are presented in Table 1. To obtain these variables in constant prices I have divided them by a price index. The price index, also presented in Table 1, is the ratio of the annual data from 1978 to 2006. The number in parentheses after each coefficient is its standard error. The variables are measured in 100 million RMB in 1978 prices, with the price index in 2006 equal to 4.598 as shown in Table 1.

In the second stage of two-stage least squares I have estimated the investment function

Ct = 218.86 + 1.067(0.074)Ct−1 – 0.0051(0.0371)Yt−1 R2 = 0.9985; s = 271.24.

The number in parentheses after each coefficient is its standard error. The variables are measured in 100 million RMB in 1978 prices, with the price index in 2006 equal to 4.598 as shown in Table 1.
This result confirms the permanent income hypothesis of Hall perfectly since the coefficient of \( C_{t-1} \) is almost exactly 1 and the coefficient of income Y is almost equal to zero. Given the result (Eq. (2)) I have dropped the variable \( Y^*_t \) and reestimated the consumption function to obtain

\[
C_t = 226.05(91.78) + 1.0570(0.0079)C_{t-1} \quad R^2 = 0.9985; \quad s = 266.08. \quad (2a)
\]

The investment function is

\[
I_t = -399.04(139.79) + 2.4149(6470)Y^*_t - 2.2861(6281)Y_{t-1} \quad (3)
\]

\[
+ 0.2233(2369)I_{t-1} \quad R^2 = 0.9968; \quad s = 327.4.
\]

Note that the coefficient of \( Y_{t-1} \) is opposite in sign and slightly less in magnitude (because of the rate of depreciation) to the coefficient of \( Y_t \). This confirms the accelerations principle that investment depends on the rate of change in income.

Given the coefficients of \( Y_t \) and \( Y_{t-1} \) in Eq. (3) to be almost equal in magnitude I replace these variables by the variable \( (Y_t^* - Y_{t-1}) \) to obtain the investment function

\[
I_t = -186.23(120.84) + 1.7782(6513)(Y_t^* - Y_{t-1})
\]

\[
+ 0.6866(1589)I_{t-1} \quad R^2 = 0.9960; \quad s = 359.28.
\]

In Chow (1985) I reported results similar to Eqs. (2a) and (3a) obtained by using Chinese annual data from 1952 to 1982. In the consumption function the coefficient of lagged consumption was almost equal to one and the coefficient of income was zero. In the investment equation the coefficient of \( Y^*_t \) was negative and slightly less in magnitude than the coefficient of \( Y \) and I replaced these variables by their difference as in Eq. (3a). The results showed that the coefficient of this difference in the investment equation was smaller than 1.7782 possibly because the ratio \( a \) of capital stock to output was smaller and the adjustment coefficient \( b \) for capital stock to reach equilibrium was also smaller before 1978.

In conclusion I have found that the permanent income hypothesis of Hall (1978) to explain consumption and the accelerations principle to explain investment are well supported by Chinese macro data for the periods 1952–1982 and 1987–2006 as well. This is one example of the applicability of economic theory to the Chinese economy. Other examples can be found in Chow (2007).

Acknowledgement

The author would like to acknowledge financial support from the Gregory C Chow Econometric Research Program of Princeton University in the preparation of this article.

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