

Interest Rate, Corporate Saving and Household Saving in Korea and Taiwan*

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A high level of national saving is necessary for maintaining rapid economic growth and surplus in the balance of payments. The national saving consists of household, corporate and government saving. Therefore, a policy to promote the national saving should consider the relationship among these three different types.

This paper studies the determinants of savings in Korea and Taiwan, emphasizing the effect of the corporate saving on the household saving. For this purpose, two different types of saving function are estimated using annual data for the last 23 years. The results show no clear linkage between the household saving and the corporate saving for both countries, thus rejecting the ultrarationality hypothesis that the household sector regards the corporate saving as a part of its own saving. The interest rate has a significantly negative effect on the corporate saving for both countries while its effect on the household saving is not significant. In view of this evidence, the policy of increasing the interest rate to promote the national saving should be accompanied by measures offsetting any decline in the business saving.

I. Introduction

This paper presents an empirical test of the relationships

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among interest rate, corporate saving and household saving in Korea and Taiwan for the last 23 years.

Unlike most empirical tests of saving (consumption) function, the model explicitly considers the income redistribution effect by incorporating the corporate saving as an independent variable. The results indicate that corporate saving does not affect the household saving (consumption) behavior. The interest rate do not exert a significantly positive effect on private saving and therefore it is implied that the income redistribution effect through changes in corporate saving is significant enough to offset the substitution effect from a higher interest rate at least in the annual model.

This paper has two major objectives: to test for an influence of corporate saving on personal saving and to determine whether the interest rate has a significant impact on the overall saving rate.

In section II, effects of interest rates on corporate saving are estimated. Section III derives models to be estimated and section IV describes data. Empirical results are presented in section V. Finally, concluding remarks are made in section VI.

II. The Rate of Interest and Corporate Saving

An increase in the interest rate reduces the profit margin as the short-run price adjustment is not fast enough to reflect the increased credit cost. Usually only a fixed fraction of the profit is distributed as a dividend by an institutional arrangement. As the firm's financial cost is directly related to the size of its debts, the macro impact of an increase in credit cost is large in a country with a large banking size. Therefore, raising interest rate sharply reduces the corporate saving in countries such as Korea and Taiwan which have large banking sectors.

Equations (1) and (2) represent the relationship between interest rate and the corporate saving-NI ratio for Korea (1968-1984) and Taiwan (1968-1984) respectively:

$$(1) \quad \frac{S_c}{NI} = 0.160 - 0.002i + 0.0001\pi - 0.340 \frac{D}{NI},$$

(9.72) (-5.39) (0.44) (-9.21)

$$R^2 = 0.874 \quad D.W. = 1.47 \quad \text{Mean of } \frac{S_c}{NI} = 0.024 \quad (\text{OLSQ})$$

$$(2) \quad \frac{S_c}{NI} = 0.105 - 0.0038i + 0.0002\pi - 0.025 \frac{D}{NI},$$

(4.47) (-1.97) (0.83) (-1.16)

$$R^2 = 0.382 \quad D.W. = 1.90 \quad \text{Mean of } \frac{S_c}{NI} = 0.054 \quad (\text{OLSQ})$$

where S_c : corporate saving,
 i : interest rate on one year time deposit,
 π : inflation rate (WPI),
 $D = M2 - M1$: time deposits.

It is important to note that the corporate saving to NI ratio in both countries has a significantly negative relationship with the interest rate, confirming our a priori reasoning. One percent point increase in the interest rate on time deposits reduces corporate saving by 0.2 percent point in Korea and 0.4 percent point in Taiwan. This reflects the larger banking size of Taiwan compared to Korea. Therefore, if the household consumption (saving) behavior is not affected by the corporate retained earnings, the income redistribution effect of the interest rate on overall saving will be substantial in both countries.

Also note that there is a strong negative relationship between the Deposit-NI ratio and corporate saving ratio in Korea. This reflects the fact that an increase in Deposit-NI ratio increases the interest cost per output. However, this effect is not significant in Taiwan.

III. The Model

A strong test of the relationship between consumption (saving) and the interest rate should involve more than one functional specification of the consumption (saving) decision. To this end, two models are used: a simplified version of Taylor's "zero-depreciation" theory of saving model and a modified version of Boskin's logarithmic consumption function.

A. Taylor's Disaggregate Income-Saving Model

Taylor uses personal saving as the dependent variable. His basic model draws upon the theory of saving developed by Houthakker and Taylor. According to this theory, personal saving is assumed to be a linear function of the existing stock of financial assets and income as follows:

$$(3) \quad S_{ht} = a + bA_{t-1} + sY_{dt} + ci_t + d\pi_t^e,$$

where S_{ht} : household saving at t ,
 A_{t-1} : stock of financial assets at the end of $t-1$,
 Y_{dt} : household disposable income at t ,
 i_t : interest rate at t ,
 π_t^e : expected inflation rate at t .

The relationship between the stock of financial assets and its flow is given by the following equation:

$$(4) \quad \dot{A}_t = S_{ht},$$

where the dot on A denotes the rate of change of the stock of financial assets with respect to time. Differencing (3) and substituting (4), the saving equation is obtained as follows:

$$(5) \quad S_{ht} = (1 + b)S_{ht-1} + s\Delta Y_{dt} + c\Delta i_t + d\Delta\pi_t^e,$$

which forms the basis for empirical work. The major recent innovation by Taylor is the disaggregation of income based on the national income accounting identity:

$$(6) \quad Y_d = LI + PRI + NTI$$

where Y_d : household disposable income,
 LI : labour income
 PRI : property income,
 NTI : net government transfer
 = government transfer payment to individuals
 - personal tax and nontax payment.

This decomposition leads to the extended model:

$$(7) S_{ht} = b'S_{ht-1} + s_1\Delta LI_t + s_2\Delta PRI_t + s_3\Delta NTI_t + c\Delta i_t + d\Delta\pi_t^e$$

B. Boskin's Logarithmic Consumption Model

Unlike the Taylor's model, Boskin uses a personal consumption as a dependent variable. Equation (8) is a modified basic equation of Boskin's logarithmic consumption function:

$$(8) \ln C_t = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln m_{t-1}^2 + \beta_3 i_t + \beta_4 \pi_t^e$$

where C_t : personal consumption at t ,

$$Y_t = Y_{dt} + S_{ct},$$

m_{t-1}^2 : real M2 at the end of $t-1$.

Unlike the original Boskin's model, the real M2 balance is included in place of wealth variable due to the lack of wealth data.

While the inclusion of interest rate in the saving (consumption) function needs no explanation, the inclusion of expected inflation rate warrants some explanation. The expected increase in price level may reduce the saving via a money illusion effect in which nominal income rises are misinterpreted as real income rises. On the other hand, since inflation erodes the real value of financial assets fixed in nominal terms, attempts by individuals to restore their wealth-income position would exert a positive influence on the saving.

It would appear that as long as the inflation is unexpected, the prediction would be that inflation tends to increase personal saving. However, if the inflation is expected, a switch from nominal assets to real assets including stocks of consumer goods is possible. Therefore, the effect of expected inflation rate on personal saving is indeterminate.

IV. Data

The models were estimated using annual data for Korea (1962-1984) and Taiwan (1962-1984). Saving and income measures correspond to household saving, corporate saving, and household disposable income as defined in the Korean and

Taiwan national income accounts. The data were converted into real terms using wholesale price indices.

The wholesale price index is chosen because tangible physical commodities of all kinds are the principal assets open to savers besides saving deposits in the commercial banks (McKinnon 1973, pp. 96-98). The nominal interest rate is represented by the one-year time deposit rate in percent.

Assuming adaptive expectations, time series for the expected rate of inflation π^e were derived from the annual wholesale price inflation rate. Six time series were generated from the following equation:

$$(9) \quad \pi_t^e = \lambda\pi_t + (1-\lambda)\pi_{t-1}^e$$

one for each value of the adjustment coefficient λ , which was assumed to come from the set $[0.5, 0.6, \dots, 1]$. All the series performed well and gave similar results. The one that produced the best fit (i.e., the highest R^2 and the most precise overall) was the one corresponding to $\lambda = 0.7$. This series is used to represent π^e in our empirical results.

V. Empirical Results

A. Taylor Type Model

Empirical results for structural coefficients for Korean saving function (1962-1984) are reported in the following equations:

$$(10) \quad S_{pt} = 0.787S_{pt-1} + 0.298\Delta LI_t + 0.712\Delta PRI_t + 0.153\Delta NTI_t \\ (11.41) \quad (3.35) \quad (2.21) \quad (0.89) \\ + 0.996\Delta S_{ct} + 1.242\Delta i_t + 0.986\Delta\pi_t^e, \\ (1.70) \quad (0.55) \quad (0.66)$$

$$R^2 = 0.980 \quad D.W. = 1.86 \quad \text{Mean of } S_p = 246.2 \quad (\text{CO-OR})$$

$$(11) \quad S_{ht} = 0.743S_{ht-1} + 0.319\Delta LI_t + 0.611\Delta PRI_t + 0.110\Delta NTI_t \\ (8.59) \quad (3.61) \quad (2.05) \quad (0.69)$$

$$-0.111\Delta S_{ct} + 1.223\Delta i_t + 0.590\Delta\pi_t^e,$$

(-0.19) (0.54) (0.62)

$$R^2 = 0.972 \quad \text{D.W.} = 1.81 \quad \text{Mean of } S_h = 195.15 \quad (\text{CO-OR})$$

$$(12) \quad S_{pt} = 0.835S_{pt-1} + 0.367\Delta Y_t + 0.369\Delta i_t + 0.724\Delta\pi_t^e,$$

(21.62) (8.94) (0.128) (-0.55)

$$R^2 = 0.946 \quad \text{D.W.} = 2.01 \quad (\text{CO-OR})$$

$$(13) \quad S_{ht} = 0.854S_{ht-1} + 0.301\Delta Y_{dt} + 0.325\Delta i_t - 0.929\Delta\pi_t^e,$$

(19.03) (7.62) (0.13) (-0.78)

$$R^2 = 0.940 \quad \text{D.W.} = 1.98 \quad (\text{CO-OR})$$

where S_h : household saving,
 $S_p = S_h + S_c$: private saving,
 $Y = Y_d + S_c$.

Empirical results for structural coefficients for Taiwanese saving function (1962-1984) are reported in the following equations:

$$(14) \quad S_{pt} = 0.860S_{pt-1} + 0.453\Delta LI_t + 0.822\Delta PRI_t + 0.164\Delta NTI_t,$$

(22.52) (3.69) (3.64) (0.62)

$$+ 1.169\Delta S_{ct} + 0.166\Delta i_t + 1.628\Delta\pi_t^e,$$

(9.44) (0.05) (2.26)

$$R^2 = 0.996 \quad \text{D.W.} = 2.01 \quad \text{Mean of } S_p = 262.2 \quad (\text{CO-OR})$$

$$(15) \quad S_{ht} = 0.827S_{ht-1} + 0.415\Delta LI_t + 0.825\Delta PRI_t + 0.130\Delta NTI_t,$$

(18.08) (3.76) (3.79) (0.43)

$$+ 0.235\Delta S_{ct} + 0.294\Delta i_t + 1.492\Delta\pi_t^e,$$

(1.92) (0.08) (2.26)

$$R^2 = 0.993 \quad \text{D.W.} = 2.03 \quad \text{Mean of } S_h = 198.5 \quad (\text{CO-OR})$$

$$(16) \quad S_{pt} = 0.848S_{pt-1} + 0.703\Delta Y_t - 2.588\Delta i_t + 2.116\Delta\pi_t^e$$

(23.57) (7.65) (-0.73) (3.77)

$$R^2 = 0.992 \quad D.W. = 1.91 \quad (\text{CO-OR})$$

$$(17) \quad S_{ht} = 0.860S_{ht-1} + 0.555\Delta Y_{dt} - 3.679\Delta i_t + 1.785\Delta\pi_t^e$$

$$(24.40) \quad (7.69) \quad (-1.42) \quad (3.91)$$

$$R^2 = 0.992 \quad D.W. = 1.99 \quad (\text{CO-OR})$$

Four equations have been estimated for each country. Equation (10) represents the full model; it is based on the disaggregation of disposable income and corporate saving discussed above and includes the one-year time deposit rate as well as the expected inflation rate. Equation (12) differs from equation (10) in that disposable income-cum-corporate saving is not disaggregated. Equations (11) and (13) correspond to equations (10) and (12) except that household saving and disposable income have been used instead of private saving and disposable income-cum-corporate saving.

1. *Effects of the Rate of Interest Rates*

All the equations above have been unable to isolate a significant interest rate effect on saving for either Korea or Taiwan.

2. *Effects of the Expected Inflation Rates*

The expected inflation rate has coefficients with t-statistics in excess of 2 in Taiwan, but they are insignificant in Korea. The uncertainty effect from high expected inflation tends to dominate the asset switching effect so that an increase in expected inflation tends to raise the saving significantly in Taiwan.

3. *The Effects of Corporate Saving*

Equation (11) and (15) show that corporate retained earnings do not have significant effect on household saving behavior for either Korea or Taiwan. The coefficients of corporate saving in equations (10) and (14) are close to 1 and their t-statistics are quite significant, implying that the so-called ultrarationality assumption does not hold.¹ This can be explained easily. Firstly,

¹In contrast, Howery and Hymans could not reject the hypothesis that corporate saving is regarded as both "personal" income and "personal" saving from the U.S. saving model (1955-1974).

unlike advanced industrial countries, open markets for primary securities are neither significant nor perfect in both countries. Therefore the value of stock does not necessarily reflect the true value of a firm. Thus it is difficult for equity holders to assess capital gains and take them into account in their saving decision. Secondly, even if equity holders realize capital gains, they cannot easily change their consumption pattern due to insufficient consumer loans. Thirdly, corporate owners in general belong to the highest income group and their marginal propensity to consume is the lowest.

4. *The Effect of Different Types of Income*

Property incomes have much higher MPS's than labor incomes in both countries.² The government net transfer payment does not have a significant effect on saving.

Every dollar transferred from corporate retained earnings to interest income reduces overall saving by approximately 30cents in both Korea and Taiwan.

B. *Boskin Type Model*

The empirical results for Korean consumption functions (1962-1984) are reported below:

$$(18) \quad \ln C_t = 0.468 + 0.743 \ln Y_t + 0.164 \ln Y_{t-1} + 0.023 \ln m_{t-1} \\
\quad \quad \quad (0.99) \quad (6.17) \quad (1.65) \quad (0.43) \\
+ 0.0001 i_t - 0.0003 \pi_t^e, \\
\quad \quad \quad (0.04) \quad (-0.22)$$

$$R^2 = 0.998 \quad D.W. = 1.80 \quad (CO-OR)$$

$$(19) \quad \ln C_t = 0.520 + 0.729 \ln Y_{dt} + 0.170 \ln Y_{dt-1} + 0.006 \ln S_{ct} \\
\quad \quad \quad (3.32) \quad (7.63) \quad (1.86) \quad (0.69)$$

²Blinder argued that MPS's might differ by income bracket, not by source of income. Presumably, there is no reason for an individual to save different fraction of marginal dollar depending on whether it accrues in the form of wages or interest income.

$$+ 0.002 \ln S_{ct-1} + 0.032 \ln m^2_{t-1}$$

(0.31) (1.53)

$$+ 0.0013i_t + 0.0003\pi_t^e,$$

(1.30) (0.32)

$$R^2 = 0.999 \quad D.W. = 2.23 \quad \text{(CO-OR)}$$

$$(20) \quad \ln C_t = 0.496 + 0.713 \ln Y_{dt} + 0.203 \ln Y_{dt-1} + 0.014 \ln m^2_{t-1}$$

(2.01) (7.04) (2.32) (0.47)

$$- 0.0002i_t - 0.0009\pi_t^e,$$

(-0.15) (-0.84)

$$R^2 = 0.999 \quad D.W. = 1.91 \quad \text{(CO-OR)}$$

The empirical results for Taiwanese consumption functions (1962-1984) are reported below:

$$(21) \quad \ln C_t = -0.053 + 0.508 \ln Y_t + 0.468 \ln Y_{t-1} - 0.024 \ln m^2_{t-1}$$

(-0.13) (2.68) (2.15) (-0.26)

$$+ 0.0103i_t - 0.0049\pi_t^e,$$

(4.02) (-4.37)

$$R^2 = 0.999 \quad D.W. = 1.82 \quad \text{(OLSQ)}$$

$$(22) \quad \ln C_t = 0.082 + 0.612 \ln Y_{dt} + 0.331 \ln Y_{dt-1} + 0.0011 \ln S_{ct}$$

(0.22) (2.89) (1.45) (0.06)

$$+ 0.017 \ln S_{ct-1} - 0.011 \ln m^2_{t-1}$$

(0.79) (-0.12)

$$+ 0.0084i_t - 0.0043\pi_t^e,$$

(3.09) (-3.05)

$$R^2 = 0.999 \quad D.W. = 1.61 \quad \text{(OLSQ)}$$

$$(23) \quad \ln C_t = 0.044 + 0.713 \ln Y_{dt} + 0.238 \ln Y_{dt-1} - 0.003 \ln m^2_{t-1}$$

(0.13) (4.43) (1.28) (-0.04)

$$+ 0.0092i_t - 0.0035\pi_t^e,$$

(3.39) (-3.59)

$$R^2 = 0.999 \quad D.W. = 1.51 \quad (OLSQ)$$

Equation (19) includes corporate saving as an explanatory variable for household consumption to test the ultrarationality hypothesis. Equation (18) uses household disposable income-cum-corporate saving as an income variable while equation (20) uses the household disposable income only.

The coefficients of expected inflation rate are negative and have significant t-statistics in Taiwan, but they are insignificant and close to 0 in Korea. This confirms the result we obtained in the Taylor model estimation. The coefficients of real M2 are insignificant for both countries: the real balance effect on consumption is negligible.

The corporate saving has an insignificant effect on household saving in both countries as was the case in the Taylor model estimation. The interest rate has a significant and positive coefficient in Taiwan, but it has an insignificant coefficient in Korea. The coefficient ranges from 0.008 to 0.010 and the t-statistics are greater than 3 in Taiwan.

By defining saving implicitly as $S = Y - C$, it follows that

$$(24) \quad \ln\left(1 - \frac{S}{Y}\right) = \ln\left(\frac{C}{Y}\right).$$

Hence for fixed Y ,

$$(25) \quad \frac{\partial\left(\frac{S}{Y}\right)}{\partial i} = -\left(1 - \frac{S}{Y}\right)\left(\frac{\partial \ln C}{\partial i}\right)$$

The upper bound on the sensitivity of the saving rate to changes in the interest rate is thus $-\frac{\partial \ln C}{\partial i}$. Since equation (21) yields the estimate $\frac{-\partial \ln C}{\partial i} = -0.0103$, it is implied that one percent point in-

crease in interest rate would be expected to lead to (at most) a 1.0 percent point decline in saving rate in Taiwan.

VI. Conclusion

In this paper, personal saving-consumption behaviors in Korea and Taiwan were studied. Incorporating those variables suggested by economic theory, two different functional relationships were shown to be empirically significant for explaining personal saving-consumption behavior.

The results of this paper do not contradict any of the a priori predictions about personal saving behavior. The marginal propensities to save out of income are positive and significant. Real balance effect on personal saving is not significant in both countries. In addition, uncertainty associated with a higher inflation encourages personal saving in Taiwan, but it is not significant in Korea.

The ultrarationality hypothesis that the household sector regards the corporate saving as a part of its own saving was rejected for both countries. Turning to the interest rate, its effects on saving and consumption are not significant in Korea. However, Boskin type models show significant and positive effects of the interest rate on consumption in Taiwan. Consequently, when the interest rate is increased, the substitution effect in intertemporal choice is not large enough to offset the income redistribution effect at least in the annual model.

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