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Interest Rates Interactions between Dual Financial Markets*

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Taiwan's financial market has been marked by a dualistic structure for a long time, so do many other less developed countries. This paper provides a model of financial dualism under the assumption that there is a normal distribution of risk premiums among funds suppliers who optimally choose a market, the organized or the unorganized one, to deposit their money. The model shows that as the authorities adjust the official interest rate, the rate in the unorganized market may respond with a negative, or an inverted-U pattern. Empirical tests based on Taiwan's data show that the latter pattern prevails.

I. Introduction

Taiwan's financial market has been characterized by a dualistic structure. On the one hand, there is an organized market consisting of quite a few number of financial institutions, the majority of which are owned by the government, operating under a uniform set of interest rate structure predetermined by the government. On the other hand, there is the unorganized market where firms directly or indirectly borrow from the funds suppliers without going through the formal banking system. The interest rate is normally rather low and at times negative in real terms in the organized market and credits have to be rationed among potential borrowers, while the rate in the unorganized market is often much higher and varying according to demand and supply conditions. Over the past

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twenty years, the latter market has been so important that it meets on average about 30 to 40 percent of the capital needs of the firms.[1]

This kind of financial dualism is by no means confined to Taiwan. A lot of less developed countries (LDCs) face the same situation, so it is both important and interesting to understand better its nature. This paper is an effort in this direction. In particular, we intend to analyze the problem of the interaction between interest rates in the organized and unorganized market under the framework of a formal model of financial dualism. The issue has previously been taken up by Tsiang (1980), Hsu (1983), Yang (1984), and Lin (1984) for the case of Taiwan, and by Tun Wai (1957), Shaw (1973), and McKinnon (1973, 1984), among others, for the general case of the LDCs. But to our knowledge, no vigorous microfoundation has been offered in these studies and this paper is written to fill the gap.

In what follows, we will present a formal model of financial dualism in section II, and then report the empirical results based on the data from Taiwan in section III. It is found that the response of the interest rate in the unorganized market to the rate in the organized one will follow an inverted-U pattern, consistent with the prediction of our model.

II. The Model

Let us first state the assumptions:

(i) The deposits in the unorganized market have an expected default rate of δ. Given the nominal rate of return there, r^*, the expected return of deposits in the unorganized is then $r^*-\delta$.

(ii) The firms' demand function for funds is given by

$$D = ce^{-gr'}\ ;\ c,\ g > 0 \tag{1}$$

where r' is the interest rate on loans to be specified later.

(iii) Households (suppliers of funds) display different degrees of risk aversion, but they share the same belief that the expected default rate in the unorganized market is δ. For a household who puts a risk premium of

[1] See Hsu (1983) for a detailed discussion of the size of the unorganized market. It should be noted here that the importance of the unorganized market in Taiwan has shrunk somewhat since the early 1980s, when the authorities started implemented a series of interest rate liberalization measures. However, the organized market, being consisting mainly of publicly owned banks which are very conservative, is still closed to many of the business firms in Taiwan.

α on the unorganized market deposits, the organized-market-equivalent rate of return on those deposits is then $r^{*}-\delta-\alpha$.

(iv) Define the loan and deposit rate in the organized market as $\bar{r}'$ and $\bar{r}$ respectively. It is assumed that $\bar{r}$ is exogenously determined and that the mark-up between the two rates or $m = \bar{r}' - \bar{r}$ is exogenously pegged.

Given assumptions (i) to (iv) above, and assuming that if all deposits are in the organized market with a deposit interest rate of r, the aggregate supply schedule would be

(1)'[2] $\quad ae^{br}$; a, b > 0

we can infer that when deposits are shared by the two markets, the supply to the organized market would be

(2) $\quad \bar{S} = \int_{\nu}^{\infty} (as^{b\bar{r}})dF(\alpha)$

where $\nu = r^{*}-\delta-\bar{r}$, F is the cumulative distribution of risk premium among the households, and it is assumed that $F(\alpha) \approx N(\mu, \alpha^2)$ with $\mu > 0$.

By the same reasoning, supply to the unorganized market is

(3) $\quad S^{*} = \int_{-\infty}^{\nu} (ae^{b(r^{*}-\delta-\alpha)})dF(\alpha)$

The equilibrium condition for the funds markets can then be established for each of the following two cases.

Case 1

If the most efficient firms get the bargain loans from the organized market,[3] the equilibrium condition would be

(4) $\quad \bar{S} + S^{*} = D(r^{*})$

as long as the officially determined loan rate in the organized market, $\bar{r}'$ is

2 Both demand and supply functions are assumed to be logarithmic because this is a form widely used in empirical studies, and also because it simplifies the computation substantially. See footnote 7 below for discussion of the consequence of having linear instead of logarithmic functions.

3 A firm is more "efficient" if its demand for funds is higher, i.e., its c in equation (1) is larger.

not higher than r^*.[4] Stated simply, this means that given $\bar{r}$, the interest rate in the unorganized market, r^*, must be such that the total supply of funds to both markets equals the national demand for funds at r^*.

Substituting equations (1)–(3) into (4) and differentiating (4) totally, we can obtain

$$\text{(5)} \qquad \frac{dr^*}{d\bar{r}'} = \frac{dr^*}{d\bar{r}} = -\frac{b(1-F(\nu))}{g(1-F(\nu)) + \int_{-\infty}^{\nu} e^{b(\nu-\alpha)} dF(\alpha)} < 0$$

meaning that if the authorities adjust upwards the interest rates in the organized market, the interest rate in the unorganized market will fall.

This is not surprising in view of equation (4). If $\bar{r}'$ and $\bar{r}$ are raised but r^* remains unchanged, the aggregate supply of funds, $\bar{S} + S^*$, has to rise because interest rate in no market falls but at least in one market it rises. An excess supply of funds is created and therefore r^* must fall to bring back equilibrium. Also, r^* would decline faster (slower) as $\bar{r}'$ and $\bar{r}$ increase, if the fund supply (demand) is more elastic with respect to interest rate. That is,

$$\frac{\partial\left(\frac{dr^*}{d\bar{r}'}\right)}{\partial b} < 0$$

$$\frac{\partial\left(\frac{dr^*}{d\bar{r}'}\right)}{\partial g} > 0$$

from equation (5).

Case 2

This is the case when loans in the organized market are made available to the firms on a first-come-first-served basis, i.e., firms with different efficiencies in using funds have an equal opportunity of obtaining loans from the organized market at an interest of $\bar{r}'$.

The equilibrium condition in the market is then

4 If $\bar{r}'$ is higher than r^*, all firms would want to borrow in the unorganized market, which would however attract few funds suppliers. What will happen is either that r^* rises again, or the unorganized market vanishes.

$$(6) \qquad \frac{S^*}{ce^{-gr^*}} + \frac{\bar{S}}{ce^{-(\bar{r}+m)}} = 1$$

which states that the percentages of firms getting loans from the unorganized and the organized market must sum up to unity.[5]

Substitute equations (2) and (3) into (6), differentiate (6) totally and rearrange terms, it can be derived that

$$(7) \qquad \frac{d\nu}{d\bar{r}'} = \frac{d\nu}{d\bar{r}} = \frac{\Omega_1}{\Omega_2} < 0$$

where

$$(8) \qquad \Omega_1 = -(b+g)\left[(1-f(\nu) + e^{g(\delta+\nu-m)} \int_{-\infty}^{\nu} e^{b(\nu-\alpha)} dF(\alpha)\right] < 0$$

$$(9) \qquad \Omega_2 = (b+g)e^{g(\delta+\nu-m)} \int_{-\infty}^{\nu} e^{b(\nu-\alpha)} dF(\alpha) + (e^{g(\delta+\nu-m)}-1)f(\nu) > 0$$

and that

$$(10) \qquad \frac{dr^*}{d\bar{r}'} = \frac{dr^*}{d\bar{r}} = \frac{f(\nu)(e^{g(\delta+\nu-m)}-1)-(b+g)(1-F(\nu))}{\Omega_2} \gtreqless 0$$

if

$$(11) \qquad \frac{f(\nu)}{1-F(\nu)} \gtreqless \frac{b+g}{e^{g(\delta+\nu-m)}-1}$$

Define now

$$(12) \qquad H(\nu) = \frac{f(\nu)}{1-F(\nu)}$$

which can be shown to be an increasing function of ν, and therefore a decreasing function of $\bar{r}'$ (and $\bar{r}$) by equation (7). Meanwhile, the RHS in equation (11) is decreasing in ν and therefore increasing in $\bar{r}'$ (and $\bar{r}$), and that it can be shown that equation (10) is positive (negative) as $\bar{r}'$ ap-

[5] Assuming there are a total of N identical firms in the economy, equation (6) can be alternatively written as

$$\frac{S^*}{\frac{1}{N}(ce^{-gr^*})} + \frac{\bar{S}}{\frac{1}{N}(ce^{-g(\bar{r}+m)})} = N$$

proaches zero (r^*). Together these properties imply that as $\bar{r}'$ rises, r^* first rises then falls, and it has a unique maximum point for $0<\bar{r}'<r^*$. That is, r^* is basically an inverted-U type of function of $\bar{r}'$.[6]

Now given a certain observed range of $\bar{r}'$, if the maximum of $r^*(r)$ happens to fall inside this range, as $\bar{r}'$ increases, r^* will rise first, then decline. If, on the other hand, the maximum point of r^* occurs at a value of $\bar{r}'$ which lies above (below) the observed range, as $\bar{r}'$ increases, r^* will be rising (declining).

Exactly which of these cases prevails is of course an empirical question, which will be discussed in the next section. Here, one final word of why r^* ever rises when $\bar{r}'$ and $\bar{r}$ increase is in other. We note that when $\bar{r}'$ and $\bar{r}$ rise, *ceteris paribus,* three things happen: (i) total supply of funds rises, (ii) percentage of total supply of funds going to the organized market rises and that to the unorganized falls, and (iii) more firms are able to obtain loans from the organized market at the bargain rate, $\bar{r}'$, including the less efficient firms, thus raising the total demand for funds. The first of these three tends to reduce r^*, the second tends to raise r^*, but we know that if aggregate demand does not change as in *Case 1* discussed earlier, the net effect is for r^* to fall. Now that a third force comes in and this tends to raise r^*, and it cannot be determined whether this third force will overcome or be overwhelmed by the net effect of the first two forces. If it overcomes the latter, $\bar{r}$ and r^* move in the same direction, and *vice versa.*

III. Empirical Results and Concluding Remarks

Table 1 reports the data currently available to us. Columns 1 and 2 give the real interest rates $\bar{r}'$ and r^* between 1964 and 81.

It is clear from Table 1 that the gap between the two rates remained substantial throughout the years, a phenomenon consistent with the observation made earlier that the unorganized market in Taiwan occupied a considerable share of the funds market. Moreover, the observed rates in the organized market are pretty scattered towards the lower end, registering even significantly negative values at times. Since in *Case 2* of our model, the sign of $dr^*/d\bar{r}'$ becomes negative only when $\bar{r}'$ approaches r^*,

6 If the fund demand and supply functions are not of the log-linear types depicted in equations (1) and (1)′, but are of the straight linear types, it can be shown that although it cannot be said for sure that r^* would be an inverted-U function of $\bar{r}$, $dr^*/d\bar{r}'$ would be positive (negative) as $\bar{r}'$ approaches zero (r^*), so the inverted-U pattern is certainly a possibility.

Table 1

STATISTICS IN TAIWAN'S DUAL FINANCIAL MARKETS

Year	(1)* Banking Interest Rate in Real Terms (%)	(2)** UFM Interest Rate in Real Terms (%)	(3)* Fixed Capital Stock in 1976 Constant Dollars (NT$ Billions)
1964	15.84	24.71	191.6
1965	15.55	23.83	202.7
1966	12.84	21.81	218.0
1967	10.92	20.49	238.5
1968	6.15	16.00	264.0
1969	8.98	20.36	293.3
1970	10.44	17.68	326.3
1971	9.97	18.67	366.7
1972	9.14	18.86	412.4
1973	4.10	14.28	462.8
1974	–30.75	–18.23	524.9
1975	9.09	22.03	605.2
1976	11.24	25.04	681.1
1977	4.73	19.57	757.1
1978	5.61	20.22	842.2
1979	3.14	19.21	942.7
1980	–4.43	11.61	1066.6
1981	–0.55	14.63	1259.9

* Data from the Research Department, Central Bank of Taiwan.

** Data from Research Section, Training Center of Taiwan Community Finance, the Provincial Government of Taiwan. UFM refers to the unorganized financial market.

and becomes positive when $\bar{r}'$ approaches (or falls below) zero, these two observations imply that for the data in Table 1, one would expect the relationship between $\bar{r}'$ and r^* to be positive, or of an inverted-U pattern, if *Case 2* is correct. On the other hand, the relationship would be negative if *Case 1* is correct.

What is the actual result? Regression analysis of the data leads to the following equation:

$$(13) \qquad \underset{(27.497)}{r^* = 16.518} + \underset{(8.0112)}{1.1423\bar{r}'} - \underset{(-2.9935)}{0.01244\bar{r}'^2} - \underset{(-2.0352)}{0.000574\bar{r}'^3} + \underset{(5.8753)}{0.07853k}$$

$\bar{R}^2 = 0.9855$

Durbin-Watson = 1.8815

where figures in the parentheses are t-values; k is real capital stock measured as deviations from its trend, being included to account for demand-side disturbances.[7]

It seems that the result is consistent with the prediction of the *Case 2* of our model, that is, r^* as a function of $\bar{r}'$ has an inverted-U shape over the relevant range $0 < \bar{r}' < r^*$. In fact, it can be easily derived from equation (1) that if $\bar{r}'$ is raised to about 20 (percent), r^* would reached its maximum, and that when $\bar{r}'$ is raised to 27, it would be approaching r^* and the unorganized market would shrink to a mere trickle.

The fact that our empirical result matches the prediction of the model does not mean of course that it leaves no room for improvement. Many revisions and extensions of the model are possible and desirable. Firms, for example, can be categorized according to their risk class, they can also be assumed to relend the cheap money obtained from the organized market to the unorganized one. It would also be desirable to identify explicitly some of the institutional variables such as the over- conservativeness of Taiwan's banks the majority of which are owned by the government. For these and other improvements of the model, we must of course await further studies. However, the current model, being as primitive as it is, still conveys an important message: The authorities in Taiwan should not take the observed seemingly positive relationship between the two rates as an indication that an increase in the organized market interest rate will do no more than causing the rate in the unorganized market to rise correspondingly. Our empirical result is consistent with the *Case 2* of our model, and this case predicts that the interest rate in the latter market will eventually fall, if that in the former market is raised by a substantial amount.

7 The variable k is defined as follows

$$k = \frac{1}{K}\left[K-(1226.8 + 547.32\ \mathrm{Time})\right]100$$

where K is the level of capital stock, and the terms in the parentheses constitute the estimated value of K's long-term trend. The coefficient of k in equation (1) is positive because presumably, for periods in which the capital stock exceeds its long-term trend, the investment demands are higher.

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