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Expectations and the Demand for Agricultural Loans

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ABSTRAK

Permintaan pinjaman pertanian yang mengambil kira jangkaan harga telah dibentuk dan dianggar dalam kajian ini. Semua persamaan yang dianggar menunjukkan kadar bunga adalah tidak penting dalam penentuan permintaan pinjaman pertanian. Tetapi pembolehubah lain seperti harga output, aset dan luas tanah adalah bermakna pada paras 5 peratus, kecuali persamaan getah asli dan kelapa sawit. Dalam persamaan getah, hanya harga dan luas tanah adalah bermakna, manakala dalam persamaan kelapa sawit hanya luas tanah sahaja yang bermakna. Keputusan kajian menunjukkan bahawa model jangkaan naif adalah sudah memadai untuk menjelaskan perlakuan petani dalam pasaran pinjaman pertanian di Malaysia.

ABSTRACT

The demand for agricultural loans incorporating price expectations was formulated and estimated in this study. All equations estimated indicate that the interest rate is not an important determinant of the demand for agricultural loans. But other variables such as price of output, assets and acreage are significant at 5 percent level, except for rubber and oil palm. In the rubber equation, only the price and acreage are significant, while in the oil palm equation, only the acreage is significant. The results suggest that the naive expectations model is good enough to explain the behaviour of the farmers in Malaysian agricultural loans market.

INTRODUCTION

In most developing nations, agriculture is the leading sector. Thus, it is natural that agriculture should play the leading role in the economic development of these countries. The sector should generate enough capital to finance itself as well as the industrial sector. As the nation becomes more developed, the need for capital becomes more and more acute. A shortage in capital may hinder agricultural development and thus the country's economic development since the agricultural based economy derives most of its foreign exchange from the sector to finance its development projects.

It is the aim of this paper to analyse the behaviour of the agricultural sector in the financial market. An introductory section is given in part one while part two describes the behaviour of a farm firm where a model of the demand for agricultural loans is formulated. The method of estimation and the results are discussed in the next section while the conclusion and policy implications are given in the final section.

Studies on the determinants of agricultural loans are numerous. Young (1973) found that liquidity level (assets) is an important determinant of rural credit in Australia while the interest rate is not. Iqbal (1983) on the other hand concluded that the expected returns from agricultural investment is an important factor that determines the amount of loans demanded. Bagi (1983) included farm size as a determinant of agricultural loans and found that it is significant and positively correlated suggesting that the larger the farm size, the more loans are needed. In our study, all the factors discussed above are

incorporated into one equation to see whether they can explain agricultural loans demand in Malaysia.

THEORETICAL FORMULATION

The basic model of the demand for factor of production, agricultural loans, shall be derived in this section. We shall assume that the objective of the farm firm is to maximize profits. Specifically, let the production function of the i-th farm firm be

$$\frac{q_i}{A_i} = g\left(\frac{X_{1i}}{A_i}, \frac{X_{2i}}{A_i}\right) \qquad (1)$$

where X_j = input j (j = 1, 2), q = output, A = farmland acreage, and therefore, q_i/A_i, X_{1i}/A_i and X_{2i}/A_i could now be interpreted as the yield per acre, and input used per acre respectively. Equation (1) could be expressed as

$$y_i = h(x_{1i}, x_{2i}) \qquad (2)$$

where $y_i = q_i/A_i$, $x_{1i} = X_{1i}/A_i$, and $x_{2i} = X_{2i}/A_i$.

The profit function from an acre of farm land, π_i, is

$$\pi_i = p^e y_i - r_1 x_{1i} - r_2 x_{2i} - B_i \qquad (3)$$

where π = profit, p^e = expected price of output, r_i = price of input j (j = 1, 2), B = total fixed cost. Solving the first-order conditions for profit maximization of (3) and assuming that the second-order conditions are satisfied, we obtain

$$x_j = \bar{J}(r_1, r_2, p^e), j = 1, 2 \qquad (4)$$

where $\delta x_1/\delta p^e > 0$; $\delta x_1/\delta r_1 < 0$; and $\delta x_1/\delta r_2$ less, equal or greater than zero according to whether x_2 is a complement, independent or substitute. Equation (4) is the basic demand equation from which the demand for agricultural loans is derived. The expression shows the optimal amount of input that should be utilized to obtain the optimal output that maximizes profit.

Friedman (1956) argues that the demand for money is synonymous with the demand for durable goods. Thus following Friedman, it is to be argued here that the demand for loans is the demand for real capital. The loans are not demanded for its own sake, but for its ability to purchase goods and services which will contribute to the total farm output. Thus, the demand for agricultural loans by a farmer i to produce an output on one acre of land could be written as

$$L_i/A_i = g(r_1, \mathcal{Z}_i, p^e) \qquad (5)$$

where L = total loans, r_1 = lending rate, $\mathcal{Z}$ = other assets, p^e = expected price of output, and A = total acreage per farm and $(\delta L/A)/\delta r_1 < 0$; $(\delta L/A)/\delta p^e > 0$; and $(\delta L/A)/\delta \mathcal{Z}$ less, equal or greater than zero. Expression (5) states that the demand for loans for an acre of land depends on the price of loans (interest rate), the amount of other assets owned by the farmer, and the expected price of output to be obtained. Notice that equation (5) is analogous with equation (4), except that we replace the variable other assets, $\mathcal{Z}$, instead of the price of these assets.

Loans are sought by the farm firm for two purposes: short-run and long-run purposes. Loans are needed in the short-run to purchase variable inputs such as fertilizers, planting materials, and labour which directly contribute to the improvement of farm output. The short-term loans may result in an improvement in the productive capacity of the firm of a given size moving toward the more efficient production frontier through the use of optimal mix of resources.

In the planning horizon, if the demand for the farm output shows an upward trend, the farm firms expect the price to rise and then decide to expand farm production operations. In order to achieve this objective they will have to purchase new farm equipment and increase farm size. That is, once the optimal mix of resources to be utilized per acre is established, the firm then will make a long-run decision whether to expand its farm size to increase its absolute profit and also to take the advantage of economies of scale to increase the overall firm's profitability through costs reduction. The behavior of the firm with regard to expansionary activities will be explained by the variable A. Multiplying equation (5) by A gives

$$L_i = g(r_1, \mathcal{Z}_i, p^e) A_i$$

and rewriting, we obtain

$$L_i = h(r_1, \mathcal{Z}_i, p^e, A_i) \qquad (6)$$

From equation (6), it can be clearly seen that the expansionist behaviour of a given farm firm is related to the amount of loans demanded. As the acreage increases, we would expect the demand for loans to increase.

The presence of the variable $\mathcal{Z}$ (other assets: cash, liquid and il liquid assets) is to take care of the effect of competing sources of funds. To the firm, there are two sources of money capital: the internal and external sources (McKinnon 1973). To obtain capital, the firm could utilize its own savings or generate its own funds by liquidating some of its own assets; this is the internal source. The external source of funds include borrowings from the financial institutions. It is possible that some farm firms take the advantage of both sources. But the likelihood is that the internal source is limiting and thus it is expected that most firms will resort to the external sources.

A priori, there are two interpretations of the effect of $\mathcal{Z}$ on L. On one hand, if $\mathcal{Z}$ is negatively related to L, then the other assets ($\mathcal{Z}$) could be considered as the internal source of funds, which is a substitute to external sources. On the other hand, their relationship might be positive, suggesting that $\mathcal{Z}$ and L complement each other. This would imply that $\mathcal{Z}$ behaves as a collateral to the firm in securing loans from the financial institutions indicating that larger loans require larger amounts of collateral. Thus, it could be argued that larger firms are more accessible to the loans from the financial institutions.

We have already derived the demand for agricultural loans by an i-th farm firm. It is to be assumed here that the demand for agricultural loans by all the farm firms could be obtained by summing horizontally the loan demand for each farm firm. Thus, the aggregate demand for agricultural loans is obtained as

$$\sum_{i=1}^{n} L_i = H(r_1, \sum_{i=1}^{n} \mathcal{Z}_i, p^e, \sum_{i=1}^{n} A_i) \qquad (7)$$

where n is the number of farm firms. Equation (7) could be written as

$$L = H(r_1, \mathcal{Z}, p^e, A) \qquad (8)$$

where $L = \sum_{i=1}^{n} L_i$, $\mathcal{Z} = \sum_{i=1}^{n} \mathcal{Z}_i$, and $A = \sum_{i=1}^{n} A_i$. Thus, equation (8) is the estimating equation.

However, equation (8) contains an unobservable variable, p^e. In this study, it is assumed that individual farmer's expectations are formed by an equation of the form

$$E(p_t) = p_t^e = p_{t-1} \qquad (9)$$

Equation (9) is called the cobweb expectation model or sometimes it is simply called a naive expectation model. The model was formulated by Ezekiel (1938). It states that the farmers take the $(t-1)$ period price, p_{t-1}, as an approximation to the (t) period expected price, p_t^e.

Substituting p_{t-1} for p_t^e in (8), we obtain

$$L_t = L_t [r_t, \mathcal{Z}_t, p_{t-1}, A_t] \qquad (10)$$

The main problem with equation (10) is that the value of $\mathcal{Z}_t$ is not easy to obtain and therefore the use of proxy variable for $\mathcal{Z}$ is inevitable. We expect that the current value of $\mathcal{Z}$ will consist of assets from the past net profits. Therefore

$$\mathcal{Z}_t = \pi_{t-1} \qquad (11)$$

$$\text{and } \pi_{t-1} = TR_{t-1} - TC_{t-1} \qquad (12)$$

where π = profits, TR = total revenue, and TC = total costs. Admittedly, it is not easy to find all the data on costs for every crop grown in Malaysia. Thus, we decided to concentrate only on the costs of production for commodities, namely: rubber, oil palm, and paddy and the inputs included in the calculation of total cost were labour, fertilizers, and interest charges.

The study concentrated on the agricultural loans extended by the commercial banks only, since it is the most important financial institution for the agriculture sector. For example, in 1980, the commercial banks extended about 72 percent of total loans to agriculture. The rest came from finance companies (17.7%) and Bank Pertanian Malaysia (9.9%).

The importance of agricultural loans in relation to the total loans can be seen in Table 1. The share of agricultural loans declined from 10.2% in 1970 to 6.0% in 1985 indicating that agricultural loans are becoming less important compared to other loans. Since the agricultural loans market is small, it could be argued that

TABLE 1

Commercial banks' loans and advances[a]

Year	Agric. Total Loans (Millions $)	Total Loans (Million $)
1970	240.3	2359.6
	(10.2)	
1975	483.8	6468.4
	(7.5)	
1980	1648.4	21031.1
	(7.8)	
1985	2936.3	48981.7
	(6.0)	

Source: Quarterly Economic Bulletin, Bank Negara Malaysia.

Note: [a]Figures in parentheses show share to total loans.

the farmers are price takers, that is the interest rate is determined by the overall movement in the money market rather than the agricultural loans market. Based on these assumptions, the model was then estimated by ordinary least squares and Cochrane-Orcutt (1949) iteration procedure was used to eliminate the problem of autocorrelation. Firstly, the aggregated model for agriculture as a whole is estimated and it is then broken down into three important commodities, namely: rubber, oil palm, and paddy.

Sources of Data

This study employed annual time series data from 1960–1985 taken from a number of sources, namely: Bank Negara Malaysia (Annual Report namely Bank Negara Malaysia (Annual Report Economic Bulletin); Department of Statistics (Oil Palm, Coconut, Tea and Cocoa, and Rubber Statistics Handbook); and Ministry of Agriculture (Import and Export Trade in Foods and Agriculture Products of Peninsular Malaysia and Paddy Statistics).

RESULTS

The regression results of the study are presented in Table 2. For the agricultural sector as a whole (aggregate model), the results are very satisfactory. Only the interest rate cannot explain the variation in the loans demanded; but all other variables-price, assets, and acreage-are significant at 1 percent level. This means that if this year prices of agricultural commodities are favourable, the farmers also expect the prices to remain favourable in the following year. They therefore borrow money from the commercial banks to expand their production activities to reap more profits. Since the variable Z, the farm firms assets, is significant and negatively related to loans, the more the internal source they have, the less money capital that needs to be borrowed to expand farm operations. In other words, Z_t behaves as competing sources of funds rather than as collateral. The acreage is also significant suggesting that farmers need more borrowed funds as the acreage becomes larger.

The results from the disaggregated model are somewhat mixed. For the paddy sector, the results follow closely with the results obtained in aggregated model. In the rubber sector, only the price and rubber acreage are significant at 5 percent level; while in the oil palm, only the acreage is significant at 5 percent level. The R^2 for rubber and oilpalm are also low at 0.45 and 0.55 respectively. All these suggest that the aggregated model performed better than the disaggregated ones.

CONCLUSIONS

All the equations estimated indicate that the interest rate is not an important factor that determines the amount of loans demanded. But all other variables such as the prices, other assets, and acreage are significant at 5 percent level, except for the rubber and oil palm equations. In the rubber equation, only the price and acreage are significant, while in the oil palm equation only the acreage is significant suggesting that the cobwed expectations model is good enough to explain the behaviour of the agricultural loans market in Malaysia. The insignificance of the interest rate as the determinant of loans has important policy implications. This means that the government may not be able to influence the agricultural loans market by manipulating the level of interest rate.

Generally speaking, we could argue that the borrowers from the rubber and oil palm are large farmers while the borrowers from the paddy sector are small farmers and these basic distinguishable characteristics of the two types of farmers have clearly shown up in the empirical results. Firstly, for big farmers (rubber and oil palm), their demand for agricultural loans will depend only on the acreage, while the price,

TABLE 2

Regression Results

Agriculture Sector

$$L_t = \underset{}{-3949.1} + \underset{(10.041)*}{1.0958P_{t-1}} + \underset{(0.3350)}{14.090R_t} - \underset{(-6.5030)*}{95463.0Z_t} + \underset{(9.2598)*}{1.6557A_t}$$

$R^2 = 0.97$ rho $= -0.35$ D.W. 1.94

where, L = total agriculture loans, P = price of agriculture commodities, R = interest rate, Z = assets, A = total agricultural acreage

Rubber Sector

$$LR_t = \underset{}{-1573.4} - \underset{(2.1904)*}{0.0733PR_{t-1}} - \underset{(-1.1417)}{8.5841R_t} - \underset{(-1.7207)}{5449.3ZR_t} - \underset{(-2.7934)*}{0.8188AR_t}$$

$R^2 = 0.45$ rho $= -0.60$ D.W. 1.80

where, LR = loans to rubber, PR = rubber price, ZR = asset in rubber sector, AR = rubber acreage

Oil Palm Sector

$$LOP_t = \underset{}{-341.36} - \underset{(-0.9917)}{0.1404POP_{t-1}} + \underset{(0.9279)}{14.501R_t} + \underset{(1.2313)}{5642.3ZOP_t} + \underset{(3.2533)*}{0.585AOP_t}$$

$R^2 = 0.55$ rho $= -0.87$ D.W. 1.87

where, LOP = loans to oil palm, POP = price of oil palm, ZOP = asset of oil palm sector, AOP = oil palm acreage

Paddy Sector

$$LP_t = \underset{}{0.8062} + \underset{(12.842)*}{0.0842PP_{t-1}} - \underset{(-1.7996)}{1.8756R_t} - \underset{(-10.929)*}{2337.6ZP_t} + \underset{(2.7399)*}{0.0371AP_t}$$

$R^2 = 0.95$ rho $= 0.37$ D.W. 2.14

where, LP = loans to paddy, PP = paddy price, ZP = assets of paddy sector, AP = paddy acreage.

Note: *Statistically significant at the 5 percent level. Figures in parentheses are t-statistics.

assets, and interest rate are not important. What it means is that for oil palm and rubber, the loans are meant for acreage expansion. The behaviour of small farmers in the loans market is quite different as indicated by the paddy sector. The price, assets, and acreage are all important determinants of the amount of loans demanded following closely with the aggregated model.

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