Part II. Business Cycles of the Seven Asian Countries : 11. The Causes of Business Cycles in Thailand

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The Causes of Business Cycles in Thailand

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Introduction

It is a widely accepted notion that the Thai economy is heavily dependent upon primary exports, as Ingram (1977, pp. 112–48) stressed in his book approximately two decades ago. Thailand is also often called "an agricultural country," for the reason that the agricultural sector plays the dominant role in its economic growth.

My previous work (Hiratsuka, 1988) makes clear that agricultural prices rather than agricultural production play a significant role in generating business cycles in Thailand, and Tubitimtong (1988) discusses the causality between primary commodity prices and business cycles. The fluctuation of agricultural prices diffuses into the whole economy through two channels. One is the fluctuation in agricultural prices, which causes a change of farm income and brings about an economic upswing or downswing. The second is that, as the main crops of paddy, cassava, maize, and rubber go through the hands of many wholesale merchants in the domestic distribution channel before they are exported, their profits fluctuate according to the agricultural prices. The more the agricultural prices rise, the more profit the merchants make. Thus, through this distribution process, the fluctuation of agricultural prices comes to affect the whole economy of Thailand.

The fluctuation in agricultural prices has in the past been the cause of business cycles in Thailand,[1] but in the last two decades the causes of business cycles have become more complicated. First, the financial market situation has come to influence the whole economy of Thailand greatly. Since the two oil shocks, Thailand's balance of trade situation has deteriorated, and the Bank of Thailand has often had to take drastic action against this.

Second, manufactured exports have become one of the leading sources for economic growth. This has come about since January 1983, when the Board of Investment announced the criteria for application for such investment incentives as granting tax and duty privileges, which attracted foreign firms to Thailand in order to produce manufactured goods for export. Therefore we have to include the financial situation and manufactured exports along with agricultural prices as the causes for business cycles.

It should also be noted that during the 1980s the Thai economy expanded despite the decline of agricultural prices. This fact raises the question of whether agricultural prices are still an important factor for the generation of business cycles in Thailand.

This study examines two hypotheses: (1) whether the fluctuation of agricultural prices, manufactured exports, and financial matters are the main causes for business cycles in Thailand, and (2) whether the Thai economy has structurally changed over time in its degree of response to the fluctuation of agricultural prices and manufactured exports. This chapter will also discuss whether money supply, credit, or interest rate is the most significant factor in business cycle generation.

Methodology and the Testing Hypotheses

First Hypothesis

To verify the hypothesis that the fluctuation of agricultural prices, manufactured exports, and the financial situation are the causes of business cycles, the following model is applied:

$$CI_t = \alpha + \beta X_{t-s1} + \gamma Y_{t-s2} + \delta Z_{t-s3} + u_t\,, \qquad (1)$$

where CI is an indicator which expresses the business cycle and X, Y, and Z respectively represent agricultural prices, manufactured exports, and the financial situation. α, β, γ, and δ are parameters, and u_t is the error term. The terms s_1, s_2 and s_3 denote the time lags, which are determined by correlation analysis.

The autoregressive (AR) method is applied in estimating the model,[2] assuming the error term u_t follows an autoregressive process of order p, denoted $AR(p)$. That is

$$u_t = \rho_1 u_{t-1} + \rho_2 u_{t-2}, \ldots, \rho_p u_{t-p} + e_t\,, \qquad (2)$$

where ρ_p is the pth order autocorrelation coefficient. The term e_t follows the normal distribution with mean zero and variance δ^2; e_t is independent of other errors over time, but u_t is not.

The AIC (Akaike Information Criterion) statistic is used both for the determination of the order of autocorrelation and for the selection of the best equation (Akaike, 1973, pp. 267–81). The AIC statistic provides us with a guideline for selecting the best estimates from more than two regressions separately estimated. The equation with the smallest AIC statistic is the best estimate. However, where the difference of the AIC statistic between the two estimates is very small, the AR model with the lower order of autocorrelation or the model with a smaller number of explanatory variables should be chosen.[3]

Second Hypothesis

The second hypothesis—that the Thai economy has become more responsive to fluctuations in manufactured exports and less to agricultural prices since approximately 1984 is tested by using the AIC criterion.

We revise the original model of equation (1) as follows:

$$CI_t = \alpha + \beta_1 X_{t-s1} + \gamma_1 Y_{t-s2} + \delta Z_{t-s3} + \beta_2 (DUM \cdot X_{t-s1}) + \gamma_2 (DUM \cdot Y_{t-s2}) + u_t \,, \qquad (3)$$

where DUM is the dummy variable and 0 and 1 represent respectively the periods before and after January 1984.

Our objective is to show that no explanatory variable except X_{t-s1}, Y_{t-s2}, Z_{t-s3} helps to explain the variation of CI_t, that is, to test the joint hypothesis of $\beta_2 = \gamma_2 = 0$. In testing the hypothesis we apply the AR method separately to the two models expressed by equation (1) and equation (3), and compare the AIC statistic between them. Since the AIC statistic implies the optimal critical value of the F test,[4] we can accept or reject the null hypothesis of $\beta_2 = \gamma_2 = 0$ according to the general AIC criterion.

The Composite Index as a Business Cycle Indicator

The coincident CI is used as the dependent variables in the model of equation (1) and equation (3), because it can be regarded as a monthly approximation of economic activity. The index is compiled with the following nine variables equally weighted.

1. production of motorcycles
2. production of commercial vehicles
3. production of beer
4. production of lignite
5. production of gypsum

6. department store sales
7. electricity consumption
8. number of checks issued by commercial banks
9. export volume index

These nine variables are the main components of the coincident DI compiled by the IDE. Their trends are estimated by applying the phase average trend (PAT) estimation method and the Bry-Boschan turning point selection method to the seasonally adjusted series processed by the X-11 program.

Testing the Causes of Business Cycles

In preparation for testing the first hypothesis regarding the causes of business cycles, the correlation and lagged correlation between the CI and the explanatory variables are examined in order to fix their time-lag relationship.

The following variables are selected as the explanatory variables: agricultural price CI, which is composed of the equally weighted farm prices of paddy, cassava, and rubber; manufactured exports; money supply M_1; commercial bank loans outstanding; interbank loan rate; government expenditure; and primary commodity exports. The growth trends, if any, of the explanatory variables are estimated by the PAT method and then eliminated. From Table 11–1 of the rectangular correlation analysis, it can be seen that agricultural prices lag five months behind the CI; manufactured exports, money supply, commodity exports, and commercial bank loans

Table 11–1
Correlation and Lagged Correlation between the Composite Index and the Explanatory Variables

Lag of Months	0	−1	−2	−3	−4	−5	−6	−7
AP	0.714	0.732	0.744	0.752	0.753	0.753*	0.748	0.737
ME	0.578	0.582*	0.576	0.563	0.515	0.487	0.438	0.375
MS	0.722	0.722*	0.713	0.702	0.685	0.669	0.650	0.636
LR	0.041	−0.021	−0.080	−0.124	−0.165	−0.199	−0.241*	−0.264
CE	0.341	0.354*	0.265	0.311	0.249	0.172	0.116	0.112
BL	0.639	0.623*	0.599	0.576	0.543	0.509	0.473	0.431
GE	−0.123	−0.159	−0.088	−0.085	−0.093	−0.098	−0.117	−0.137
LD	0.124	0.098	0.060	0.037	−0.001	−0.038	−0.073	−0.112

Note: AP=agricultural price (composite index), ME=manufactured exports, MS=money supply M_1, LR=inter-bank loan rate, CE=commodity exports, BL=commercial bank loans, GE=government expenditure, and LD=loan-deposit ratio. * marks the lag period with the highest correlation.

Table 11-2
The Estimated Results Using the Yule-Walker Second Order Autocorrela-

Equation Number	Estimates of Yule-Walker			
	AP_{-5}	ME_{-1}	MS_{-1}	LR_{-6}
4.1	0.144 (4.209)			
4.2		1.144 (2.321)*		
4.3	0.164 (6.132)	1.171 (2.490)*		
4.4	0.127 (4.492)	1.029 (2.222)*	5.510 (3.047)	
4.5	0.135 (5.915)	1.392 (3.066)	6.559 (4.058)	−0.089 (−4.041)
4.6	0.136 (6.401)	1.458 (3.243)	6.261 (4.046)	−0.089 (−4.331)
4.7	0.093 (3.385)	1.523 (3.437)	5.948 (3.944)	−0.105 (−5.057)

Note: 1. AP=agricultural prices, ME=manufactured exports, MS=money supply M_1, LR=inter-bank loan rate, CE=exports of primary commodities, BL=loans by commercial banks.

outstanding lag one month behind; and the interbank loan rate lags six months behind the CI. It can also be seen that the correlation of government expenditure is negative, and that of the loan/deposit ratio very low; therefore they are omitted from all further analysis.

The AR estimate method is applied to the model expressed in equation (1). The computed results are summarized in Table 11–2. All the equations are estimated by using the Yule-Walker estimates (Gallant and Goebel, 1976), one of the methods for estimation of autoregression. In selecting the order of autocorrelation from the three orders of autocorrelation estimates, the AIC criterion shows the second order autocorrelation to be the preferable one obtained from the estimates.

Table 11–3 shows the computed AIC statistic. The AIC statistic obtained from the application of the ordinary least-square estimates are rather large, indicating that the error terms have autocorrelation. Applying the Yule-Walker estimates to equations (4.1)–(4.7) in Table 11–2, the smallest AIC statistic is obtained from the second-order autocorrelation of equations (4.1), (4.3), and (4.5), and from the third-order autocorrelation of equations (4.2), (4.4), (4.6), and (4.7). The second-order of autocorrelation estimates are preferable in view of the simplicity of analysis, since the AIC statistic of the second-order autocorrelation differs little from the third-order autocorrelation.

tion Estimates (January 1976–October 1988)

Parameters			AIC	Total R-Square	Degree of Freedom
CE_{-1}	BL_{-1}	Intercept			
		82.781 (22.446)	223.045	0.875	154
		97.301 (186.265)	228.208	0.835	151
		79.320 (27.312)	213.503	0.852	150
		78.045 (28.022)	207.325	0.859	149
		76.809 (36.084)	205.271	0.863	148
0.877 (2.286)*		76.128 (39.240)	204.827	0.864	147
0.879 (2.309)*	2.056 (2.307)*	79.309 (33.755)	202.483	0.868	146

2. No mark shows significance at 1 per cent level, and * indicates significance at 5 per cent level.

Table 11–3
Sumary of the Computed AIC Statistic Derived from the Estimates (January 1976–October 1988)

Equation Number	Number of Independent Variables	Ordinary Least-square Estimates	Yule-Walker Estimates		
			First-order Autocorrelation AR (1)	Second-order Autocorrelation AR (2)	Third-order Autocorrelation AR (3)
4.1	1	415.043	231.245	223.044	224.547
4.2	1	438.754	247.606	228.208	226.960
4.3	2	338.439	224.818	213.044	213.969
4.4	3	317.866	218.348	207.325	207.204
4.5	4	267.311	212.540	205.325	205.723
4.6	5	256.638	209.807	204.827	203.967
4.7	6	250.682	206.232	202.484	201.568

The t-statistic of each coefficient estimated by the Yule-Walker method with the second-order autocorrelation, as shown in Table 11–2, is significant at a five per cent level for all the equations. All the equations satisfy the t-statistic criterion. However, from the AIC criterion, it can be seen that equation (4.4) is the best of the equations estimated. The AIC statistic, which is the optimal critical value of the F test and helps to find the best estimates, is the smallest in equation (4.7). However, it is not the best equation. When equation (4.7) is compared with equation (4.4), the difference in the AIC statistic between the two is less than five, but the difference in the number of the explanatory variables is three. Thus, the marginal difference in the AIC statistic to the number of explanatory variables is 5/3 which is less than two, the critical value.

Two implications can be drawn from equation (4.4). First, fluctuations in the agricultural prices, manufactured exports, and money supply M_1 have a close relationship to business cycles in Thailand, and from this we can accept the first hypothesis; second, money supply M_1 is a crucial factor generating business cycles within money supply M_1, commercial bank credit, and interest rates.

Testing the Structural Change of the Thai Economy

In order to test the second hypothesis that since approximately 1984 the Thai economy has changed to respond more to fluctuations in manufactured exports than to those in agricultural prices, we apply the model equation (3) to equation (4.4). The equation is estimated by the Yule-Walker parameter estimates with the second-order autocorrelation:

$$\begin{aligned} CI = &\ \underset{(29.755)}{78.519} + \underset{(3.868)}{0.112AP_{-5}} + \underset{(2.519)}{1.187ME_{-1}} + \underset{(3.591)}{6.421MS_{-1}} \\ &- \underset{(-0.493)}{0.001(DUM \cdot AP)_{-5}} + \underset{(1.493)}{0.522(DUM \cdot ME)_{-1}}, \qquad (5) \\ &\text{Total } R\text{-squares} = 0.856,\ AIC = 215.065, \end{aligned}$$

where AP, ME, and MS represent respectively the agricultural price composite index, manufactured exports, and money supply M_1, and DUM is a dummy with 1 assigned to the period after 1984 and 0 to the period before it.

We can observe that the t-statistics concerning the estimated parameters with dummy variables are lower than the critical value at ten per cent significance level. Furthermore, the above computed AIC of equation (5), 215.065, is higher than that for equation (4.4), 207.325. This observation means that, according to the AIC criterion, equation (4.4) is better than equation (5). Consequently, the null-hypotheses, $\beta_2=\gamma_2=0$, set forth in the second section above, should be accepted. Therefore we can conclude that the Thai economy has not undergone any structural change in its response to fluctuations in agricultural prices as opposed to those in manufactured exports.

Concluding Remarks

This chapter dealt with the causes of business cycles in Thailand; a causality test was applied to elicit results. The results showed that the fluctations in agricultural prices, manufactured exports, and money supply are the main causes of business cycles, and that money supply is a crucial factor for cycles in money supply, credit, and interest rates. These can be interpreted as indicating that business cycles are an autonomous process responding to the external impulse of agricultural prices and manufactured exports. However the government can apply some control to the cycles and avoid severe recessions through appropriate money supply control by the Bank of Thailand.

The study also tested the hypothesis that the recent Thai economy responds less to the fluctuation in agricultural prices and more to the increase in manufactured exports. The results unexpectedly denied the hypothesis and suggest that agricultural prices are still one of the major sources of business cycles in Thailand.

Notes

1 My previous study concluded that the fluctuation of agricultural prices generates not only short cycles but also medium cycles. In this study, the author uses "business cycles" to mean the short cycles.

2 When the ordinary least-squares (OLS) estimate method was applied to the model, autocorrelation was present. Therefore the AR model was applied.

3 It is the general criterion that if the marginal difference of the AIC statistic to a number of explanatory variables is less than two, then the equation with the smaller number of explanatory variables is better than the one with the larger number.

4 In the F test, we always face the problem of determining the optimal significance level, since the acceptance or rejection of a hypothesis depends on the significance level chosen. See Amamiya 1985, pp. 52–55.

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