Chapter 4

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

4.1 Introduction

The role of the financial system in the process of economic development has received attention from many researchers and scholars since the pioneering works by Patrick (1966), Gurly and Shaw (1967), Goldsmith (1969) and McKinnon (1973). Numerous research studies on this issue support the theory that there is a positive relationship between economic development and financial system development. However, when testing empirical models, some debate lingers on concerning the issue of the appropriate representative variables for financial development. Also, despite the suggestion of a positive correlation between financial development and growth, one remaining unsettled issue is the direction of the relationship. Scholars and researchers cannot agree whether the supply-leading or the demand-following approach yields the best description of the model.

In this study, the hypothesis is set such that a positive relationship exists between economic growth and financial development. This study also uses the growth rate of GDP, the traditional measure of economic growth. On the financial development side, the study focuses on credit allocation as the main service of financial intermediaries. Four indicators are chosen to represent the credit allocation variable: domestic credit, financial assets, loan and advances of commercial banks, and total assets of commercial banks. The fifth indicator, international reserves, accounts for the effects of the international flow of funds resulting from exports and the

recent financial liberalization. The ordinary least squares method is used to identify the positive relationships among these variables.

The empirical results shows that the final economic model consists of two explanatory variables: loans and advances of commercial banks and international reserves. The study continues to test the direction of this relationship by applying the Granger-causality test with the completed Akaike's final prediction error (FPE) as suggested by Hsiao (1981). Only one variable, loans and advances of commercial banks, shows support for the 'supply-leading' approach while international reserves shows support for both 'supply-leading' and 'demand-following' hypotheses. These results suggest that any monetary policy concerning commercial banks' credit should have strong impact on the economic growth especially when the country is still in the early stage of financial development where commercial banks play a dominant role in the system. Section 2 provides the definitions of the variables and the data description. Research methodology and estimation technique are provided in Section 3. Section 4 describes the empirical results and Section 5 analyzes the output from the estimation. The conclusion is in Section 6.

4.2 *Data and definition of variables*

Previous studies in this field made extensive use of ratios of monetary aggregates to represent financial development. Some examples of this common measurement are the ratio of M1 or M2 to GDP. However, as has been pointed out in De Gregorio and Guidotti (1995), these liquid forms of monetary aggregates are likely to cause some serious problems in the analysis. The two major roles of financial institutions are allocating credit and providing liquidity; our concern is on the ability of financial institutions to efficiently provide credit, not the liquidity function. Thus, using M1 and M2 as proxies may lead to misinterpretation of the results as cautioned in De Gregorio and Guidotti (1995): *"Therefore, one can envisage situations in which*

a high level of monetization-say, measured by the ratio of M1 to GDP-is the result of financial underdevelopment, while a low level of monetization is the result of a high degree of sophistication of financial markets which allows individuals to economize on their money holdings." (De Gregorio and Guidotti, 1995, p. 438)

In order to focus on the issue of credit allocation, five indicators of the development of the Thai financial sector have been chosen. The first two indicators are selected to measure the overall financial depth of the country; the first variable, domestic credits, consists of claims on government, claims on nonfinancial public enterprises, claims on the business and household sectors and claims on other financial institutions. The second indicator is financial assets, comprised of net foreign assets and domestic credits excluding claims on other financial institutions. Two indicators focus on the role of commercial banks: the third indicator is loans and advances of commercial banks which are the main assets of banks. The fourth variable is net assets of commercial banks, defined as total assets minus loans and advances of commercial banks. The fifth variable, the international reserves, accounts for reserves in the hands of monetary authorities, such as gold, SDRs, the reserves position in IMF, and foreign exchange.

The growth indicator is traditionally represented by GDP. It should be mentioned at this point that some of the variables are closely related to each other, especially the first two variables. However, we will drop some variables from the model during the process of estimation and only the most significant variables will be kept in the final equation. This method of using only financial variables as the explanatory variables in the model may be subjected to the problem of missing variables. We argue that we only want to emphasize our study of the impact of financial development on growth and also the direction of this relationship to enhance the study. In the next chapter, we want to test the efficiency of the financial intermediaries before and after financial liberalization. This type of study (one that includes only financial variables in the model) has been done by some earlier studies such as Scheide (1993), who tests the effect of

external capital on economic growth in various countries, and the most recent study of Arestis and Demetriades (1997) that examines the relationship between stock market development and economic growth as new evidence in this area. The variables in the model are: real GDP per capita, the ratio of bank credit to nominal GDP, stock market capitalization, and an index of stock market volatility, all of which represent financial development.

The advantage of choosing the above variables as proxy for the degree of financial development is due to the fact that most of these variables represent the accepted role of the financial institutions as intermediaries and as a channel for funds including credit extended to both the public and private sectors. The reason to include claims on the public sector in the analysis is because most of the public's borrowings are for building up the basic infrastructure of the country which clearly has a strong impact on economic growth. In the case of the international reserves, this variable is chosen in order to capture the effect of international flow of funds resulting from exports and from the implementation of the financial reform policies that have taken place since 1989.

The financial indicators data are taken from the Bank of Thailand (BOT) monthly bulletin from the first issue in 1960 to the seventh issue of 1996. The first indicator, domestic credit which is termed DOC, is taken from line 2, Table 2, entitled *Monetary Survey*. The second indicator, financial assets which is termed FAS, is taken from line 6, Table 1, entitled *Financial Survey*. The third indicator, international reserves which is termed INR, is taken from line 5, Table 40, entitled *International Reserves*. The fourth indicator, loans and advances of commercial banks which is termed LOA, is taken from line 10, Table 9, entitled *Main Assets and Liabilities of Commercial Banks*. The fifth indicator, net assets of commercial banks which is termed NAS, is line 37 Table 7, entitled *Asset and Liabilities of Commercial Banks* minus LOA. The GDP data is gathered from National Accounts Division, National Economic and Social

Development Board (NESDB) and from various issues of the BOT monthly bulletin. The annual data is collected from the year 1957 through 1995, resulting in 39 observations.

In order to reach stationarity, all variables are expressed in logarithmic form and then the first-difference of each variables is taken. Thus, the logarithmic first-difference form of each variable represents the growth rate of each one: Dlog GDP, Dlog DOC, Dlog FAS, Dlog LOA, Dlog NAS and Dlog INR. The log difference form is then used in the estimation process. GDP growth is calculated as log differences using 1988 data as the base year.

4.3 *Research methodology and estimation technique*

The empirical specification in this study comes from a traditional study methodology where output (GDP) is a function of financial variables: domestic credit, financial assets, loans and advances of commercial banks, net assets of commercial banks, and international reserves.

$$GDP = f(DOC, FAS, LOA, NAS, INR) \quad \text{---------- (1)}$$

By totally differentiating equation (1) and dividing through by the output we have:

$$dlog\ GDP = A_0 + A_1\ dlogDOC + A_2\ dlogFAS + A_3\ dlogLOA + A_4\ dlogNAS + A_5\ dlog\ INR \quad \text{---------- (2)}$$

Adding a disturbance term, e, yields an estimating equation :

$$dlogGDP_t = A_o + A_1\ dlogDOC_t + A_2\ dlogFAS_t + A_3\ dlogLOA_t + A_4 dlogNAS_t + A_5 dlogINR_t + e_t \quad \text{---------- (3)}$$

where subscript t denotes the t^{th} observation and $e_t \sim i(o,\delta^2), cov(e_t, e_s) = 0$

The first part of the estimation process aims to support the idea that there is a positive relationship between financial development and growth. The ordinary least squares (OLS) method is being used to estimate the equation. Using the five financial indicators as proxy for financial development, we expect to see each coefficient on the right-hand side of the regression to show a positive sign, *e.g.* A_1, A_2, A_3, A_4, and $A_5 > 0$.

The second part of the estimation attempts to identify the direction of the relationships. By following the work of Darrat *et al.* (1989), the Granger concept of causality in conjunction with Akaike's final prediction error (FPE) criterion is being used to test the hypotheses of "supply-leading" and "demand-following". The bivariate model pairs each financial indicator with growth. This method is expected to give the best prediction of growth with financial variables. However, due to the dynamic structure of the Thai economy during the past 40 years, the sample range is divided according to the change in economic structure. In addition, more analyses will be completed in order to verify the robustness of the model and obtain more useful insights.

Granger Causality

Granger Causality is the concept of testing the direction of causality in economic relationships. The crucial concept lies in the fact that there is a circumstance where one time-series variable consistently and predictably leads other variables. These leading variables do not contain the property of theoretical causality; instead the variables are very useful for prediction purposes. Granger (1969) develops a test called Granger causality test as follows:

$$\Delta y_t = \alpha_0 + \sum \alpha_{1i} \Delta y_{t-i} + \sum \alpha_{2i} \Delta x_{t-i} + e_{1t} \qquad \text{---------- (a)}$$

$$\Delta x_t = \beta_0 + \sum \beta_{1i} \Delta y_{t-i} + \sum \beta_{2i} \Delta x_{t-i} + e_{2t} \qquad \text{---------- (b)}$$

These two equations are estimated by OLS. If we can reject the null hypothesis:

$$H_o: \alpha_{2i} = 0; i = 1, \ldots\ldots, n$$

in equation (a) but can not reject the null hypothesis:

$$H_o: \beta_{1i} = 0; i = 1, \ldots\ldots, m$$

in equation (b), then we can conclude that X Granger-causes Y. The variables used in Granger Causality tests are required to be stationary or else the test will produce meaningless results. All data in this study are stationary in logarithmic first-difference form.

There are a number of tests based on the concept of Granger Causality. One test used in this study combines Granger Causality with the final prediction error (FPE) criterion. The FPE criterion is being used to specify the appropriate lag in the model. Hsiao (1981) suggests the following procedure:

Step 1:

Find the order of the one-dimensional autoregressive model of Y by using FPE criterion.

The FPE is defined for lag m, m = 1, ..., k, as

$$FPE(m) = [(T+m+1) / (T-m-1)]*[RSS(m) / T]$$

where T = number of observations

RSS = residuals sum-of-squares

Choose the order yielding the minimum FPE.

Step 2:

Construct the two-dimensional autoregressive model by letting y represent the output of the system and introduce X as an explanatory variable. Again, calculate the FPE to determine the lag order of X while the lag operator of Y is fixed at the order in step 1, say m. The FPE for an additional variable with lag n, n =1, ..., k, is

$$FPE(m, n) = [(T+m+n+1) / (T-m-n-1)]*[RSS(m, n) / T]$$

Step 3:

Check whether the lagged Y might pick up the effects of lagged X. Fix lagged X at the order found in step 2, say n, then vary lagged Y from 0 to m. Choose the order of lag Y with smallest FPE, say m*, where m* may or may not be equal to m.

Step 4:

Compare the smallest FPE of step 1 and 3. If $FPE(m) < FPE(m^*, n)$ we can say that X does not help predict Y. If $FPE(m) > FPE(m^*, n)$ we can say than X Granger-causes Y; that is, X helps predict Y and the optimal model for predicting Y is the one that includes m* lagged Y, and n lagged X.

Step 5:

Transpose X and Y and repeat Steps 1 to 4 to find the optimal model of X.

Step 6:

Pool the two single equations from the system equation and re-estimate by the method of seemingly-unrelated regression (SUR) to account for the effects of contemporaneous correlations between variables and also to check the consistency and the asymptotic efficiency of the estimation.

4.4 Empirical results

Table 4.1 presents the first set of regression results, estimated by using the ordinary least squares (OLS) procedure. The standard errors and t-statistics are computed using a heteroskedasticity consistent covariance matrix as suggested by White (1980).

The first regression shows that all financial indicators except DlogFAS -- financial assets, are positively correlated with GDP growth. However, only one of the coefficients of the explanatory variables, DlogLOA, has a significant t-statistic despite the overall significance of the statistical model. This imprecision of the OLS estimate results from collinearity of the financial variables on the right-hand side of the equation. Multicollinearity is caused by correlation between the explanatory variables and may lead to the spurious estimation. One way to resolve this problem is to drop some variables from the equation. Since domestic credit, financial assets, loans and advances of commercial banks, and total assets of commercial banks are highly correlated, only one of these indicators should be kept in the equation.

Table 4.1: Full model regression

Sample range: 1958 - 1995

Number of Observations: 38

Heteroskedasticity - Consistent Covariance Matrix

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STATISTIC*	*2-TAIL SIG.*
C	0.0236827	0.0339858	0.6968394	0.4909
Dlog DOC	0.0546658	0.1294914	0.4221577	0.6757
Dlog FAS	-0.2712929	0.2673400	-1.0147863	0.3178
Dlog NAS	0.0001416	0.0032580	0.0434544	0.9656
Dlog LOA	0.3580830	0.1422599	2.5171037	0.0170
Dlog INR	0.1042117	0.0573964	1.8156488	0.0788

R-squared	0.425859	***Mean of dependent variable***	0.073256
Adjusted R-squared	0.336149	***Std. Dev. of dependent variable***	0.041739
Std. Error of regression	0.034008	***Sum of squared residual***	0.037009
Log likelihood	77.82960	***F-statistic***	4.747086
Durbin-Watson statistic	2.052413	***Prob (F-statistic)***	0.002345

Table 4.2 shows the effect that each variable in the regression has on GDP growth. It is clearly shown that only two variables, DlogLOA and DlogINR, are significant. The significance of the first variable (the growth rate of loans and advances of commercial banks) and the strong positive relationship with economic growth is in accordance with the earlier works of King and Levine (1993) and De Gregorio and Guidotti (1995). The second variable, the growth rate of international reserves, is significant due to the fact that the major component of the reserves of the country is coming from export income. As the country transformed into higher industrialization, the growth rate of exports also increased and led to the positive relationship among the two variables. Although the explanatory variables in these two papers are not defined exactly the same as in this study, the significant fact is that they are measuring the same thing--the role of financial intermediation in the economic progress. Thus, the final economic model consists of two explanatory variables, DlogINR and DlogLOA, in this form:

Dlog GDP = C+ DlogLOA + DlogINR

Table 4.2: Single regression

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STATISTIC*	*2-TAIL SIG.*
C	0.0597035	0.0199650	2.9904108	0.005
Dlog DOC	0.0831849	0.1262791	0.6587387	0.514

R-squared	0.017299	**Mean of dependent variable**	0.07325
Adjusted R-squared	-0.009998	**Std. Dev. of dependent variable**	0.04173
Std. Error of regression	0.041947	**Sum of squared residual**	0.06334
Log likelihood	67.618430	**F-statistic**	0.63372
Durbin-Watson statistic	1.819185	**Prob (F-statistic)**	0.43121

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STATISTIC*	*2-TAIL SIG.*
C	0.0690405	0.0240133	2.8750935	0.006
Dlog FAS	0.0277977	0.1807914	0.1537557	0.878

R-squared	0.001580	***Mean of dependent variable***	0.07325
Adjusted R-squared	-0.026153	***Std. Dev. of dependent variable***	0.04173
Std. Error of regression	0.042282	***Sum of squared residual***	0.06435
Log likelihood	67.316930	***F-statistic***	0.05698
Durbin-Watson statistic	1.830523	***Prob (F-statistic)***	0.81267

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STATISTIC*	*2-TAIL SIG.*
C	0.0037553	0.0216827	0.1731915	0.863
Dlog LOA	0.369471	0.1145923	3.2257594	0.002

R-squared	0.307618	***Mean of dependent variable***	0.07325
Adjusted R-squared	0.288385	***Std. Dev. of dependent variable***	0.04173
Std. Error of regression	0.035210	***Sum of squared residual***	0.04463
Log likelihood	74.271610	***F-statistic***	15.99444
Durbin-Watson statistic	1.85771	***Prob (F-statistic)***	0.00030

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STATISTIC*	*2-TAIL SIG.*
C	0.0393733	0.0306415	1.2849637	0.2070
Dlog NAS	0.0032196	0.0027056	1.1900039	0.2418

R-squared	0.019507	***Mean of dependent variable***	0.073256
Adjusted R-squared	-0.007729	***Std. Dev. of dependent variable***	0.041739
Std. Error of regression	0.041900	***Sum of squared residual***	0.063203
Log likelihood	67.66118	***F-statistic***	0.716235
Durbin-Watson statistic	1.829330	***Prob (F-statistic)***	0.402972

Table 4.2 Single regression (continued)

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STATISTIC*	*2-TAIL SIG.*
C	0.0578891	0.0078191	7.4035779	0.000
Dlog INR	0.1232762	0.0331843	3.7148904	0.000

R-squared	0.155039	***Mean of dependent variable***	0.07325
Adjusted R-squared	0.131568	***Std. Dev. of dependent variable***	0.04173
Std. Error of regression	0.038897	***Sum of squared residual***	0.05446
Log likelihood	70.487710	***F-statistic***	6.60551
Durbin-Watson statistic	2.316256	***Prob (F-statistic)***	0.01445

Table 4.3 shows the results of the estimation where both financial indicators have positive signs and are consist with expectations. The t-statistics have been highly improved even though the estimated coefficient of DlogINR is still measured with some limited precision. The Ramsey Regression Specification Error Test (RESET) is applied to check for any specification error. The results of the test displayed in Table 4.4 show that there is no specification error in the model since the statistical F-value, 2.61, is less than the critical F-value, 3.75, at 5 percent level of significance. Moreover, when the sample range has been set to cover the year 1975-1995 as in Table 4.5, the t-statistics of both variables are dramatically improved. A discussion of this improvement will be presented later. Thus, we can conclude at this point that a positive relationship between financial development and economic growth does indeed exist.

Table 4.3: Final economic model

SAMPLE range : 1958 - 1995

Number of observations : 38

Heteroskedasticity-Consistent Covariance Matrix

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STATISTIC*	*2-TAIL SIG.*
C	0.0059937	0.0217807	0.2757865	0.7848
Dlog LOA	0.3151131	0.1240287	2.5406462	0.0157
Dlog INR	0.0642981	0.0349598	1.8392008	0.0744

R-squared	0.343100	***Mean of dependent variable***	0.073256
Adjusted R-squared	0.305563	***S.D. of dependent variable***	0.041739
S.E. of regression	0.034783	***Sum of squared residual***	0.042344
Log likelihood	75.27113	***F-statistic***	9.140289
Durbin-Watson statistic	2.120230	***Prob (F-statistic)***	0.000640

Table 4.4: Specification test

RESET (2)

SAMPLE range:	1958 - 1995		
Number of observations:	38		
F-statistic	2.60629	Probability	0.0889
Likelihood ratio	5.57298	Probability	0.0406

LS // Dependent Variable id Dlog GDP

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STAT.*	*2-TALL SIG.*
C	-0.0291109	0.1111623	-0.2618774	0.7950
Dlog LOA	1.5709335	1.9242215	0.8163995	0.4201
Dlog INR	0.3419123	0.4184911	0.8170121	0.4198
FIT^2	-71.436421	79.842040	-0.8947219	0.3774
FIT^3	357.91073	323.74464	1.1055341	0.2769

R-squared	0.432708	***Mean of dependent variable***	0.073256
Adjusted R-squared	0.363945	***Std. Dev. of dependent variable***	0.041739
Std. Error of regression	0.033288	***Sum of squared residual***	0.036568
Log likelihood	78.05761	***F-statistic***	6.292773
Durbin-Watson stat	2.197908	***Prob (F-statistic)***	0.000705

Table 4.5: Sub-period regression

LS // Dependent Variable is Dlog GDP

SAMPLE range : 1975 - 1995

Number of observations : 21

Heteroskedasticity-Consistent Covariance Matrix

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STAT.*	*2-TALL SIG.*
C	0.0078554	0.0226075	0.3474681	0.7323
Dlog LOA	0.2397281	0.0684885	3.5002677	0.0026
Dlog INR	0.1033121	0.0344979	2.9947325	0.0078

R-squared	0.352352	***Mean of dependent variable***	0.069782
Adjusted R-squared	0.280391	***Std. Dev. of dependent variable***	0.041501
Std. Error of regression	0.035205	***Sum of squared residual***	0.022309
Log likelihood	42.09863	***F-statistic***	4.896536
Durbin-Watson statistic	2.351041	***Prob (F-statistic)***	0.020047

The next step is to test the direction of the relationship using a Granger-causality test. The test follows the work of Darrat *et al.* (1989) using Akaike's FPE criterion to verify the appropriate lag for each variable as suggested by Hsiao (1981). However, Darret *et al.* do not employ the whole process of Hsiao (1979a, 1982). Darret *et al.* do not check the effects between lags as mentioned in STEP 3, so they do not find the lag m* which may or may not be equal to m. Their work only compares FPE(m) with FPE(m, n). Thus, the optimal model for predicting any variable may not be found (e.g. when m* does not equal m).

Based on the full process of Hsiao (1979a, 1982), the two explanatory variables will be analyzed by pairing each one with economic growth. Table 4.6 shows the results from STEPS 1 and 2; Table 4.8 shows the results from STEP 3, when GDP growth is the dependent variable. Each variable will be discussed individually.

Table 4.6: Final Prediction Errors 1

Dependent Variable: GDP growth (Dlog GDP)

Period Lags	*Autoregressive*	*Best Dlog GDP adding Dlog LOA*	*Best Dlog GDP adding Dlog INR*
1	0.0017713 *	0.0018656	0.0016510
1, 2	0.0018320	0.0016803	0.0014858 *
1, 2, 3	0.0018590	0.0016058 *	0.0016048
1, 2, 3, 4	0.0018896	0.0016731	0.0015687

Table 4.7: Final Prediction Errors 2

Dependent Variable: GDP growth

Period Lags	*Dlog LOA (-3) adding Dlog GDP*	*Dlog INR (2) adding Dlog GDP*
0	0.0015426 *	0.0016612
1	0.0016058	0.0014858 *

Discussion of variable DlogLOA

Strong support for the supply-leading hypothesis can be found when the financial development is proxied by this variable. As can be seen in the pure autoregressive model for GDP growth, the minimum FPE is found at lag 1 = 0.0017713 and when adding DlogLOA to the model, the best FPE is 0.0016058 when the lag length of DlogLOA is 3. When checking for the effect of lagged DlogLOA on lagged DlogGDP, the results in Table 4.7 show that the best lag of DlogGDP in the model is lag 0. In other words, the lagged variable (lag of DlogGDP) should not appear in the model. The optimal theoretical model for predicting DlogGDP is the one that contains only lagged DlogLOA:

DlogGDP = C + DlogLOA(-1) + DlogLOA(-2) + DlogLOA(-3)

When reversing the procedure, where DlogLOA is treated as a dependent variable and DlogGDP is an explanatory variable, the results in Table 4.8 show that there is no reversal effect from GDP growth to DlogLOA. The initial FPE of 0.0036023 resulting from the pure autoregressive model at lag 2 can not be improved when introducing the lag length of GDP growth into the model. These findings strongly support the supply-leading theory when DlogLOA Granger-causes DlogGDP and DlogGDP does not Granger cause DlogLOA. The optimal model for predicting DlogLOA is:

DlogLOA = C + DlogLOA(-1) + DlogLOA(-2)

Table 4.8: Final Prediction Errors 3

Dependent Variable: Loan and Advances of Commercial Banks

Period Lags	*Autoregressive*	*Best Dlog LOA (2) adding Dlog GDP*
1	0.0039447	0.0037662
1, 2	0.0036023 *	0.0039655
1, 2, 3	0.0039043	0.0043152
1, 2, 3, 4	0.0039327	0.0043462

The next step is to use the seemingly-unrelated regression (SUR) method to check the robustness of the equations and also to take account of any contemporaneous correlation between the two variables.

The SUR method is an alternative for estimating systems of equations simultaneously. The benefit of simultaneously estimating all of the equations in a system is the fact that separate estimations of each equation ignores the possibility that the residuals from the equations are related. By using system analysis like SUR, we can take account for the fact that the residuals of the two equations (as in our case) may have a contemporaneous relationship.

In order to identify this type of situation more clearly, if we assumed that the errors from the two equations are uncorrelated, meaning:

$$e = \begin{bmatrix} e_1 \\ e_2 \end{bmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}\right], \; E\begin{pmatrix} e_1 e_1' & e_1 e_2' \\ e_2 e_1' & e_2 e_2' \end{pmatrix} = \begin{pmatrix} \delta_1^2 I_T & 0 \\ 0 & \delta_2^2 I_T \end{pmatrix}$$

the off-diagonal blocks of the covariance matrix are zero, thus uncorrelated.

Griffiths, Hill and Judge (1993) also show that the squared contemporaneous correlation between e_1 and e_2 is:

$$r_{12}^2 = \frac{\left(\hat{\delta}_{12}\right)^2}{\hat{\delta}_1^2 \hat{\delta}_2^2}$$

To check the statistical significance of r_{12}^2, we test the null hypothesis H_0: $\delta_{12} = 0$ where the test statistic, Tr_{12}^2 (T= number of observations), is to be compared with the critical value of the χ^2 distribution. Tables 4.9 shows the results from the SUR estimations; Table 4.10 show the results where each of the two equations were estimated individually as a single equation. As we can see, all of the t-statistics in Tables 4.9 improved when compared to the results in Table 4.10.

Table 4.9: Seemingly unrelated regression 1

SAMPLE range: 1957 - 1995

Observations excluded because of missing data

Number of observations: 36

System: 2 Equations

Coefficients							
C (1):	0.128423	*C (2):*	0.087537	*C (3):*	-0.213829	*C (4):*	-0.168126
C (5):	0.180581	*C (6):*	0.409538	*C (7):*	-0.360458		
Residual Covariance Matrix							
1, 1	0.003048	*1, 2*	0.001019	*2, 2*	0.001228		
Residual Correlation Matrix							
1, 1	1.000000	*1, 2*	0.526600	*2, 2*	1.000000		
Determinant (Residual Covariance Matrix): 2.705 E-06							

SYS -SUR // Dependent Variable is Dlog GDP

SYSTEM - Equation 1 of 2

Dlog GDP = C(1) + C(2) * Dlog LOA(-1) + C(3) * Dlog LOA(-2) + C(4) * Dlog LOA (-3)

	COEFFICIENT	*STD. ERROR*	*T-STATISTIC*	*2-TAIL SIG.*
C (1)	0.1284234	0.0275251	4.6656850	0.0000
C (2)	0.0875366	0.1031667	0.8484973	0.3993
C (3)	-0.2138293	0.1048940	-2.0385269	0.0456
C (4)	-0.1681264	0.0897302	-1.8736889	0.0655
Unweighted Statistics				
R-Squared	0.2567500	***Mean of dependent variable***	0.073892	
Std. Dev. of dependent variable	0.0412420	***Std. Error of regression***	0.037237	
Sum of squared residual	0.0429840	***Durbin-Watson statistic***	2.084311	

SYSTEM - Equation 2 of 2

Dlog LOA = C(5) + C(6) * Dlog LOA(-1) + C(7) * Dlog LOA(-2)

	COEFFICIENT	*STD. ERROR*	*T-STATISTIC*	*2-TAIL SIG.*
C (5)	0.1805814	0.0348482	5.1819420	0.0000
C (6)	0.4095384	0.1515711	2.7019551	0.0088
C (7)	-0.3604583	0.1547837	-2.3287865	0.0230
Unweighted Statistics				
R-Squared	0.2148840	***Mean of dependent variable***	0.190333	
Std. Dev. of dependent Variable	0.0631940	***Std. Error of regression***	0.057666	
Sum of squared residual	0.1097370	***Durbin-Watson statistic***	2.012726	

Moreover, the test statistic of Tr_{12}^2 is computed as follows:

$$r_{12}^2 = \frac{(0.001019)^2}{(0.003048)(0.001228)}$$

$$= 0.27739$$

$$Tr_{12}^2 = (36)\,(0.27739)$$

$$= 9.9861$$

The 5% critical value of a χ^2 distribution with one degree of freedom is 3.84. Therefore, we reject the null hypothesis that there is no correlation between the errors from the two equations and conclude that there is contemporaneous correlation between the equation errors.

Table 4.10: Separated estimations

OLS: Dependent Variable is Dlog GDP

Sample range: 1958 - 1995

Number of observation: 38

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STAT*	*2-TAIL SIG.*
C	0.1314167	0.031152	4.2185662	0.0002
Dlog LOA (-1)	0.0846111	0.1123210	0.7532973	0.4570
Dlog LOA (-2)	-0.2051281	0.1140445	-1.7986667	0.0818
Dlog LOA (-3)	-0.1916402	0.1119493	-1.7118483	0.0969

OLS : Dependent Variable is Dlog LOA

Sample range : 1985 - 1995

Number of observation : 38

VARIABLE	*COEFFICIENT*	*STD. ERROR*	*T-STAT*	*2-TAIL SIG.*
C	0.179664	0.0365948	4.9095540	0.0000
Dlog LOA (-1)	0.4138931	0.1593321	2.5976751	0.0139
Dlog LOA (-2)	-0.3611918	0.1616948	-2.2337875	0.0324

The results from Table 4.10 show that when we estimated each equation separately, the power of the test statistic is lower than using the system estimation in Table 4.9

Discussion of variable DlogINR

When adding the lags of DlogINR into the pure autoregressive model of DlogGDP, the minimum FPE is improved, shrinking from 0.0017713 to the smallest value of 0.0014858 at lag 2 of DlogINR (see Table 4.6). In Table 4.7, when holding DlogINR at lag 2 and changing the lag of DlogGDP from 0 to 1, the results still confirm that the best lag for DlogGDP is lag 1. Therefore, the optimal model for predicting DlogGDP with Dlog INR is as follows:

DlogGDP = C + DlogGDP(-1) + DlogINR(-1) + DlogINR(-2)

When switching the position between DlogGDP and DlogINR, the results in Table 4.11 show that the FPE from the pure autoregressive model of DlogINR improves from 0.0125140 at lag 1 to 0.0080862 when adding DlogINR at lag 2. This minimum FPE cannot be reduced any further by varying the lag length of DlogINR to lag 0 (see Table 4.12). Thus, the optimal model for predicting DlogINR with DlogGDP is:

DlogINR = C + DlogINR(-1) + DlogGDP(-1) + DlogGDP(-2)

The results above suggest that in the case of DlogGDP and DlogINR, there exists a two-way relationship between these two variables. The results support both hypotheses.

Table 4.11: Final Prediction Errors 4

Dependent Variable: International Reserves (Dlog INR)

Period Lags	*Autoregressive*	*Best Dlog INR (1) adding Dlog GDP*
1	0.0125140 *	0.0119967
1, 2	0.0135304	0.0080862 *
1, 2, 3	0.0130655	0.0084989
1, 2, 3, 4	0.0130604	0.0089338

Table 4.12: Final Prediction Errors 5

Dependent Variable: INR

Period Lags	*Dlog GDP (2) adding Dlog INR*
0	0.0153635
1	0.0080862 *

From Table 4.13, the test statistic Tr_{12}^2 is 0.25256592. Thus, we can not reject the null hypothesis $\delta_{12} = 0$ and conclude that there is no contemporaneous correlation between DlogGDP and DlogINR.

Table 4.13: Seemingly unrelated regression 2

SAMPLE range : 1957-1995

Number of observation : 36

System: 2 Equations

Coefficients							
C(1):	0.065508	*C(2):*	0.023547	*C(3):*	0.191769	*C(4):*	-0.139870
C(5):	0.112404	*C(6):*	0.750099	*C(7):*	0.676269	*C(8):*	-1744128
Residual Covariance Matrix							
1, 1	0.001189	*1, 2*	-0.000233			*2, 2*	0.006474
Residual Covariance Matrix							
1, 1	1.000000	*1, 2*	-0.083865			*2, 2*	1.000000
Determinant (Residual Covariance Matrix): 7.642E-06							

4.5 The analyses

The positive relationship between economic growth and financial development can be observed when we choose the growth rate of loans and advances of commercial banks (DlogLOA) and the growth rate of international reserves (DlogINR) to represent the degree of financial development. This should not come as any surprise because, as has been mentioned before, since the 1961 implementation of the first National Economic Development plan, the rapid expansion of the manufacturing sector has become a main contributor to Thailand's remarkable achievement of economic growth. The country has successfully transformed itself from agriculture-based production to manufacturing-based production. Figure 4.1 shows the structure of production. The share from agriculture decreased from 25.9 percent in 1970 to 12.7 percent in 1990. In contrast, the share from manufacturing increased from 15.9 percent in 1970 to 26.5 percent in 1990. The structure of exports also reveals significant changes. As shown in Figure

4.2, agriculture exports declined from 67.5 percent in 1970 to 17.0 percent in 1990, while manufactured exports increased from 6.1 percent in 1970 to 74.7 percent in 1990.

Accordingly, in the early period of the development of the financial system in Thailand, most of the activities of commercial banks had been set up to facilitate the international trade of the country. As mentioned in Chapter 3, the ratio of bank credit to GDP was very low before 1960, indicating an insignificant role for the commercials banks toward development planning. Most of the private investments in the country were financed by private saving. However, after the first few National Economic and Social Development plans were implemented, the role of commercial banks become more important in accelerating the economic growth. The commercial banks' credit became the major source of funds for most private investments. The interest of the banks expanded to include provision of funds for the manufacturing sector rather than only concentrating in import and export financing.

As an observer of Thai commercial banks, one could have long noticed that most funds have been distributed to manufacturing and trade while very little funds have been channeled to the agricultural sector. Table 4.14 shows that from 1976-1995, the share of credit granted to the agricultural sector never exceeds 10 per cent; in fact, it even went as low as 3.7 per cent in 1995. Manufacturing has been growing from 18.2 per cent in 1976 to 25.8 per cent in 1995. Thus, we can conclude that as Thailand transforms her economic structure to become more industrialized, the role of bank credit will also become more important in the economic development process.

The second variable that shows a positive relationship with economic growth is the international reserves which by definition are the reserves held at the monetary authorities. These reserves include gold, SDRs, the reserves position in IMF, and the largest item, foreign exchange. In the early period of development, most of the reserve money was directly linked with the exports of a country. According to the world development report of the World Bank, as noted in Warr (1993), the growth rate of Thai merchandise exports has been gradually increasing from 1965 to 1990 (see Table 4.15). This phenomenon is the result of the structural shift from agriculture-based to manufacture-based in the economic development process as mentioned

before, hence, the results in this study support the 'export led growth' policy induced in the Fifth and Sixth National Economic Development Plan (1982-1991).

Table 4.14: Bills, loans and overdrafts from commercial banks classified by purpose -- 1976 to 1995 (millions of baht)

Institution	*1976*	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*
1. Agriculture	4,121	6,340	8,656	10,774	11,090	16,042	22,139	30,450	37,409	39,355
	(4.3)b	*(5.2)*	*(5.4)*	*(5.4)*	*(5.6)*	*(6.2)*	*(7.2)*	*(7.4)*	*(7.8)*	*(7.4)*
2. Mining	1,115	688	1,078	1,250	1,293	1,806	1,895	2,439	2,844	3,361
	(1.2)	*(0.5)*	*(0.7)*	*(0.6)*	*(0.7)*	*(0.7)*	*(0.6)*	*(0.7)*	*(0.6)*	*(0.6)*
3. Manufacturing	17,586	23,846	29,579	34,331	3,489	58,329	64,893	88,713	106,048	122,576
	(18.2)	*(19.4)*	*(18.4)*	*(17.3)*	*(18.0)*	*(22.0)*	*(21.2)*	*(21.5)*	*(22.0)*	*(23.1)*
4. Construction	4,372	6,003	8,413	1,014	10,894	13,033	16,073	21,773	26,143	29,427
	(4.5)	*(4.9)*	*(5.2)*	*(5.1)*	*(5.5)*	*(5.1)*	*(5.2)*	*(5.3)*	*(5.4)*	*(5.5)*
5. Real estate business	3,633	3,841	4,394	6,003	6,170	6,971	8,471	12,218	16,781	19,446
	(0.3)	*(3.1)*	*(2.7)*	*(3.0)*	*(3.1)*	*(2.7)*	*(2.8)*	*(3.0)*	*(3.5)*	*(3.7)*
6. Imports	13,367	15,585	18,318	26,426	26,265	25,110	23,987	34,566	36,048	34,188
	(13.9)	*(12.7)*	*(11.4)*	*(13.3)*	*(13.4)*	*(9.7)*	*(7.8)*	*(8.4)*	*(7.6)*	*(6.5)*
7. Exports	12,529	13,119	17,853	25,556	23,544	26,077	28,991	32,022	39,733	45,019
	(13.0)	*(10.7)*	*(11.1)*	*(12.9)*	*(12.0)*	*(10.1)*	*(9.5)*	*(7.8)*	*(8.2)*	*(8.5)*
8. Wholesale and retail trade	20,812	28,129	38,497	44,384	44,059	58,816	76,530	101,271	133,012	122,256
	(21.6)	*(22.9)*	*(23.9)*	*(22.4)*	*(22.4)*	*(22.8)*	*(24.9)*	*(24.6)*	*(23.3)*	*(23.0)*
9. Public utilities	1,306	2,631	3,959	4,503	5,977	5,963	5,648	6,552	7,476	9,548
	(1.3)	*(2.1)*	*(2.5)*	*(2.3)*	*(3.0)*	*(2.3)*	*(1.0)*	*(1.6)*	*(1.6)*	*(1.8)*
10. Banking and other financial business	5,846	7,017	9,590	12,474	9,666	12,748	16,849	25,713	30,302	33,067
	(6.1)	*(5.7)*	*(6.0)*	*(6.3)*	*(4.9)*	*(4.9)*	*(5.5)*	*(6.2)*	*(6.3)*	*(6.2)*
11. Services	4,067	5,425	6,311	6,944	6,747	12,032	16,008	19,703	24,251	26,926
	(4.2)	*(4.4)*	*(3.9)*	*(3.5)*	*(3.4)*	*(4.7)*	*(5.2)*	*(4.8)*	*(5.0)*	*(5.1)*
12. Personal	7,597	10,155	14,191	15,407	15,483	21,184	25,298	36,537	41,800	45,555
	(7.9)	*(8.3)*	*(8.8)*	*(7.8)*	*(7.9)*	*(8.2)*	*(8.3)*	*(8.8)*	*(8.7)*	*(8.6)*
13. Others	18	45	25	159	178	-	-	-	-	-
	(-)	*(0.1)*	*(-)*	*(0.1)*	*(0.1)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*
Total	96,377	122,810	160,878	198,363	196,861	258,117	306,787	411,962	481,851	530,729
	(100.0)	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*

Table 4.14: (Continued)

Institution	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*
1. Agriculture	39,694	46,137	57,184	7,358.0	99,353.8	126,387.0	135,493.9	148,958.9	152,279.8	158,939.5
	(7.2)	*(6.7)*	*(6.6)*	*(6.5)*	*(6.6)*	*(7.0)*	*(6.2)*	*(5.5)*	*(4.4)*	*(3.7)*
2. Mining	3,169	3,478	4,623	5,203.4	8,204.5	8,247.7	12,053.5	16,664.5	15,692.3	24,984.8
	(0.6)	*(0.5)*	*(0.5)*	*(0.5)*	*(0.6)*	*(0.5)*	*(0.6)*	*(0.6)*	*(0.5)*	*(0.6)*
3. Manufacturing	12,945	162,238	223,868	290,518.8	375,108.2	457,617.4	517,913.5	647,286.2	836,233.9	1,097,377.5
	(22.8)	*(23.4)*	*(25.8)*	*(25.8)*	*(25.1)*	*(25.3)*	*(23.7)*	*(24.0)*	*(24.2)*	*(25.8)*
4. Construction	30,555	31,801	37,381	42,990.0	59,321.8	72,095.1	88,371.6	103,719.2	141,991.0	185,850.3
	(5.6)	*(4.6)*	*(4.3)*	*(3.8)*	*(4.0)*	*(4.0)*	*(4.0)*	*(3.9)*	*(4.1)*	*(4.4)*
5. Real estate	20,764	31,006	54,054	100,624.9	177,699.0	207,140.3	251,124.9	303,801.4	364,208.0	400,184.3
business	*(3.8)*	*(4.5)*	*(6.2)*	*(8.9)*	*(11.9)*	*(11.5)*	*(11.5)*	*(11.3)*	*(10.5)*	*(9.4)*
6. Imports	32,388	39,250	45,947	58,030.2	68,600.6	71,543.3	87,030.9	89,273.5	115,654.6	139,970.4
	(5.9)	*(5.7)*	*(5.3)*	*(5.2)*	*(4.6)*	*(4.0)*	*(4.0)*	*(3.3)*	*(3.3)*	*(3.3)*
7. Exports	50,144	60,809	72,168	83,242.1	91,366.7	95,257.4	116,650.6	135,296.8	166,505.1	182,710.3
	(9.1)	*(8.8)*	*(8.3)*	*(7.4)*	*(6.1)*	*(5.3)*	*(5.4)*	*(5.0)*	*(4.8)*	*(4.3)*
8. Wholesale and retail trade	127,619	140,221	164,213	199,508.8	263,154.3	314,843.0	371,505.8	477,216.5	627,721.8	756,798.9
	(23.2)	*(20.3)*	*(9.0)*	*(17.7)*	*(17.6)*	*(17.4)*	*(17.0)*	*(17.7)*	*(18.2)*	*(17.8)*
9. Public utilities	6,511	12,628	13,683	20,442.5	25,084.3	30,096.9	40,881.5	61,322.3	86,344.8	108,106.1
	(1.7)	*(1.8)*	*(1.6)*	*(1.8)*	*(1.7)*	*(1.7)*	*(1.9)*	*(2.3)*	*(2.5)*	*(2.5)*
10. Banking and other	33,406	63,038	54,842	66,011.7	76,170.8	99,266.7	13,835.1	163,010.0	245,151.2	339,203.6
financial business	*(6.1)*	*(9.1)*	*(63.0)*	*(5.9)*	*(5.1)*	*(5.4)*	*(6.1)*	*(6.0)*	*(7.1)*	*(8.0)*
11. Services	28,548	36,023	49,238	64,167.3	91,381.2	123,217.1	159,103.4	208,725.6	268,449.6	333,295.8
	(5.2)	*(5.2)*	*(5.7)*	*(5.7)*	*(6.1)*	*(6.8)*	*(7.3)*	*(7.8)*	*(7.8)*	*(7.9)*
12. Personal	48,281	65,162	89,662	121,736.2	158,617.4	201,846.2	269,394.0	339,675.4	437,475.2	523,437.0
	(8.8)	*(9.4)*	*(10.4)*	*(10.8)*	*(10.6)*	*(11.1)*	*(12.3)*	*(12.6)*	*(12.6)*	*(12.3)*
13. Others	-	-	-	-	-	-	-	-	-	-
	(-)	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*	*(-)*
Total	549,024	691,781	866,863	1,126,033.9	1,494,062.3	1,807,558.1	2,182,358.7	2,694,950.3	3,457,707.3	4,250,824.5
	(100.0)	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*	*(100.0)*

a Including interbank transactions.

b Figures in parentheses are percentage share of total

Source: Bank of Thailand

Table 4-15: Growth and structure of merchandise trade, 1965 to 1990

	Annual growth rate of exports		*Percentage share of merchandise exports*						*Other manufacturing*		*Textiles, clothing*	
			Fuels, Minerals, metals		*Other primary commodities*		*Machinery, transport, equipment*					
	1965-80	*1980-90*	*1965*	*1990*	*1965*	*1990*	*1965*	*1990*	*1965*	*1990*	*1965*	*1990*
Thailand	8.6	13.2	11	2	86	43	0	20	3	44	0	16
China	..	11.0	15	10	20	16	9	17	56	56	29	27
Indonesia	9.6	2.8	43	48	53	16	3	1	1	34	0	11
Philippines	4.6	2.5	11	12	84	26	0	10	6	52	1	7
Malaysia	4.6	10.3	34	19	60	37	2	27	4	17	0	22
Korea, Republic	27.2	12.8	15	2	25	5	3	37	56	57	27	22
India	3.0	6.5	10	8	41	19	1	7	47	66	36	23

Source : Would Bank, World Development Report, 1992. (Reproduce from Warr 1993, p.64)

Another important factor contributing to the expansion of reserves in the later period is the financial reform policies that have been implemented since 1989. The free flow of funds between Thailand and other countries is dramatically increasing; many public companies have been able to raise funds in international markets. Moreover, after the Securities and Exchange Act BE 2535 (1992) was implemented, new opportunities in fund raising activities appeared for Thai companies, coupled with the significant difference between domestic and foreign interest rates in international financial markets especially before the full interest rate liberalization took place. All these factors encouraged the big companies to search for low cost funds in international markets. The most popular financial instruments being used by the Thai companies are Euro Convertible Debenture (ECD) and Debenture with Warrants (DW). By the end of 1993, the volume of these instruments that are issued in the European market were estimated to be as high as twenty billion Baht. All of these funds are expected to enhance the productivity of the country, thus, leading to higher economic growth.

However, De Gregorio and Guidotti (1995) point out that the financial liberalization that occurred in a country with poor regulatory environment may lead to lower productivity of the economy similar to what happened in Latin America in early 1980s. The liberalization of the financial system in many Latin American countries took place in situations where there were not sufficiently strong financial regulations. The governments of these countries heavily intervened in the financial markets by bailing out failed banks without proper back-up legislation, leading to massive overlending. These inefficient lending activities can result in the negative relationship between financial development and growth in the later periods of deregulation. Therefore, in the case of Thailand, which we find a strong positive relationship between banks' credit and growth, we might need data over a longer time frame (after the deregulation period) to confirm this positive relationship and also to make sure that the regulatory environment in the country are strong enough to enhance development.

The effects of both financial variables can be seen more clearly in the later period when the sample range is set to cover the years 1975 to 1995. This can be explained by looking at the implementation of the Fourth and Fifth National Economic Development Plans covering the period 1977-1986 where the industrial policies had been set up to promote import substitution and export-oriented industries respectively. From 1980 onwards, the export industries have diversified away from agri-based to manufacturing-based. These successful policies resulted in the structural change in national production: in terms of GDP, manufacturing took a larger share than agriculture beginning in the early 1980s. In the second half of the 1980s, Thailand was experiencing the first export boom and the major export products were coming from the manufacturing sectors. This sharp increasing in exports is the direct result of the devaluation of the baht from 23 Baht/US$ to 27 Baht/US$ (14.9 percent) in 1984. Together with the devaluation, the government decided to change the exchange rate system from a peg with the US dollar to a more flexible "basket of currencies" system. However, the US dollar still dominated the basket due to the high volume of dollar-denominated trade. During that time, Thailand became more attractive as a new place to invest for the newly industrialized countries (NICs): Hong Kong, Taiwan, South Korea and Singapore, who were looking for a low labour cost manufacturing base. The inflows of direct foreign investment from these countries have been increasing since. Thus, the international reserves of the country expanded. Another important factor should be dedicated to the international flow of funds flooding in the country since starting the BIBF operations in 1992. Therefore, these variables show stronger effect after 1975.

Based on the results from the Granger causality tests, only one variable, loans and advances of commercial banks (DlogLOA), shows strong support for the 'supply-leading' concept. This finding is consistent with Hill (1992) in which he hypothesized that *".....countries with relatively high currency ratios would be predominantly supply-leading (pre-stage 3) while countries with relatively low currency ratios would be either predominantly demand-following or a mixture of the two but not supply-leading (post-stage 2)....."* (Hill 1992, p. 12).

Table 4.16 shows that the financial system in Thailand is still in the early stage of development where currency ratio accounts for a high proportion in narrow money (M1). The average of this ratio from 1963-1995 is 65.8 per cent. Therefore, when measuring financial development with bank credit, we are able to find support for the supply-leading model. Moreover, findings a contemporaneous correlation between these two financial variables, loans and advances of commercial banks and GDP, also coincides with the monetary policy employed in 1984 when the Thai monetary authorities imposed an 18 per cent credit restraint on the commercial banks' lending activities so as to significantly slow down economic growth during the same period.

Table 4.16: Growth and structure of merchandise trade, 1965 to 1990; Currency ratio from 1963-1995

	Currency	M1	%
1963	6,660.3	10,201.5	65.3
1964	7,265.8	10,937.8	66.4
1965	8,124.5	12,916.8	62.9
1966	9,370.9	14,656.5	63.9
1967	9,823.9	15,706.3	62.5
1968	10,640.7	17,285.4	61.5
1969	10,949.7	17,988.8	59.1
1970	11,863.5	19,447.5	61.0
1971	13,053.0	21,445.7	61.0
1972	15,279.3	24,830.9	61.5
1973	18,645.4	29,936.5	62.3
1974	20,449.7	33,207.9	61.6
1975	22,271.3	34,982.5	63.7
1976	25,445.5	40,627.4	63.4
1977	28,566.9	44,296.3	64.5
1978	33,161.7	54,677.7	60.6
1979	40,831.0	63,548.6	64.2
1980	45,868.7	71,480.4	64.2
1981	47,774.4	73,332.8	65.1
1982	53,991.0	78,946.6	68.4
1983	59,646.5	83,756.0	71.2
1984	63,543.9	88,769.0	71.6
1985	63,992.8	85,864.4	74.5
1986	72,051.3	103,426.8	69.7
1987	56,653.1	132,395.7	65.7
1988	98,953.0	148,492.7	66.6
1989	119,043.2	174,700.9	68.1
1990	137,456.4	195,414.3	70.3
1991	149,294.4	222,400.7	67.1
1992	180,158.9	249,717.0	72.1
1993	208,575.2	296,155.7	70.4
1994	241,949.7	246,434.0	69.8
1995	284,057.3	388,276.0	73.1

Average = 65.8%

Source: Bank of Thailand

This finding of a supply-leading phenomenon partially supports the work of Darrat *et al.* (1989) who find strong support for the supply-leading approach in only one country, namely Hong Kong, while most of the studies in this field cannot clearly conclude the unidirectional relationship between financial development and growth. These earlier ambiguous results may be due to the proxy variables chosen to represent financial growth. The advantage of this study in choosing banks' credit as one of the proxy variables lies in the fact that this variable represents the main service of financial intermediaries in terms of credit allocation. Other proxies such as real interest rate or monetary aggregation variables may not be as good as representative variables in this sense. This issue is already pointed out by many researchers such as De Gregorio and Guidotti (1995) who conclude in their work that the real interest rate may be a good indicator for the productivity of investment but not for financial development; in some cases it may produce a negative relationship that leads to the wrong conclusion. Monetary aggregation variables such as M1 or M2, which by definition are the liquid assets of the country, mainly indicate the role of the financial intermediaries as providing liquidity rather than credit allocation. Moreover, choosing the growth rate of loans and advances of commercial banks as financial variables can give more insight that directly links to the core of this study in the next chapter.

However, when we consider another variable, international reserves, the results support both supply-leading and demand-following hypotheses. This finding can be explained by considering the country's reserves as composed of two major components *e.g.* export-income and external capitals. In the macroeconomic point of view, there exists a two-way relationship between exports and growth. Increased productivity which is in excess of domestic demand will result in increased exports. Another angle considers that the expansion of exports is considered as one of the key elements in promoting the economic growth of the country, which is the so-called 'export-led growth' policy. The significance of exports, or more commonly mentioned as export growth, as one of the explanatory variables in the growth model has been found in many studies (*i.e.* Darrat *et al.*, 1989, Sharma and Dhakal, 1994 and Bleaney, 1996). However, most of

these studies cannot conclude the unidirectional relationship between exports and growth, thus, leading to the support of the two-way relationship as mentioned before.

In terms of considering the external funds as another part of international reserves, Scheide (1993) cannot find the positive relationship between the net external assets and real GDP in less developed countries. The findings show that these positive relationships exist in some certain period of time in the developed countries. However, the study cannot conclude any particular effect of the changes in the level of net external assets on economic development. Based on the data of Asia Pacific countries, the mixed results of the causality tests between the external debt and economic growth are also reported in Chowdhury (1994).

In this study, we do not directly measure the effects of the export growth and the external capital on GDP growth. Since these two variables are the major components of international reserves, the behavior of the growth rate of the international reserves that supports both the supply-leading and demand-following hypotheses, which is found here, is the result that lends support to many earlier studies in this field.

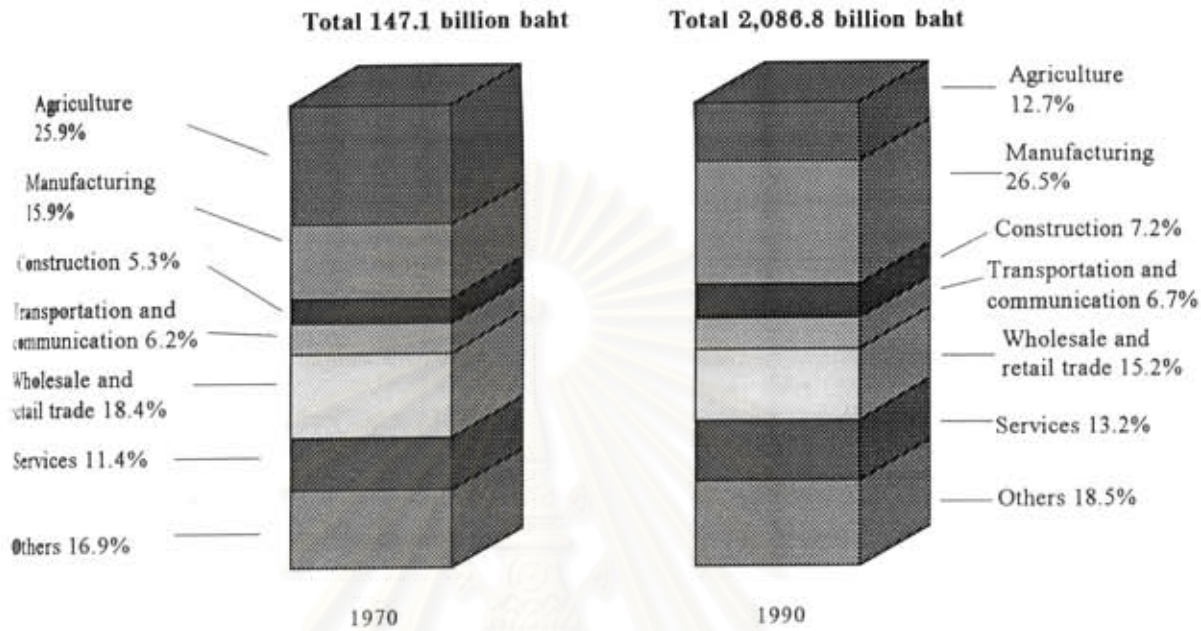
It should be noted that our analysis focuses only on the bank-based measures of financial development. However, the role of the stock market as a key element of the capital market should be emphasized for future research. The well-developed stock market may offer different financial services and provide an interesting relationship with growth.

4.6 *Conclusion*

In summary, the study shows that when choosing the appropriate variables to be used as financial variables, we are able to find the positive relationship between financial development and economic growth. The results from the Granger causality test suggest that one of the variables, loans and advances of commercial banks, establishes the unidirectional relationship

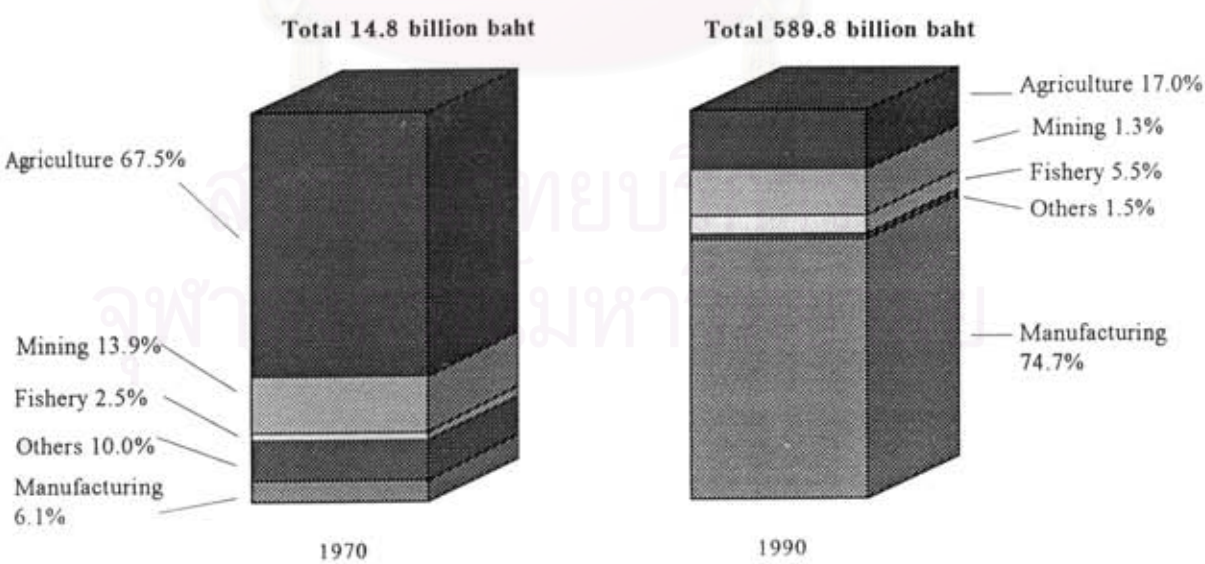
with growth and the results seem to support the 'supply-leading' hypothesis. However, the findings in this chapter are subject to the specific economic model specified in order to highlight the importance of the role of financial institutions in the economic development process. The role of commercial banks, which are the most powerful financial institutions in the Thai financial system, will be discussed in terms of studying the operational efficiency in banking operations. The effect of financial liberalization will be incorporated in the analysis in the next chapter.

Figure 4.1 STRUCTURE OF PRODUCTION (%)



Source : Bank of Thailand

Figure 4.2 STRUCTURE OF EXPORTS (%)



Source : Bank of Thailand