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APPENDICES

Appendix 1: Summary of the Liberalization Process

Foreign investors have faced various restrictions in Thai market. For example, they are prohibited from borrowing in local currency and cannot take the majority ownership of Thai corporations. However, the restrictions differ across industries. Recently, some of these barriers have been lowered. Withholding tax on dividend payments to foreign security owners has been reduced gradually from 25% to 10%. In addition, withholding on long-term capital gains which has been as high as 25% has been reduced to zero. Although, Thailand had adopted double taxation treaties during this decades, but not with all countries. The key deregulated policies are as follows:

1979-1980	Interest rate reform (remove the ceiling of 15%).
1984	A new scheme of exchange rate specification adopted (basket system).
1987	Inaugurate the Alien Board.
1988	- Repatriation of investment funds, dividends and profits as well as loan and interest repayments can be made freely without permission from Bank of Thailand. - Commercial banks are authorized to approve the purchase of foreign exchange for remittance abroad without limit.
1990	Declaration to accept the IMF's Article 8 obligation.
1991	Adopt double tax treaties.
1990-1992	Three-year financial reform plan such as deregulating interest rates and financial institutions' portfolio management and relaxing exchange controls.
1992	Effectively completed the liberalization of all types of interest rates.
1993	Operate Thai Rating Information Service.

Appendix 2: Summary of Income Tax Regulations and Securities Investment by Foreigners

Type of Income	Tax Rate
1. Income from direct investment in the SET*	
Capital Gains :	
- Individual Investor	- Tax free
- Juristic Investor	- 15% withholding tax
Dividends :	
- Individuals Investor	- 10% withholding tax
- Juristic Investor	- 10% withholding tax
Interest Income :	
- Individuals Investor	- 15% withholding tax
- Juristic Investor	- 15% withholding tax
2. Income from investment in the foreign investment funds registered in Thailand	
Capital Gains :	
- Individual Investor	- Tax free
- Juristic Investor	- 12.5% withholding tax for investment funds registered before Dec. 27, 1991.
	- 15% withholding tax for investment funds registered Since Dec. 27, 1991.
Dividends :	
- Individual Investor	- 10% withholding tax
- Juristic Investor	- 10% withholding tax

* *SET -- The Stock Exchange of Thailand*

Appendix 3: Generalized Method of Moments (GMM)

This study uses the generalized method of moments (GMM) to obtain a consistent and efficient estimate of Equation (7). The weighting matrix W_t is chosen optimally as in Hansen (1982). The orthogonality condition of Equation (7) implies that the moment restrictions as below to hold.

$$E[U_t \mid Z_{t-1}] = 0 \qquad \text{(A1)}$$

GMM chosen the parameters which minimizes the criterion function :

$$J_t = [{}^1/t \ \Sigma^t_{t=1} (U_t \otimes Z_{t-1})] \ W_t \ [{}'t \Sigma^t_{t=1} (U_t \otimes Z_{t-1})] \qquad \text{(A2)}$$

where W_t is the variance-covariance matrix of $T^{-1}\Sigma^t_{t=1} (U_t \otimes Z_{t-1})$, $\otimes$ is the Kronecker product, T is the number of observations.

The fact that expectation cannot be observed in the model does not matter as long as we have a large sample ($\lim_{t\to\infty}$). Hanson shows that the optimal weighting matrix is the one that minimizes the variance covariance. The minimized value of the quadratic form in Equation A2 is distributed χ^2 with MN-P degree of freedom, whereas M is the number of columns of Z_{t-1}, N is the number of test assets, and P is the number of parameters in the system. An iterated GMM is used to make the estimates in this study. The iterated GMM uses an identity matrix for W_t to obtain the first set of estimates which will be used to update W_t for obtaining a new set of the estimates. The updating is repeated until W_t converges.

The χ^2 statistic measures how close the errors are to zero after repeated iterations, and can be interpreted as indicator of the model's goodness of fit as it measures whether the quadratic maximum evaluated at the optimal parameter estimates is statistically different from zero. A high value of the χ^2 statistic signals that

the disturbances are correlated with the instrumental variables and that the model may be misspecified.

Appendix 4: Results from Using Projections from the Alien Board

Table A4-1: Testing market integration using the financial eligible assets sampling from stocks selected by mutual funds

System	Full sample	First sub-period	Second sub-period
	T_j	T_j	T_j
Hong Kong	0.119	2.29	0.121
	(0.509)	*(2.23)*	*(0.014)*
Singapore	-0.006	2.77	0.049
	(0.701)	*(3.01)*	*(0.199)*
Japan	0.138	7.81	-0.028
	(0.797)	*(3.95)*	*(0.063)*
UK	0.039	2.30	3.36
	(0.533)	*(2.81)*	*(3.13)*
US	-0.095	0.84	0.87
	(0.598)	*(3.20)*	*(2.83)*

Table A4-2 Testing market integration using the projected ineligible assets sampling from characteristics of active stock in Alien Board

System	Full sample	First sub-period	Second sub-period
	T_j	T_j	T_j
Hong Kong	3.76	3.75	4.68
	(2.79)	*(3.24)*	*(3.66)*
Singapore	3.82	4.49	4.93
	(3.34)	*(3.73)*	*(2.56)*
Japan	7.63	8.92	8.75
	(4.61)	*(3.44)*	*(4.18)*
UK	4.28	4.60	4.86
	(4.31)	*(3.82)*	*(5.05)*
US	2.13	1.87	2.71
	(2.87)	*(2.41)*	*(2.12)*

Appendix 5: Results from Using Ineligible Assets Sampling from Mutual Funds

Table A5-1: Testing market integration using the projected ineligible assets sampling from characteristics of stocks selected by mutual funds

System	Full sample	First sub-period	Second sub-period
	T_j	T_j	T_j
Hong Kong	3.79	4.18	5.73
	(2.23)	*(3.34)*	*(3.74)*
Singapore	4.78	4.86	5.29
	(3.57)	*(3.06)*	*(3.52)*
Japan	9.45	9.4	9.39
	(4.40)	*(5.32)*	*(5.44)*
UK	4.43	4.23	5.11
	(3.05)	*(2.94)*	*(3.48)*
US	2.71	1.93	3.23
	(2.33)	*(2.15)*	*(2.66)*

Appendix 6: Results from Using Market Index

Table A6-1: Test of market integration using the country market index as the eligible assets

System	Full sample	First sub-period	Second sub-period
	T_j	T_j	T_j
Hong Kong	2.49	3.09	2.74
	(2.35)	*(2.12)*	*(3.43)*
Singapore	3.58	4.05	2.91
	(2.58)	*(3.89)*	*(2.55)*
Japan	5.93	8.85	6.52
	(3.88)	*(4.16)*	*(3.37)*
UK	4.22	3.92	4.67
	(2.62)	*(2.02)*	*(3.46)*
US	1.97	1.47	2.30
	(2.64)	*(2.93)*	*(2.22)*

Appendix 7: Results from Further Classifying Eligible Assets into Two Sub-Groups

Table A7-1: Testing market integration using the financial eligible assets sampling from stocks selected by mutual funds

System	Full sample	First sub-period	Second sub-period
	T_j	T_j	T_j
Hong Kong	-0.115	1.23	-0.052
	(0.145)	*(3.26)*	*(0.183)*
Singapore	0.008	2.07	0.053
	(0.163)	*(3.68)*	*(0.051)*
Japan	-0.293	5.05	-0.023
	(0.0720)	*(2.93)*	*(1.13)*
UK	0.003	1.69	2.82
	(0.369)	*(2.38)*	*(3.37)*
US	-0.01	0.07	0.91
	(0.407)	*(3.04)*	*(2.60)*

Table A7-2: Testing market integration using the financial eligible assets sampling from stocks selected by mutual funds

System	Full sample	First sub-period	Second sub-period
	T_j	T_j	T_j
Hong Kong	0.107	2.98	0.074
	(0.098)	*(2.90)*	*(0.079)*
Singapore	0.068	3.56	0.166
	(0.173)	*(3.05)*	*(0.018)*
Japan	0.121	8.93	0.192
	(0.258)	*(2.21)*	*(0.147)*
UK	0.295	2.86	5.06
	(0.631)	*(3.29)*	*(5.36)*
US	0.018	1.12	1.22
	(0.287)	*(3.38)*	*(3.94)*

Appendix 8: Replication of the Edwards and Khan model

The original model of Edwards and Khan is estimated by ordinary least-squares method for Thailand. The data employed are the quarterly data sampled from 1980 to 1996, taken from various sources. The data are:

I - three-month interbank rate of Thailand (percentage) which obtain from the Bank of Thailand Monthly Statistical Bulletin;

i^* - three-month Eurodollar rate (percentage) taken from Datastream International of the Dun and Bradstreet Corporation;

M1 - narrow definition of money, defined as currency in circulation plus demand deposits (billions of baht) from the Bank of Thailand;

pc - Thailand's consumer price index (log) from the Bank of Thailand;

m - real money balances (log), defined as log M1-pc;

Y - Gross Domestic Product (GDP) of Thailand (billion of baht);

(Since the data for GDP are not available on a quarterly basis they are interpreted as described in Bank of Thailand (1991) and obtained from Bank of Thailand.)

π^e - expected inflation rate for Thailand (percentage) measured as $pc_t - pc_{t-4}$, (This is one of the possible measurement of the actual rate of inflation in the quarterly basis. It has been found to perform well.); and

e - spot exchange rate of the Thai baht against the US dollar (log) come from Datastream International of the Dun and Bradstreet Corporation.

The below table describes the results obtained from an ordinary least squares (OLS) estimation of the original Edwards and Khan approach. The results show the general model of interest rates estimated from quarterly data. The top panel (A) shows the results of a model which includes the lagged interest rate term whereas the bottom panel (B) presents the results of model excluding the lagged interest rate term. For the model with the lagged interest rates, the results are quite satisfactory in terms of expectation from the original model. All the coefficients have the expected signs. The positive sign on the coefficient of real income implies that the higher the income, the higher the nominal interest rate. The estimated coefficient on the lag of real money balance and inflation is found to be negative. The negative sign of the expectation can be explained by noting that this coefficient is influenced by many factors. One is the relationship between nominal rate and expected inflation which should lead to a positive sign. The other influence is expressed in the equilibrium demand for money which has a negative relation. Therefore, it should be noted that the expected sign of the reduced form coefficient for expected inflation was ambiguous. It depends on whether $\lambda (1-\beta)(\alpha_2 - \alpha_3)$ is greater or less than unity.

The most important coefficients are the coefficient of the foreign interest rate and the coefficient of the lagged interest, since they are the key parameters to calculate the openness parameter from the Edwards and Khan's point of view. The calculated degree of openness (which equals the combination of S_1 and S_5) is 0.9515. This parameter is quite high, indicating a high level of integration of the Thai financial sector with the rest of the world. However, one should recall that the openness parameter in this specification is the weighted average over the period of 1980 to 1996. In addition, the significance of the coefficient of the lagged interest rate and the

Durbin Watson statistics also give the recommendation that the model that excludes the lagged interest rate from the estimation would clearly not be appropriate since it will face serial correlation in its estimation. Panel B provides the evidence consistent with this suggestion. The Durbin Watson statistics show that serial correlation exists in the test. As a result, the interpretation of coefficient of the foreign investment rates for the model similar to that in Panel B as the degree of openness may pose to wrong conclusion. For example, Hataiseree and Phipps's paper employs this model in their study and the authors conclude that the degree of capital mobility appears not to have increase significantly nor to be as high as reported in other studies.

Table A8-1: Estimates of the Edwards and Khan Model

Panel A: Empirical estimates of the Edward and Khan Model for the Thai nominal interest rate

$$i_t = \underset{(1.899)}{1.50756} + \underset{(2.6539)}{0.34528}\, i^* + \underset{(6.08226)}{0.0426}\, y - \underset{(2.318)}{0.0095}\, m_{t-1} - \underset{(-2.7600)}{30.4459}\, \pi^e + \underset{(6.0822)}{0.5743}\, i_{t-1}$$

$R^2 = 0.6407$ DW = 2.0182

Panel B: Empirical estimates of the Edward and Khan Model for the Thai nominal interest rate excluding the lag of domestic rate

$$i_t = \underset{(1.5318)}{14.422} + \underset{(3.7445)}{0.5789}\, i^* + \underset{(2.4902)}{1.047}\, y - \underset{(2.0789)}{0.0088} m_{t-1} - \underset{(-3.6974)}{49.126}\, \pi^e$$

$R^2 = 0.416$ DW = 0.8397

BIOGRAPHY

Miss Pornanong Penpas was born in June 6, 1968 at Bangkok, Thailand. She received her bachelor degree in Business Administration from Faculty of Commerce and Accountancy, Chulalongkorn University in 1989 and obtained master degree in management information systems from University of Dallas in 1991. Then she started her Doctoral degree in Business Administration majoring in Finance with the Joint Doctoral Business Administration (JDBA) under Chulalongkorn University in 1992. Her current position is a lecturer at Department of Banking and Finance, Faculty of Commerce and Accountancy, Chulalongkorn University.