

REFERENCES

- Act on Undertaking of Finance Business, Securities Business and Credit Foncier Business, B.E. 2522.
- Al-Faraj, T.N., Alidi, A.S., and Bu-Bshait, K.A. 1993. *Evaluation of Bank Branches By Means of Data Envelopment Analysis*. International Journal of Operations and Production Management 13, 9: 45-53.
- Athanassopoulos, A.D., and Giokas, D. 1995. *The use of Data Envelopment Analysis in Banking Institutions: Evidence from the Commercial Bank of Greece*. Journal of Productivity Analysis, 6: 153-170.
- Athanassopoulos, A.D. 2000. *An Optimization Framework of the Triad: Service Capabilities, Customer Satisfaction and Performance*. Performance of Financial Institutions, Cambridge, England, Cambridge University Press: 312-335.
- Avkiran, Neemi. 2000. *Rising Productivity of Australian Trading Banks Under Deregulation*. Journal of Economics and Finance, 24, 2: 122-141.
- Bank of Thailand. 1998. *Bank of Thailand Economic Focus: Focus on the Thai crisis*. 2, 2 (April-June): 1.
- Bank of Thailand 2001. *Bank of Thailand: Super vision report 2000*.
- Banker, R.D., A. Charnes, and W.W Cooper. 1984. *Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment analysis*. Management Science, 30: 1078-92.
- Bauer, P.W. 1990. *Recent Developments in the Econometric Estimation of Frontiers*. Journal of Econometrics, 46: 39-56.
- Berger, A.N., DeYoung, R., Genay, H., Udell, G.F. 2000. *Globalization of Financial Institutions: Evidence from Cross-Border Banking Performance*, Brookings-Wharton Papers on Financial Services, 3.

- Berger, A.N., Humphrey, D.B. 1997. *Efficiency of financial institutions: international survey and directions for future research*. European Journal of Operational Research, 98, 2: 175-212.
- Berger, A.N., Mester, L.J. 1997. *Inside the black box: What explains differences in the efficiencies of financial institutions?*, Journal of Banking and Finance, 21: 895-947.
- Casu, B. and Molineux, P. 1999. *A Comparative Study of Efficiency in European Banking*. Working Paper, School of Accounting, Banking and Economics, University of Wales, UK.
- Chansarn, Supachet. 2005. *The efficiency in Thai financial sector after the financial crisis*. MPRA Paper 1776, University Library of Munich, Germany.
- Charnes, A., Cooper, W.W., Rhodes, E. 1978. *Measuring the Efficiency of decision Making Units*. European Journal of Operational Research, 2, 6: 429-444.
- Charnes, A., Cooper, W.W., Seiford, L.M. 1994. *Extension to DEA Models*, in: Charnes A., Cooper, W.W., Lewin, A.Y., Seiford, L.M. (eds.), *Data Envelopment Analysis: Theory, Methodology and Applications*. Kluwer Academic Publishers.
- Chunhachinda, Pornchai and Li, Li. 2007. *Efficiency of Thai Commercial Banks: Pre- vs. Post-1997 Financial Crisis*. Working Paper, School of Business, The University of The Thai Chamber of Commerce.
- Claessens, S., Demirgüç-Kunt, A., Huizinga, H. 2001. *How does foreign entry affect domestic banking markets?*. Journal of Banking and Finance, 25, 5: 891-911.
- Clarke, G., Cull, R., D'Amato, L., Molinari, A. 1999. *The effect of foreign entry on Argentina's domestic banking sector*, World Bank.
- Commercial Banking Act B.E. 2505.
- Cummins, J. David, Tennyson, Sharon and Weiss Mary A. 1998. *Efficiency, Scale Economies, and Consolidation In the U.S. Life-insurance Industry*. Journal of Banking and Finance 23: 325-357.

- Demirgüç-Kunt, A., Detragiache, E. 1998. *Financial liberalization and financial fragility*. IMF Working Paper WP/98/83.
- Demirgüç-Kunt, A., Levine, R. 2001. *Bank-based or market-based financial systems: cross country comparisons: Financial Structure and Economic Growth: A cross-country comparison of banks, markets and development* (Cambridge, MA: MIT Press).
- Denizer, C. 2000. *Foreign entry in Turkey's banking sector*. Working Paper, World Bank.
- Galagedera, Don U.A. and Edirisuriya, Piyada. 2002. *Performance of Indian Commercial Banks (1995-2002): an Application of Data Envelopment Analysis and Malmquist Productivity Index*.
- Giokas, D. 1991, *Bank Branch Operating Efficiency: A Comparative Application of DEA and the Log-Linear Model*, 19, 6: 549 - 557.
- Grifell-Tatje, E., and C.A.K. Lovell. 1997. *The sources of productivity change in Spanish Banking*, European Journal of Operational Research.
- Haag, S.E. and Jaska, P.V. 1995. *Interpreting Inefficiency Ratings: An Application of Bank Branch Operating Efficiencies*. Managerial and Decision Economics 16, 1: 7-15.
- Herberholz, Chantal. 2002. *The impact of foreign entry on the Thai domestic banking sector*. Master of Arts in International Economics and Finance, Chulalongkorn University, Bangkok.
- Igor, Jemric and Boris, Vujcic. 2001. *Efficiency of Banks in Transition: A DEA Approach*. Current Issues in Emerging Market Economics.
- International Monetary Fund. 1999. *International Financial Statistics Yearbook*.
- Kim, Sarah. 2004. *Merger-related productivity gains in the Canadian banking industry*, Master of Arts in Economics and Finance, The University of Hong Kong.
- Leibenstein, H. 1966. *Allocative Efficiency vs "X-efficiency"*, American Economic Review, 56: 392-415.

- Leightner, J.E., Lovell, C.A.K. 1998. *The impact of financial liberalisation on the performance of Thai banks*, Journal of Economics and Business, 50, 2: 115-131.
- Lin, Liang-Feng. 2002. *Deregulation and efficiency in Taiwan Life-insurance Industry*. Doctoral dissertation, Temple University.
- Mansor, Shazali Abu and Radam, Alias. 2000. *Productivity and Efficiency Performance of the Malaysian Life-insurance Industry*. Journal Ekonomi Malaysia, 34: 93-105.
- Montreevat, Sakulrat and Rajan, Ramkishan. 2001. *Financial Crisis, Bank Restructuring and Foreign Bank Entry: An Analytic Case Study of Thailand*. CIES Working Paper, 131.
- Okuda, H., Mieno, F. 1999. *What happened to Thai commercial banks in the pre-Asian crisis period: microeconomic analysis of Thai banking industry*. Hitotsubashi Journal of Economics, 40: 97-121.
- Oral, M. and Yolalan, R. 1990. *An Empirical Study on Measuring Operating Efficiency and Profitability of Bank Branches*. European Journal of Operational Research 46: 282-294.
- Seiford, L.M. and Thrall, R.M. 1990. *Recent Developments in DEA: The Mathematical Programming Approach in Frontier Analysis*. Journal of Econometrics, 46, 1-2: 7-38.
- Sherman, D., and F. Ladino. 1995. *Managing Bank Productivity Using Data Envelopment Analysis (DEA)*, 25: 60-73.
- Smith, P. 1990. *Data Envelopment Analysis Applied to Financial Statements*, OMEGA International Journal of Management Science, 18(2): 131-138.
- Vassiloglou, M. and Giokas, D. 1990. *A Study of The Relative Efficiency of Bank Branches: An Application of Data Envelopment Analysis*. Journal of The Operational Society 41, 7: 591 - 597.

- Vichyanond, Pakorn. 1995. *The Evolution of Thailand's Financial System: Future Trends*. TDRI Quarterly Review, 10, 3, (September): 16 - 20.
- William, Jonathan and Intarachote, Thida. 2002. *Financial Liberalization and Profit Efficiency in the Thai Banking System, 1990 - 1997: the Case of Domestic and Foreign Banks*.
- Kim, Yong-Duck. 2002. *WTO Negotiations, Financial Crisis, and Efficiency and Productivity in the Korean Market Insurance Market*. Working paper, College of Business and Economics, Soongsil University.

APPENDICES

APPENDIX A

Table 6: List of commercial banks and companies' code and foreign participation in 2003

Number	Company's name	Code	Foreign Participations
1	Bangkok Bank	BBL	48.8%
2	Krung Thai Bank	KTB	2.0%
3	Thai Farmers Bank	KBANK	49.0%
4	Siam Commercial Bank	SCB	45.8%
5	Bank of Ayudhya	BAY	17.4%
6	Thai Military Bank	TMB	0.0%
7	Siam City Bank	SCIB	2.2%
8	Bank of Asia	BOA	0.5%
9	DBS Thai Danu Bank	DTDB	78.8%
10	Standard Chartered Nakornthon Bank	SCNB	59.2%
11	Bank Thai	BT	75.0%
12	UOB Radanasin Bank	UOBR	75.0%

Table 7: List of finance companies and companies' code and foreign participation in 2003

Number	Company's name	Code	Foreign Participations
1	Asia Credit Co., Ltd.	ACL	33.9%
2	Ayudhya Investment and Trust Co., Ltd.	AITCO	0.8%
3	The Book Club Finance Co., Ltd.	BC	0.2%
4	Bangkok First Investment and Trust Co., Ltd.	BFIT	25.0%
5	Kiatnakin Finance Co., Ltd.	KK	33.6%
6	National Finance Co., Ltd.	NFS	48.0%
7	The Siam Industrial Credit Co., Ltd.	SICCO	7.7%
8	Tisco Finance Co., Ltd.	TISCO	59.7%

Table 8: List of Life-insurance companies and companies' code and foreign participation in 2003

Number	Company's name	Code	Foreign Participations
1	Bangkok Life Assurance Co., Ltd.	BLA	25.00%
2*	Krungthai Axa Life-insurance Co., Ltd.	KTAL	25.00%
3*	BIU Life-insurance Co., Ltd.	TPILife	0.00%
4*	Millea Life-insurance (Thailand)	TCA	25.00%
5	Thai Life-insurance Co., Ltd.	TLI	0.00%
6	Finansa Life Assurance Co., Ltd.	TPN	0.00%
7	Siam Commercial New york Life-insurance	SCNYL	25.00%
8*	Thai Cardif Life Assurance Co., Ltd.	CGULife	25.00%
9*	Siam Samsung Life Assurance Co., Ltd.	SSLI	25.00%
10	Ocean Life-insurance Co., Ltd.	OLIC	0.00%
11*	Thanachart Life Assurance Co., Ltd.	ZNLA	0.00%
12	Ayudhya Allianz C.P. Life Public Co.,Ltd.	AZCPLife	25.00%
13*	Generali Life Assurance (Thailand) Co., Ltd.)	PAC	25.00%
14	Prudential TSLife Assurance Public Co., Ltd.	PTSL	25.00%
15	Muang Thai Life Assurance Co., Ltd.	MTL	25.00%
16*	ACE Life Assurance Co., Ltd.	WALL	25.00%
17*	Max Life Assurance Co., Ltd.	BMLife	0.00%
18	Siam Life-insurance Co., Ltd.	SLI	25.00%
19	Saha Life-insurance Co., Ltd.	SAHA	0.00%
20	American International Assurance Co., Ltd.	AIA	100.00%
21	The SouthEast Life-insurance Co., Ltd.	SEIC	0.00%
22	Manulife-insurance (Thailand) Public Co., Ltd.	ILJH	25.00%
23*	Advance Life Assurance Co., Ltd.	AMLC	0.00%
24*	ING Life Limited	AETNA	25.00%

Note: * For the new life-insurance companies established in 1997

APPENDIX B

Guidelines for equity holding to Thai Financial Institutions

In order to restore the confidence in the financial sector, the Ministry of Finance and the Bank of Thailand announced the requiring commercial banks and finance companies in operation to increase their capital as a cushion against any potential loss from asset deterioration. All financial institutions are encouraged to take early action so as to prevent problem in the future.

To facilitate and expedite financial institutions' capital increase, the Bank of Thailand, with the approval of the Minister of Finance, has set the following guidelines for the financial institution's capital increase:

1. Guideline for foreign equity participation in Thai financial institutions

1.1 To help increase the efficiency in the financial institutions, the Foreign investors that have sound financial status were allowed to hold more than 49% of the share in the 15 commercial banks, 33 finance companies, and 12 credit foncier companies for a period of 10 years. After 10 years, foreign investors will not be forced to sell their shares but may not purchase any additional shares, unless the amount of foreign shareholdings is less than 49% of total shares.

Additional shares may be acquired to bring foreign shareholdings to 49% of total shares. For the holding of shares of the 58 suspended finance companies, the Financial Sector Restructuring Agency (FRA) shall follow the guideline of the Committee to Supervise the Merger and Acquisition of Financial Institutions announced on 13 October 1997. The guideline allows unlimited amount of shareholding by foreign shareholders up to period of 10 years. After 10 years, foreign investors may not purchase any more shares unless the amount held is less than 49% of total shares in which case additional shares maybe acquired until the 49% mark is reached.

1.2 The guideline shall be the same for foreign investors that are banks. The foreign bank that already has a full branch or a Bangkok International Banking Facility will be allowed to continue their existing operation. However, the authorities

reserve the right not to allow a foreign bank that has more than 49% stake in a Thai bank to have an additional full branch in Thailand.

2. Thai financial institutions' holdings of shares in other financial institutions

The authorities have the intention to apply the same guideline for Thai commercial banks and finance companies with sound financial status that wish to hold shares in other banks and finance companies. Nonetheless, there are legal limitations which prohibit a domestically incorporated commercial bank from holding other bank's shares unless approved by the Finance Minister on a case by case basis, and with a specified timeframe. Finance companies are also subject to the same legal constraints.

Therefore, the guideline regarding the shareholding in other financial institutions by domestically incorporated banks and finance companies will be as follows: The authorities will allow domestically incorporated banks and finance companies with sound financial status to have more than 49% stake in other financial institutions for a period of 10 years. After 10 years if the banks or finance companies request to maintain their ownership, the extension will be approved on the ten-year basis. During the extension period, banks and finance companies will not be forced to sell their shares. Additional shares maybe acquired to bring their shareholdings to 49% of total shares.

3. Common directors

Thai commercial banks and finance companies that are allowed to hold shares in other financial institutions according to 2 above may have the same directors as the financial institutions in which they hold shares for no more than 3 years. Further extension may be allowed if necessary. The Bank of Thailand believes that the above guidelines will assist in the capital increase of financial institutions and will provide equal treatment between Thai and foreign investors.

APPENDIX C

This section contributes to the statistical numbers of total inputs and outputs of both production and intermediation approaches for Thai commercial banks, Finance companies and Life-insurance companies.

Table 9: Descriptive of statistics for inputs and outputs of Thai bank companies (Intermediation approach)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	
X1	Average	2,427	2,890	3,126	3,445	3,029	3,211	3,309	3,163	3,327	
	Max	8,542	9,340	10,097	10,536	9,343	8,259	8,435	8,283	8,408	
	Min	211	273	348	691	628	692	721	766	744	831
	Standard deviation	2,444	2,830	2,972	3,133	2,746	2,819	2,590	2,725	2,410	2,558
X2	Average	7,209	8,339	9,945	8,655	8,925	10,743	11,551	10,943	10,806	11,114
	Max	22,811	24,227	26,976	20,452	20,873	29,339	33,956	30,130	29,846	29,879
	Min	1,594	1,731	1,814	1,814	2,039	2,433	2,271	2,423	2,300	2,073
	Standard deviation	6,929	7,902	8,610	6,816	7,194	8,624	10,303	9,505	9,208	9,289
X3	Average	209,361	249,890	284,310	319,347	362,593	360,457	379,312	393,766	415,179	430,901
	Max	653,635	766,849	841,931	946,548	969,780	957,172	1,033,511	1,071,931	1,062,665	1,114,910
	Min	17,870	23,256	29,774	46,762	60,958	48,130	58,484	57,650	51,571	46,156
	Standard deviation	205,160	234,443	259,536	291,833	314,048	301,911	324,182	332,939	337,222	365,756
Y1	Average	218,474	274,593	313,815	353,326	340,952	317,262	275,390	289,473	312,851	331,733
	Max	749,086	863,217	957,364	1,026,681	858,196	756,776	730,121	680,931	799,059	930,149
	Min	13,600	24,604	33,835	57,428	48,004	49,690	55,982	57,080	54,352	52,863
	Standard deviation	231,549	259,124	285,066	303,902	294,782	249,147	205,066	219,089	242,513	276,622
Y2	Average	3,078	3,550	3,759	5,140	5,192	4,854	4,546	4,367	5,226	6,556
	Max	11,522	13,351	14,625	21,574	20,127	26,692	18,245	12,427	14,526	20,825
	Min	137	411	661	830	363	468	277	38	902	1,041
	Standard deviation	3,345	3,803	4,065	5,926	6,001	7,369	5,221	3,782	4,001	5,959

X1 = Personnel expenses, X2 = Property Plant and Equipment, X3 = Total Deposits, Y1 = Loans, Y2 = Non-interest income, Unit: million baht.

Table 10: Descriptive of statistics for inputs and outputs of Thai banking (Production approach)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
X1										
Average	2,427	2,890	3,126	3,445	3,029	3,211	3,164	3,309	3,163	3,327
Max	8,542	9,340	10,097	10,536	9,343	8,259	7,951	8,435	8,283	8,408
Min	211	273	348	691	628	692	721	766	744	831
Standard deviation	2,444	2,830	2,972	3,133	2,746	2,819	2,590	2,725	2,410	2,558
X2										
Average	7,209	8,339	9,945	8,655	8,925	10,743	11,551	10,943	10,806	11,114
Max	22,811	24,227	26,976	20,452	20,673	29,339	33,956	30,130	29,846	29,879
Min	1,594	1,731	1,814	1,814	2,039	2,433	2,271	2,423	2,300	2,073
Standard deviation	6,929	7,902	8,610	6,816	7,194	8,624	10,303	9,505	9,208	9,289
Y1										
Average	209,361	249,890	284,310	319,347	382,593	360,457	379,312	393,766	415,179	430,901
Max	653,635	766,849	841,931	946,548	989,780	957,172	1,033,511	1,071,931	1,062,685	1,114,910
Min	17,870	23,256	29,774	46,762	60,958	48,130	58,484	57,650	51,571	46,156
Standard deviation	205,160	234,443	259,536	291,833	314,048	301,911	324,182	332,939	337,222	356,756

X1 = Personnel expenses, X2 = Property Plant and Equipment, Y1 = Total Deposits, Unit: million baht.

Table 11: Descriptive of statistics for inputs and outputs of Thai Finance companies (Intermediation approach)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
X1	Average	212	211	226	173	166	144	152	171	247
	Max	459	436	440	269	311	269	310	331	540
	Min	44	77	72	60	59	51	45	45	49
	Standard deviation	153	135	126	74	89	85	103	103	115
X2	Average	248	265	326	381	233	270	206	182	198
	Max	1,135	1,287	1,288	1,364	900	847	819	827	815
	Min	18	27	34	27	22	4	2	2	5
	Standard deviation	366	421	433	549	315	338	270	270	270
X3	Average	19,908	22,770	24,944	23,682	21,506	19,024	20,126	20,667	19,850
	Max	42,292	49,087	53,720	43,128	40,881	48,402	51,658	65,158	88,582
	Min	6,728	7,690	7,355	7,198	6,518	3,504	2,818	3,100	36
	Standard deviation	14,575	16,360	17,271	15,508	14,867	15,794	17,017	20,320	28,885
Y1	Average	20,771	25,384	27,566	22,395	17,516	13,349	13,425	16,355	17,555
	Max	46,263	52,560	54,473	42,496	34,434	32,299	33,289	49,315	78,108
	Min	4,049	6,023	6,883	6,203	4,267	3,225	2,534	2,137	36
	Standard deviation	16,654	19,501	19,493	15,946	12,635	10,970	11,469	16,235	25,723
Y2	Average	139	111	107	137	78	50	42	64	91
	Max	384	306	357	420	391	149	129	232	415
	Min	18	18	19	4	3	4	4	6	3
	Standard deviation	121	95	106	174	129	61	52	81	145

X1 = Personnel expenses, X2 = Property Plant and Equipment, X3 = Total Deposits, Y1 = Loans, Y2 = Non-interest Income, Unit: million baht.

Table 12: Descriptive of statistics for inputs and outputs of Thai Finance companies (Production approach)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Average	212	211	226	173	166	162	144	152	171	247
Max	459	438	440	259	311	366	269	310	331	540
Min	44	77	72	60	58	48	51	45	45	49
Standard deviation	153	135	126	74	89	123	85	103	115	193
Average	248	265	326	381	233	197	270	206	182	198
Max	1,135	1,287	1,288	1,364	900	874	847	819	827	815
Min	18	27	34	27	22	6	4	2	5	10
Standard deviation	366	421	433	549	315	301	338	270	270	269
Average	19,908	22,770	24,944	23,682	21,506	19,064	19,024	20,126	20,667	19,850
Max	42,292	49,087	53,720	43,129	40,881	34,500	48,402	51,658	65,159	89,592
Min	6,728	7,690	7,355	7,198	6,518	5,493	3,504	2,818	3,100	36
Standard deviation	14,575	16,360	17,271	15,508	14,867	12,309	15,794	17,017	20,320	28,885

X1 = Personnel expenses, X2 = Property Plant and Equipment, Y1 = Total Deposits, Unit: million baht.

Table 13: Descriptive of statistics for inputs and outputs of Thai Life-insurance companies (Production approach)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
X1									
Average	8,193	1,141	840	397	399	416	511	412	537
Max	40,000	5,669	5,173	4,084	4,090	4,182	4,893	3,630	4,281
Min	15	28	32	20	17	18	26	22	21
Standard deviation	17,782	2,230	1,492	867	869	876	1,019	746	953
X2									
Average	876	805	673	341	314	273	308	261	254
Max	2,219	2,233	2,336	2,436	2,351	2,278	2,167	2,198	2,081
Min	4	2	2	3	4	3	1	2	2
Standard deviation	891	869	740	611	565	510	555	489	470
Y1									
Average	3,962	3,860	5,103	2,444	2,637	3,008	3,771	4,566	5,343
Max	10,979	12,882	27,554	26,942	29,465	35,350	44,515	54,389	59,027
Min	15	30	48	0	1	3	4	13	12
Standard deviation	4,287	4,844	8,439	6,059	6,535	7,615	9,475	11,404	12,603

X1 = operating expenses, X2 = Property Plant and Equipment, Y1 = under writing income, Unit: million baht.

Biography

Mr. Naratip Wongsivarangkoon was born on November 16, 1982 in Krabi. At the undergraduate level, he graduated from the Faculty of Economics, Thammasat University in May 2004 with a Bachelor of Arts in economics degree, majoring in monetary economics. He joined the Master of Science in Finance program, Chulalongkorn University in June 2004.