UNIVERSITI PUTRA MALAYSIA

*THE IMPACT OF EXCHANGE RATE VOLATILITY
ON ECONOMIC GROWTH: A DYNAMIC PANEL
DATA ANALYSIS OF ASIAN COUNTRIES*

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THE IMPACT OF EXCHANGE RATE VOLATILITY ON ECONOMIC GROWTH: A DYNAMIC PANEL DATA ANALYSIS OF ASIAN COUNTRIES

By

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To My Parents and Ken

ABSTRACT

The issue of exchange rate volatility and its impact on economic performance has been the subject of numerous studies. However, the impact of exchange rate volatility on long-run economic growth remains an open question. The purpose of this project paper is to examine the impact of exchange rate volatility on economic growth in a panel of selected Asian Countries. Recent arguments on the relationship between exchange rate volatility and economic growth advanced by researchers into the literature of growth empirics are reviewed. Numerous measures of exchange rate volatility that have been used in previous studies are considered and then quantified as a proxy for the empirical study. Based on an augmented growth model, the dynamic panel data regression model are estimated using four different estimation methods. Conditional upon other determinants, the results show that exchange rate volatility has a robust and significant negative impact on economic growth in Asian countries. This finding suggests that coordination of exchange rate policies directed to reduce exchange rate volatility in a group of countries is deemed to be desired. Specifically, the fixed exchange rate regimes such as common currency in a group of Asian countries may be worth considered seriously by policymakers.

ABSTRAK

Isu pergolakan kadar pertukaran dan kesannya ke atas pencapaian ekonomi merupakan subjek yang hangat diperkajikan. Namun demikian, kesan pergolakan kadar pertukaran ke atas pertumbuhan ekonomi jangka panjang masih merupakan satu tanda tanya. Bagi mengatasi isu ini, kertas projek ini mengkaji kesan pergolakan kadar pertukaran ke atas pertumbuhan ekonomi dengan menggunakan data keratan lintang-siri masa di negara-negara Asia yang terpilih. Perdebatan-perdebatan mengenai perhubungan antara pergolakan kadar pertukaran dan pertumbuhan ekonomi yang dimajukan baru-baru ini oleh para penyelidik adalah diulas. Pelbagai ukuran pergolakan kadar pertukaran yang pernah digunakan dalam kajian-kajian lepas adalah dipertimbang dan kemudian dibentuk bagi dikaji secara empirik. Berdasarkan model pertumbuhan tokokan, empat kaedah penganggaran telah digunakan untuk menganggarkan model regresi dinamik data panel. Tertakluk kepada penentu-penentu yang lain, keputusan menunjukkan bahawa pergolakan kadar pertukaran mempunyai kesan negatif yang signifikan ke atas pertumbuhan ekonomi di negara-negara Asia. Hasil kajian ini mencadangkan bahawa penyelarasan dasar-dasar kadar pertukaran yang ditujukan kepada pengurangan pergolakan kadar pertukaran di dalam sekumpulan negara sesungguhnya diperlukan. Secara khususnya, rejim-rejim kadar pertukaran tetap seperti mata wang umum di dalam sekumpulan negara-negara Asia adalah berfaedah dipertimbangkan secara serius oleh para pembuat dasar.

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ERV	Exchange Rate Volatility
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
LSDV	Least Squares Dummy Variables
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PWT	Penn World Table
U.S.	United States

CHAPTER ONE

INTRODUCTION

Since the general floating of exchange rate in 1973, the issue of exchange rate volatility and its impact on economic performance has been the subject of numerous studies. In general, most of the previous studies were focused on international trade flows and foreign investment.

Recent episodes of currency crisis have refocused the discussion by questioning whether exchange rate volatility affects long-run economic growth. As observed during the European currency crisis 1992/93, the Mexican crisis 1994/95, and the Asian financial crisis 1997/1998, exchange rate volatility has disrupted the pattern of international trade and capital flows and led to economic slowdown.

However, based on the literature review in Chapter 2, the impact of exchange rate volatility on long-run economic growth remains an open question. To the best of my knowledge, only few studies have attempted to investigate this issue empirically and none of them focused specifically on the case of Asian countries. This study is conducted with the aim to fill this knowledge gap.

The organization of this study is structured as follows. Chapter 1 provides a brief background, problem statement, objective and significance of the study.

Chapter 2 is devoted to literature review in which both the theoretical and empirical issues related to economic growth and exchange rate volatility are covered. Chapter 3 discusses the theoretical framework and estimation methods for growth regression. Chapter 4 presents and discusses the empirical results. Finally, Chapter 5 summarizes and concludes the study.

1.1 A Brief Background

This section provides a brief background to the study. To bring the issue into perspective, comparisons of the economic variables of interest across Asian countries may shed more light.[1] In what follows, the discussion will be focused on economic growth, the degree of openness, and exchange rate movements. The data on these variables are provided in Tables 1.1 to 1.3.

As shown in Panel B of Table 1.1, the growth performance of Asian countries has been impressive since 1960s. The average annual growth rate of per capita GDP for the 15 countries under study was 3.9% for the period 1960–2000. This average annual growth rate was much higher compared to other regions of the world. For example, the average annual growth rate of per capita GDP for 24 OECD countries and 22 Sub-Saharan African countries were 2.9% and 0.5%, respectively.[2]

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[1] Due to data availability, the Asian countries covered in this study comprise Bangladesh, China, Hong Kong, India, Indonesia, Japan, South Korea, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, and Thailand.

[2] These figures are taken from Hoeffler (2002).

Table 1.1
The Level and Growth Rate of Per Capita GDP of
Selected Asian Countries: 1960-2000

	1960	1965	1970	1975	1980	1985	1990	1995	2000	Mean ($\bar{y}_{i\cdot}$) [c]
Panel A: Per Capita GDP (in constant dollars)										
Bangladesh	1057	1089	1105	963	973	1165	1278	1467	1684	1174
China	682	768	815	908	1069	1474	1787	2818	3747	1504
Hong Kong	3090	5056	6506	8145	12578	15151	20827	25674	26699	13975
India	847	927	1073	1094	1159	1369	1675	1979	2479	1378
Indonesia	936	896	1087	1418	1896	2278	2851	3645	3642	2078
Japan	4545	6839	11474	13164	15619	17743	22220	23268	24675	15867
S. Korea	1495	1803	2716	3657	4790	6569	9952	13552	15876	6609
Malaysia	2119	2498	2884	3590	4876	5448	6525	8705	9919	5145
Nepal	779	774	816	884	860	1001	1087	1242	1459	983
Pakistan	633	746	943	1019	1152	1445	1747	1903	2008	1300
Philippines	2015	2210	2396	2795	3289	2760	3009	3029	3425	2810
Singapore	2161	3086	5279	7881	11464	13527	17933	22642	28644	12501
Sri Lanka	1333	1385	1557	1659	1790	2262	2515	3066	3300	2077
Taiwan	1430	1969	2790	3917	5869	7511	10981	14785	n.a.	6906
Thailand	1091	1348	1822	2076	2730	3270	4833	6765	6857	3387
Mean ($\bar{y}_{\cdot t}$) [d]	1614	2093	2844	3545	4674	5531	7281	8969	9601	5180
Panel B: Growth Rate of Per Capita GDP (in percent) [a]										
Bangladesh		0.7	0.3	-2.4	0.3	3.7	1.9	2.8	2.8	1.3
China		2.6	1.3	2.2	3.4	6.7	4.0	9.6	5.9	4.5
Hong Kong		10.5	5.3	4.7	9.1	3.8	6.6	4.3	0.9	5.7
India		1.9	3.1	0.4	1.2	3.4	4.1	3.4	4.6	2.8
Indonesia		-0.8	4.0	5.5	6.0	3.8	4.6	5.0	0.2	3.5
Japan		8.6	10.9	2.8	3.5	2.6	4.6	0.9	1.2	4.4
S. Korea		3.9	8.6	6.2	5.7	6.5	8.7	6.4	3.4	6.2
Malaysia		3.3	2.9	4.5	6.3	2.3	3.7	5.9	2.7	4.0
Nepal		-0.1	1.1	1.7	-0.5	3.1	1.7	2.7	3.3	1.6
Pakistan		3.4	4.8	1.6	2.5	4.6	3.9	1.7	1.1	3.0
Philippines		1.9	1.6	3.1	3.3	-3.4	1.8	0.2	2.6	1.4
Singapore		9.6	11.3	8.4	7.8	3.4	5.8	4.8	4.9	7.0
Sri Lanka		0.8	2.4	1.3	1.5	4.8	2.2	4.0	1.6	2.3
Taiwan		6.6	7.2	7.1	8.5	5.1	7.9	6.1	4.9 [b]	6.8
Thailand		4.3	6.2	2.7	5.7	3.7	8.2	7.0	0.5	4.8
Mean ($\bar{y}_{\cdot t}$) [d]		3.8	4.7	3.3	4.3	3.6	4.6	4.3	2.7	3.9

Notes: [a] The growth rate is the average for each of the eight five-year periods 1960-1965, ..., 1995-2000. [b] Average growth rate for the period 1995-1998. [c] The mean $\bar{y}_{i\cdot}$ is the average growth rate for the period 1960-2000, except Taiwan for 1960-1998. [d] The mean $\bar{y}_{\cdot t}$ refers to the average of the 15 countries under study.

Source: Heston, Summers and Aten (2002), *PWT 6.1*.

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Despite this fact, there is substantial variation in growth performance within the region as captured by the level and growth rate of per capita GDP. Based on the data in Table 1.1, some countries those were relatively rich in 1960 have maintained their growth path over the past four decades while others were not. Also can be observed from the data is that some countries have grown faster than the other. For example, the so-called four East Asian "Tigers" (i.e., Hong Kong, South Korea, Singapore, and Taiwan) have achieved remarkable rates of economic growth. For the period 1960-2000, Hong Kong grew at 5.7% per year and South Korea, Singapore, and Taiwan maintained growth rates of over 6% per year. China, Indonesia, Japan, Malaysia, Pakistan, and Thailand grew moderately, achieving growth rates of 3-5 percent. Bangladesh, India, Nepal, Philippines, and Sri Lanka experienced relatively low growth rates, below 3% per year. These different growth performances have led several scholars seek to explain the underlying mechanism of growth as the understanding may provide important policy implications.

While Asian countries are different in several aspects, economic growth has in general been accompanied by structural transformation. For example, Malaysia and Thailand had successfully transformed their agricultural-based economy into manufacturing-based economy. Furthermore, among the fast growing countries, the economic success of Hong Kong, South Korea, Malaysia, Singapore, Taiwan, and Thailand are general attributed to their outward-oriented policies. In fact, openness to trade has been identified as one of the main contributing factors of economic growth.

Table 1.2 shows the degree of openness to trade of the 15 Asian countries for the period 1965-2000. As can be seen from the table, countries with higher degree of openness to trade are generally the country that grows faster than the others. Singapore, Hong Kong, and Malaysia are the obvious example in this case. To a lesser extent, this observation is also found in Indonesia, South Korea, Taiwan, and Thailand.

Table 1.2
Degree of Openness to Trade of Selected Asian Countries: 1965-2000

	1965	1970	1975	1980	1985	1990	1995	2000
Bangladesh	12.0	13.8	12.0	17.8	15.5	21.9	27.7	30.9
China	8.9	6.3	9.0	11.7	28.1	30.7	37.5	53.5
Hong Kong	78.8	99.5	88.4	106.8	126.2	193.0	284.0	309.6
India	18.4	12.9	14.0	18.7	18.0	18.0	24.5	24.6
Indonesia	37.5	42.0	58.2	58.6	42.3	40.8	50.4	45.0
Japan	8.7	10.9	12.7	14.4	15.2	16.3	17.9	21.1
S. Korea	6.1	14.9	23.9	35.2	35.2	43.0	59.7	86.3
Malaysia	74.6	76.9	71.5	84.8	89.0	127.0	183.6	194.2
Nepal	33.7	18.3	22.5	31.1	31.2	31.6	58.5	55.2
Pakistan	28.3	22.4	33.2	36.6	33.3	38.9	37.1	34.6
Philippines	40.2	35.3	34.1	47.5	39.1	58.4	81.6	76.3
Singapore	208.1	218.1	171.6	229.8	220.9	301.3	341.0	341.6
Sri Lanka	81.3	70.3	54.0	73.8	65.8	64.1	80.5	100.2
Taiwan	23.8	40.3	54.3	67.0	67.5	82.8	91.4	n.a.
Thailand	37.6	42.8	38.9	45.2	42.8	70.2	90.3	101.2

Note: Openness is defined as exports plus imports as a percentage of GDP.

Source: Heston, Summers and Aten (2002), *PWT 6.1*.

However, the benefits gain from openness does not come without its cost. Countries those are very open in nature always subject to external development. One of the main concerns is the movement of exchange rate. Exchange rate fluctuations, which create uncertainty to the conduct of businesses across countries, tend to depress international trade.

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Table 1.3 shows the level and volatility of exchange rates vis-à-vis the U.S. dollar for the 15 Asian Countries over the period 1960-2000. In general, the movements of exchange rates are irregular and fluctuate over time in most of the countries. Hence, it is not surprising that exchange rate volatilities are large and persistence over time. A clearer observation is provided in Figures 1.1 and 1.2.

1.2 Statement of Problem

In the current international monetary system, the recurrent occurrences of excessive volatility of exchange rate and their large and persistence misalignment have been identified as one of the serious economic problems facing national monetary authorities and international organizations such as International Monetary Fund and World Bank. As observed during the European currency crisis 1992/93, the Mexican crisis 1994/95 and the Asian financial crisis 1997/1998, exchange rate volatility has disrupted the pattern of international trade and capital flows and led to economic slowdown. However, the impact of exchange rate volatility on long-run economic growth remains an open question.
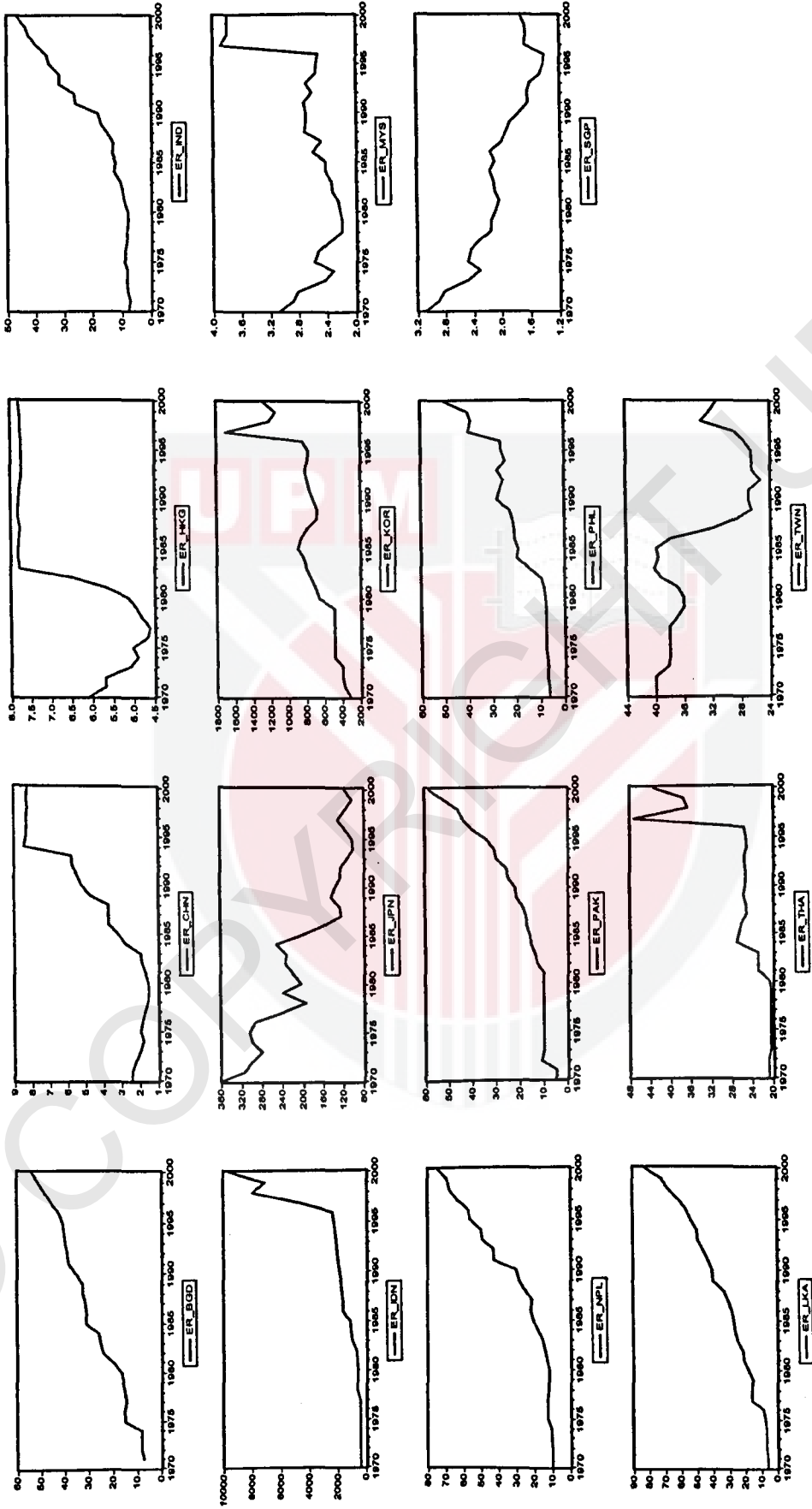
Table 1.3
The Level and Volatility of Nominal Exchange Rate of
Selected Asian Countries: 1960-2000

	1960	1965	1970	1975	1980	1985	1990	1995	2000	Mean $(\bar{y}_{i.})$ [c]
Panel A: Nominal Exchange Rate [a]										
Bangladesh	n.a.	n.a.	n.a.	14.826	16.251	31	35.79	40.75	54	28.4
China	2.462	2.462	2.462	1.966	1.53	3.202	5.222	8.317	8.277	3.7
Hong Kong	5.709	5.711	6.079	5.033	5.13	7.811	7.801	7.732	7.796	6.5
India	4.773	4.775	7.576	8.937	7.93	12.166	18.073	35.18	46.75	15.5
Indonesia	n.a.	235	378	415	626.75	1125	1901	2308	9595	1727.2
Japan	358.22	360.9	357.65	305.15	203	200.5	134.4	102.83	114.9	234.1
S. Korea	65	271.78	316.65	484	659.9	890.2	716.4	774.7	1264.5	608.0
Malaysia	3.06	3.059	3.078	2.588	2.222	2.427	2.702	2.542	3.8	2.8
Nepal	7.619	7.619	10.125	12.5	12	20.7	30.4	56	74.3	24.1
Pakistan	4.768	4.77	4.791	9.875	9.875	15.94	21.845	34.165	58.029	17.0
Philippines	2.02	3.91	6.435	7.498	7.6	19.032	28	26.214	49.998	15.2
Singapore	3.06	3.06	3.08	2.49	2.094	2.105	1.745	1.414	1.732	2.3
Sri Lanka	4.75	4.775	5.958	7.713	18	27.408	40.24	54.048	82.58	25.4
Taiwan	36.38	40	40	38	36	39.86	26.889	26.489	31.26	35.3
Thailand	21.14	20.83	20.928	20.4	20.63	26.65	25.29	25.19	43.268	24.4
Panel B: Exchange Rate Volatility [b]										
Bangladesh		n.a.	n.a.	18.88	3.39	14.10	3.26	2.66	5.80	8.29
China		0	0	6.92	5.72	16.59	10.74	11.58	0.10	6.46
Hong Kong		0.25	1.55	4.60	3.83	9.11	0.27	0.24	0.17	2.50
India		0.24	12.25	5.35	2.43	10.1	9.17	15.25	5.90	7.59
Indonesia		0	10.93	1.96	10.19	13.32	12.18	3.96	43.62	13.74
Japan		0.95	0.36	6.44	15.90	8.93	13.04	6.29	11.98	7.99
S. Korea		40.6	3.23	9.37	7.27	6.18	6.20	3.30	31.06	13.40
Malaysia		0.29	0.32	7.83	3.55	1.79	4.17	2.87	11.35	4.02
Nepal		0.00	6.60	4.53	0.80	11.61	8.91	13.84	5.88	6.52
Pakistan		0.24	0.50	28.13	0.00	10.53	6.62	9.50	11.25	8.35
Philippines		18.86	12.95	3.45	0.96	23.44	8.34	8.05	16.37	11.55
Singapore		0.26	0.39	7.03	3.37	2.36	4.92	4.40	5.17	3.49
Sri Lanka		0.13	4.93	5.84	21.60	8.92	8.20	6.11	8.91	8.08
Taiwan		1.99	0	1.01	1.07	2.53	8.12	2.34	10.48	2.89
Thailand		0.29	0.25	0.55	0.24	6.27	2.01	0.65	25.22	4.44

Notes: [a] The exchange rate is measured in domestic currency per unit of USD. [b] The exchange rate volatility is defined as absolute percentage change of the exchange rate and averaged for each of the eight five-year periods 1960-1965, ..., 1995-2000. [c] The mean $\bar{y}_{i.}$ is the average for the period 1960-2000, except Bangladesh (1971-2000) and Indonesia (1965-2000).

Sources: Data are obtained from IMF, *International Financial Statistics*, except Taiwan from Heston, Summers and Aten (2002), *PWT 6.1*.

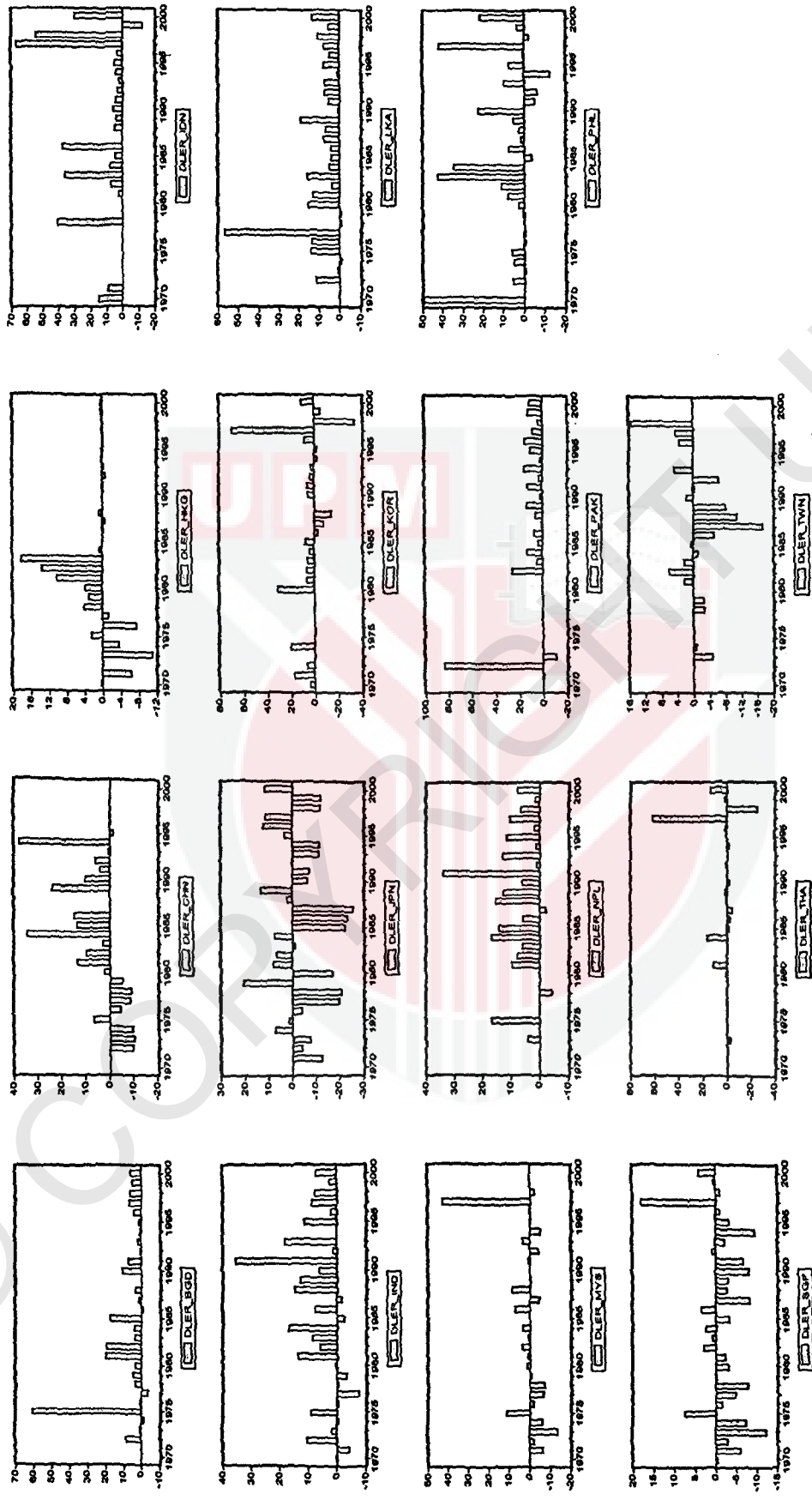Figure 1.1: Exchange Rate of Selected Asian Currencies Vis-à-vis U.S. Dollar

Sources: Data are obtained from IMF, *International Financial Statistics*, except Taiwan from Heston, Summers and Aten (2002), *PWT 6.1.*

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Figure 1.2: Annual Percentage Change of Exchange Rate of Selected Asian Currencies Vis-à-vis U.S. Dollar

Sources: Data are obtained from IMF, *International Financial Statistics*, except Taiwan from Heston, Summers and Aten (2002), *PWT 6.1*.

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1.3 Objective of the Study

Many studies have investigated the impact of exchange rate volatility on international trade flows, investment and other aspects of economic performance. However, little empirical study has been done on the issue of exchange rate volatility and long-run economic growth, especially in the context of Asian countries. Therefore, the main objective of this study is to examine the impact of exchange rate volatility on long-run economic growth based on a panel dataset of selected Asian countries, namely Bangladesh, China, Hong Kong, India, Indonesia, Japan, South Korea, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, and Thailand.

The specific objectives of this study are as follows:

1) To examine the sensitivity of the results to different methods of estimation.
2) To examine the sensitivity of the results to different measures of exchange rate volatility.

1.4 Significance of the Study

The impact of exchange rate volatility on economic performance has always been a major concern of policymakers. An understanding of such impact and its mechanism constitutes one motivation behind the choice of exchange rate regime and the formulation of exchange rate policy.

Furthermore, the setting of this study goes beyond individual country and argues that coordination of exchange rate policies in the regional context may play an important role in enhancing long-run growth prospect. Hence, this study may be used as a background paper for policy discussion.

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