

Real and Financial Integration in East Asia

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Main Issues

- What are the empirical evidences on real and financial integration in East Asia?
- Did continuing trade and financial integration lead to a higher economic interdependence- both regionally and globally- in East Asia?
- What are the policy challenges to promote regional financial integration and stability?

Measurement of Real and Financial Integration

- Price and quantity measures of trade and financial market integration
- Macroeconomic Measures (1): *Cross-country Output and consumption correlation*
- Macroeconomic Measures (2): *VAR Analysis of output and consumption interdependence*

East Asia:

- EA10 – PRC; Hong Kong, China; Indonesia; Japan; Rep of Korea; Malaysia; Philippines; Singapore; Taipei,China; Thailand
- EA9 – same, excluding Japan

Trade with Selected Economies (as % of Total Trade)

	Intraregional Trade ¹			Trade with Japan			Trade with US		
	1995	2000	2006	1995	2000	2006	1995	2000	2006
PRC	29.7	28.5	29.8	20.4	17.5	11.8	14.5	15.7	14.9
Hong Kong, China	54.1	58.3	64.9	10.7	8.9	7.7	14.4	14.8	9.8
Indonesia	30.6	35.9	48.7	25.0	20.7	14.6	12.9	12.4	8.0
Korea, Rep of	22.9	27.5	34.4	18.6	15.7	12.3	20.6	20.2	12.2
Malaysia	35.0	40.5	45.6	20.1	16.7	10.8	18.5	18.8	16.0
Philippines	27.1	36.1	43.9	19.8	16.7	15.0	25.1	24.5	17.3
Singapore	39.2	41.6	50.1	14.6	12.3	6.8	16.6	16.2	11.3
Taipei, China	29.0	32.2	43.6	20.2	19.1	14.7	21.9	20.8	12.9
Thailand	25.5	30.3	35.0	22.9	19.5	16.4	13.7	16.8	10.9
East Asia 9	35.5	37.5	40.9	17.7	15.4	11.4	17.0	17.4	12.9
<i>Memo Items:</i>									
EU-25	65.1	65.1	65.4	3.0	2.6	1.7	6.9	8.5	6.1
NAFTA	42.0	46.8	42.0	11.4	8.3	5.9	21.2	24.0	20.7

¹Composed of 9 selected Asian economies.

Source: IMF Direction of Trade Statistics.

Trade with Selected Economies (as % of GDP)

	Intraregional Trade ¹			Trade with Japan			Trade with US		
	1995	2000	2006	1995	2000	2006	1995	2000	2006
PRC	5.7	5.6	9.9	3.9	3.5	3.9	2.8	3.1	5.0
Hong Kong, China	68.7	71.8	111.5	13.6	10.9	13.2	18.3	18.2	16.8
Indonesia	5.9	10.4	13.8	4.8	6.0	4.1	2.5	3.6	2.3
Korea, Rep of	5.9	8.9	11.2	4.8	5.1	4.0	5.3	6.6	4.0
Malaysia	29.9	40.4	44.5	17.1	16.7	10.6	15.7	18.7	15.6
Philippines	8.2	17.3	18.4	6.0	8.0	6.3	7.6	11.7	7.2
Singapore	56.5	61.1	96.9	21.1	18.1	13.2	23.9	23.8	21.9
Taipei,China	11.4	14.5	25.5	7.9	8.6	8.6	8.6	9.3	7.5
Thailand	10.3	16.2	22.0	9.3	10.4	10.3	5.5	9.0	6.9
East Asia 9	13.6	15.4	19.3	6.9	6.3	5.4	6.6	7.1	6.1
<i>Memo Items:</i>									
EU-25	14.7	18.9	20.8	0.7	0.8	0.5	1.6	2.5	1.9
NAFTA	4.8	6.1	5.8	1.3	1.1	0.8	2.4	3.1	2.9

¹Composed of 9 selected Asian economies.

Source: IMF Direction of Trade Statistics and IMF World Economic Outlook database.

Estimated AR-1 Coefficients of the Real Exchange Rate

A. Jan 1990 – Dec 1996

	PRC	HKG	INO	KOR	MAL	PHI	SIN	TAP	THA	JPN	US
Average	---	0.871	0.870	0.917	0.861	0.848	0.850	0.636	---	0.924	0.881
exc. JPN	---	0.854	0.852	0.907	0.842	0.833	0.826	0.637	---	---	0.866

B. Jan 2000 – Dec 2007

	PRC	HKG	INO	KOR	MAL	PHI	SIN	TAP	THA	JPN	US
Average	0.820	0.822	0.889	0.880	0.838	0.934	0.808	0.818	0.911	0.311	0.955
ex.PRC, THA	---	0.794	0.879	0.855	0.820	0.932	0.790	0.779	---	0.289	0.946
and JPN	---	0.910	0.915	0.929	0.922	0.980	0.914	0.918	---	---	0.949

Price Measures of Financial Market Integration

Standard Deviations of yields (61-day moving avg)

- Local-currency government bond yields (5-yr & 10-yr)
- Local currency interbank offer rates (overnight, 1-mo & 12-mo)
- Daily standard deviation of Asia-9 and Asia-10 vs USD market

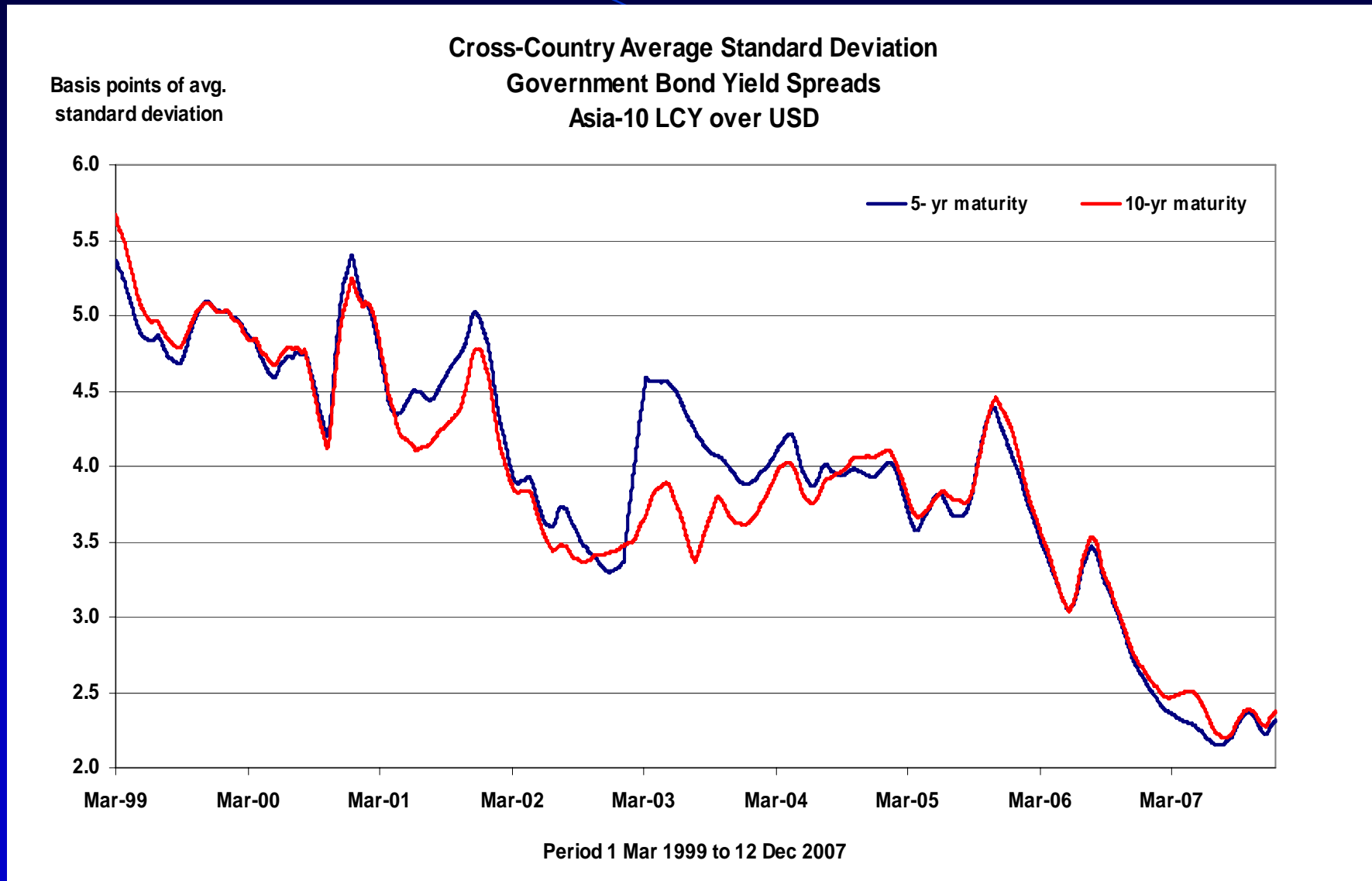
Correlation of Stock prices

- Correlation of quarterly increase in stock price index (in US dollar)

Covered Interest Differentials

- Daily interbank rates (vis-à-vis the US rate and Japanese rate)

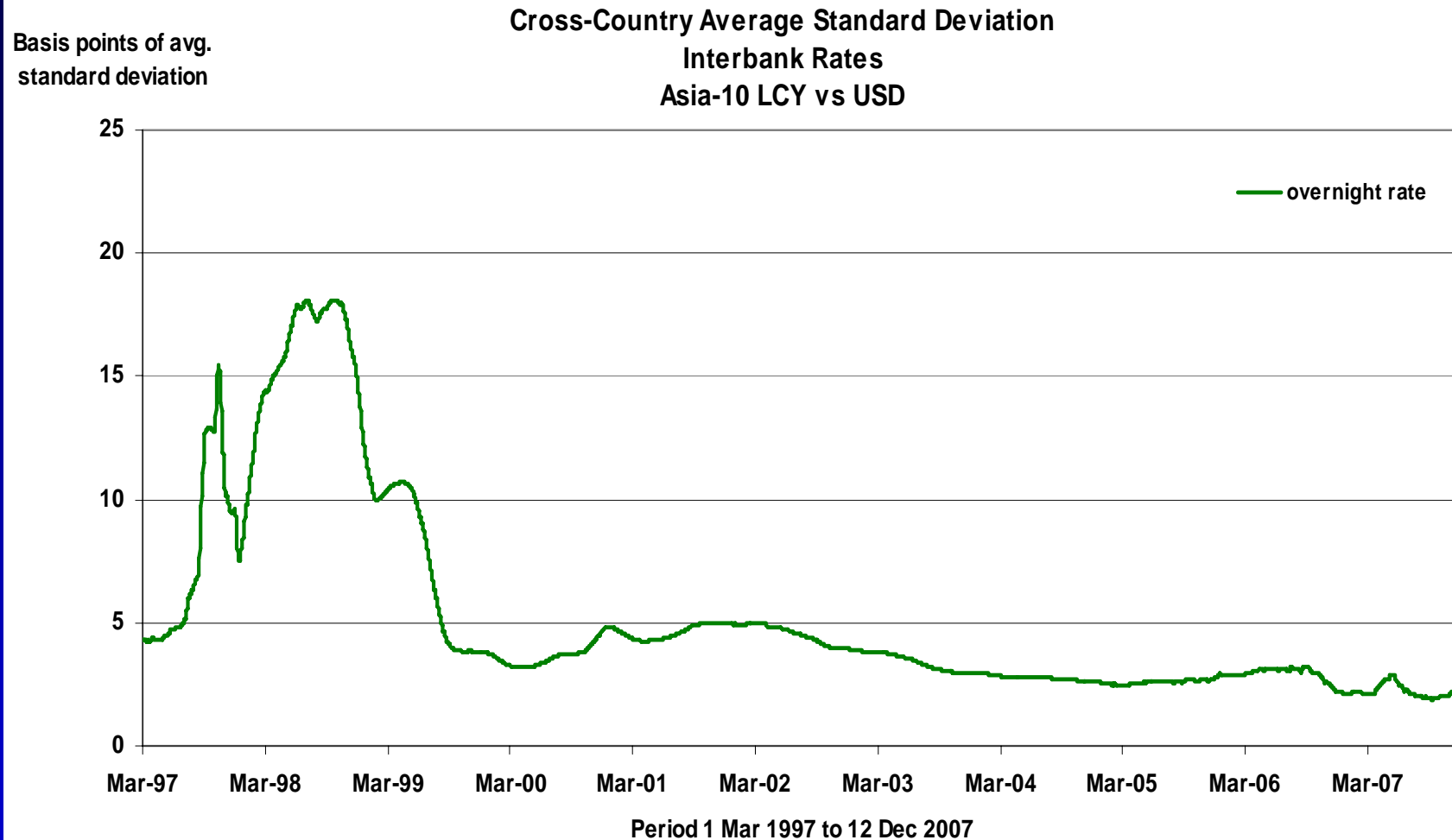
Bond Market Integration – Asia 10



Source: Bloomberg.



Interbank Market Integration – Asia 10



Source: Bloomberg.

Correlation Analysis: Stock Price Indices

1990:Q2 – 1996:Q4

	PRC	HKG	INO	KOR	MAL	PHI	SIN	TAP	THA	JPN	US
PRC	1	0.24	0.06	<i>-0.47</i>	0.00	0.02	<i>-0.26</i>	<i>-0.09</i>	<i>-0.33</i>	<i>-0.49</i>	0.14
JPN	<i>-0.49</i>	<i>-0.15</i>	<i>-0.10</i>	0.33	0.18	0.17	0.27	0.34	<i>-0.03</i>	1	<i>-0.03</i>
EA10	<i>-0.15</i>	0.35	0.34	0.06	0.46	0.45	0.45	0.28	0.35	0.06	0.33

2000:Q1 – 2007:Q2

	PRC	HKG	INO	KOR	MAL	PHI	SIN	TAP	THA	JPN	US
PRC	1	0.25	0.13	0.03	0.34	0.22	0.26	0.15	0.02	0.23	0.28
JPN	0.23	0.63	0.50	0.60	0.46	0.47	0.57	0.57	0.54	1	0.53
EA10	0.18	0.54	0.55	0.57	0.56	0.58	0.64	0.58	0.57	0.51	0.53

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Source: Bloomberg.

Deviations from Covered Interest Parity

Country	vis-à-vis USD IBOR		vis-à-vis JPY IBOR	
	Average, 2000-03	Average, 2004-07	Average, 2000-03	Average, 2004-07
PRC	0.019	0.016	0.025	0.030
Hong Kong, China	0.002	0.006	0.023	0.020
Indonesia	---	0.043	---	0.070
Korea, Rep. of	---	0.005	---	0.030
Malaysia	---	0.001	---	0.024
Philippines	0.280	0.275	0.299	0.295
Singapore	0.005	0.004	0.028	0.031
Taipei, China	---	0.024	---	0.009
Thailand	---	0.023	---	0.019
Japan	0.023	0.026	---	---

¹Composed of 9 selected Asian economies.

Source: IMF Direction of Trade Statistics and IMF World Economic Outlook database.

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Quantity Measures of Financial Market Integration

Cross-border holdings of international financial assets

- Data sourced from the IMF Coordinated Portfolio Investment Survey (CPIS), 1997, 2001-2005.
- Bilateral asset holdings between 67 source economies (8 East Asia) and 223 destination countries/territories.
- Breakdown of a country's stock of total portfolio, equity, long-term and short-term debt securities by the residency of the nonresident issuers.

Portfolio Investment (in billion US\$) In East Asia, 2001

Countries	Assets in:			Total	Liabilities from:			Total
	A9	Japan	US		A9	Japan	US	
PRC					10.03	1.67	3.00	20.26
Hong Kong, China	23.10	9.25	39.25	205.60	5.49	6.12	32.05	96.69
Indonesia	0.15	0.00	0.25	0.72	1.01	0.16	1.84	5.55
Korea, Rep of	1.54	0.18	3.76	8.03	8.33	5.83	34.47	76.78
Malaysia	0.78	0.02	0.21	2.28	9.77	2.54	4.26	22.59
Philippines	0.12	0.01	1.84	2.13	2.63	1.56	4.02	12.73
Singapore	22.03	10.55	18.01	105.24	3.52	2.13	22.82	50.70
Taipei, China					3.46	0.48	19.86	41.09
Thailand	0.25	0.00	0.29	0.83	3.72	1.04	2.70	12.01
EA9	47.97	20.01	63.62	324.83	47.97	21.52	125.02	338.39
	<i>(14.8)</i>	<i>(6.2)</i>	<i>(19.6)</i>	<i>(100.0)</i>	<i>(14.2)</i>	<i>(6.4)</i>	<i>(36.9)</i>	<i>(100.0)</i>
Japan	21.52		490.02	1,289.75	20.01		197.84	542.31
EA10	69.5	20.01	553.64	1,614.58	67.98	21.52	322.86	880.70
	<i>(4.3)</i>	<i>(1.2)</i>	<i>(34.3)</i>	<i>(100.0)</i>	<i>(7.7)</i>	<i>(2.4)</i>	<i>(36.7)</i>	<i>(100.0)</i>

Source: IMF Coordinated Portfolio Investment Survey (CPIS).



Portfolio Investment (in billion US\$) In East Asia, 2006

Countries	Assets in:			Total	Liabilities from:			Total
	A9	Japan	US		A9	Japan	US	
PRC					115.70	10.27	75.31	281.64
Hong Kong, China	139.80	18.84	64.87	592.48	28.91	11.72	87.52	233.68
Indonesia	0.29	0.00	0.11	1.51	5.74	0.92	14.07	38.91
Korea, Rep of	9.78	2.62	30.41	83.52	32.76	9.11	123.88	280.52
Malaysia	2.67	0.25	0.82	7.19	18.30	1.55	15.40	59.38
Philippines	1.32	0.01	3.09	7.16	1.99	1.60	10.99	30.25
Singapore	74.27	6.50	37.09	244.58	12.48	7.50	52.73	126.08
Taipei,China					7.35	2.66	74.45	145.09
Thailand	0.96	0.01	0.36	5.14	5.86	1.19	13.05	37.80
EA9	229.09	28.23	136.75	941.58	229.09	46.52	467.40	1,233.37
	<i>(24.3)</i>	<i>(3.0)</i>	<i>(14.5)</i>	<i>(100.0)</i>	<i>(18.6)</i>	<i>(3.8)</i>	<i>(37.9)</i>	<i>(100.0)</i>
Japan	46.52		797.61	2,343.48	28.23		585.57	1,434.92
EA10	275.61	28.23	934.36	3,285.06	257.32	46.52	1,052.97	2,668.29
	<i>(8.4)</i>	<i>(0.9)</i>	<i>(28.4)</i>	<i>(100.0)</i>	<i>(9.6)</i>	<i>(1.7)</i>	<i>(39.5)</i>	<i>(100.0)</i>

Source: IMF Coordinated Portfolio Investment Survey (CPIS).

Summary of Price and Quantity Measures

- Intraregional trade among East Asian economies increased steadily. The share of global markets in Asian trade has been declining but still remains substantial.
- Cross-border standard deviations in government bond yields and overnight interbank rates have increasingly converged among East Asian economies since the Asian financial crisis, but still remains substantial.
- The degree of co-movement in stock prices of East Asian economies increased substantially after the crisis.
- The covered interest differential vis-à-vis the US rate has been smaller than that vis-à-vis the Japanese interbank rate over the time, indicating that the degree of integration with global financial markets has been larger than the extent of regional financial integration.
- Intraregional financial integration measured by holdings of cross-border financial assets is increasing, but it remains limited, falling behind that of integration with global financial markets.

Consumption and Output Correlation Estimation

- Quarterly Data: consumption growth, GDP growth
- Estimation Period: 1990-1996 (before Asian-Crisis), 2000-2007:Q2 (after Asian-Crisis)
- East Asia: PRC; Hong Kong, China; Indonesia; Japan; Rep of Korea; Malaysia; Philippines; Singapore; Taipei, China; Thailand

Correlation Analysis: Output

1990:Q2 – 1996:Q4

2000:Q1 – 2007:Q2

	HKG	INO	KOR	MAL	PHI	PRC	SIN	TAI	THA	JPN	US
HKG	1	0.10	-0.05	-0.02	-0.09	0.22	-0.14	-0.10	0.29	-0.16	-0.04
INO	0.10	1	-0.32	-0.31	0.02	-0.18	-0.25	-0.18	0.07	0.25	0.02
KOR	-0.05	-0.32	1	0.16	0.19	-0.40	-0.01	0.25	0.21	-0.14	-0.18
MAL	-0.02	-0.31	0.16	1	-0.10	-0.29	0.16	0.20	-0.05	0.00	-0.14
PHI	-0.09	0.02	0.19	-0.10	1	-0.10	0.04	-0.22	0.07	0.18	0.45
PRC	0.22	-0.18	-0.40	-0.29	-0.10	1	0.08	0.08	0.07	-0.29	0.21
SIN	-0.14	-0.25	-0.01	0.16	0.04	0.08	1	0.09	-0.34	-0.21	0.07
TAI	-0.10	-0.18	0.25	0.20	-0.22	0.08	0.09	1	0.16	-0.12	0.19
THA	0.29	0.07	0.21	-0.05	0.07	0.07	-0.34	0.16	1	-0.06	-0.03
JPN	-0.16	0.25	-0.14	0.00	0.18	-0.29	-0.21	-0.12	-0.06	1	-0.09
AVG	0.00	-0.09	-0.01	-0.03	0.00	-0.09	-0.06	0.02	0.05	-0.06	0.05

	HKG	INO	KOR	MAL	PHI	PRC	SIN	TAI	THA	JPN	US
HKG	1	0.26	0.27	0.43	0.39	0.31	0.73	0.61	0.25	0.34	0.43
INO	0.26	1	0.03	0.32	0.02	-0.01	0.26	0.03	0.40	0.13	0.12
KOR	0.27	0.03	1	0.39	0.27	-0.19	0.36	0.36	0.13	0.36	0.02
MAL	0.43	0.32	0.39	1	0.47	-0.02	0.42	0.43	0.31	0.55	0.21
PHI	0.39	0.02	0.27	0.47	1	0.27	0.40	0.38	0.16	0.18	0.16
PRC	0.31	-0.01	-0.19	-0.02	0.27	1	0.40	0.29	0.01	-0.20	0.38
SIN	0.73	0.26	0.36	0.42	0.40	0.40	1	0.78	0.40	0.25	0.48
TAI	0.61	0.03	0.36	0.43	0.38	0.29	0.78	1	0.21	0.22	0.47
THA	0.25	0.40	0.13	0.31	0.16	0.01	0.40	0.21	1	0.07	0.12
JPN	0.34	0.13	0.36	0.55	0.18	-0.20	0.25	0.22	0.07	1	0.10
AVG	0.40	0.16	0.22	0.37	0.28	0.10	0.45	0.37	0.21	0.21	0.25



Sources: Bloomberg, CEIC, IMF International Financial Statistics (IFS), and national sources.

Correlation Analysis: Consumption

1990:Q2 – 1996:Q4

2000:Q1 – 2007:Q2

	HKG	INO	KOR	MAL	PHI	PRC	SIN	TAI	THA	JPN	US
HKG	1	-0.02	0.07	0.32	-0.07	-0.02	0.32	0.20	-0.43	-0.10	-0.03
INO	-0.02	1	0.21	0.45	0.13	-0.10	-0.34	-0.23	-0.09	0.25	-0.11
KOR	0.07	0.21	1	-0.01	0.14	-0.54	0.01	-0.16	-0.02	0.13	-0.09
MAL	0.32	0.45	-0.01	1	-0.08	0.24	-0.31	-0.17	-0.07	0.00	-0.09
PHI	-0.07	0.13	0.14	-0.08	1	-0.18	0.02	0.06	0.11	0.31	0.02
PRC	-0.02	-0.10	-0.54	0.24	-0.18	1	-0.23	0.19	0.09	0.03	0.36
SIN	0.32	-0.34	0.01	-0.31	0.02	-0.23	1	0.41	-0.15	-0.05	0.05
TAI	0.20	-0.23	-0.16	-0.17	0.06	0.19	0.41	1	-0.18	-0.01	0.36
THA	-0.43	-0.09	-0.02	-0.07	0.11	0.09	-0.15	-0.18	1	0.17	0.09
JPN	-0.10	0.25	0.13	0.00	0.31	0.03	-0.05	-0.01	0.17	1	-0.07
AVG	0.03	0.03	-0.02	0.04	0.05	-0.06	-0.03	0.01	-0.06	0.08	0.05

	HKG	INO	KOR	MAL	PHI	PRC	SIN	TAI	THA	JPN	US
HKG	1	0.13	0.17	0.19	0.39	0.34	0.58	0.71	-0.20	0.23	0.30
INO	0.13	1	-0.07	0.15	0.14	-0.32	0.10	0.11	-0.04	0.04	-0.11
KOR	0.17	-0.07	1	-0.03	-0.28	0.15	0.26	0.23	-0.46	0.10	0.22
MAL	0.19	0.15	-0.03	1	0.22	0.07	0.18	0.05	-0.40	-0.26	0.22
PHI	0.39	0.14	-0.28	0.22	1	0.13	-0.01	0.27	0.06	0.25	0.31
PRC	0.34	-0.32	0.15	0.07	0.13	1	0.11	0.42	-0.20	0.06	0.48
SIN	0.58	0.10	0.26	0.18	-0.01	0.11	1	0.55	-0.15	0.05	0.00
TAI	0.71	0.11	0.23	0.05	0.27	0.42	0.55	1	-0.09	0.07	0.35
THA	-0.20	-0.04	-0.46	-0.04	0.06	-0.20	-0.15	-0.09	1	0.12	-0.10
JPN	0.23	0.04	0.10	-0.26	0.25	0.06	0.05	0.07	0.12	1	0.21
AVG	0.28	0.03	0.01	0.02	0.13	0.09	0.19	0.26	-0.15	0.07	0.19



Sources: Bloomberg, CEIC, IMF International Financial Statistics (IFS), and national sources.

Summary of Output and Consumption Correlation

- Comparing the pre-crisis period and the post-crisis period, the average of pair-wise correlation coefficients between individual GDP and regional aggregate GDP and that between individual East Asian economy and US GDP increased.
- This evidence supports the growing regional as well as global macroeconomic interdependence of East Asian economies.
- Compared to GDP, the direction of changes in correlation coefficients in consumption is less discernible, though it increased in the post-crisis period.

VAR Analysis of Output and Consumption Interdependence

VAR approach with various types of output (or consumption) is useful, especially compared to simple correlation:

- the relevant structural shocks (such as global and regional shocks) can be identified
- the effect of each shock and conditional co-movement can be analyzed
- Panel VAR with fixed effect is used to increase the degree of freedom and to control the individual country factor

Output VAR

- Recursive VAR:

$$[d \log Y(W), d \log Y(A), d \log Y(i)]$$

- Three variables are considered to examine the effects of world aggregate output and Asian aggregate output shocks on individual country output.
- Ordering: world aggregate output is treated as *contemporaneously* exogenous to regional aggregate output and individual country output. Regional aggregate output is treated as *contemporaneously* exogenous to individual country output.

Consumption VAR

Recursive VAR:

$[d \log C(W) - d \log Y(i), d \log C(A) - d \log Y(i), d \log C(i) - d \log Y(i)]$

$$\Delta \log(C_{it}) = \alpha + \lambda_W \Delta \log(C_{Wt}) + \lambda_A \Delta \log(C_{At}) + (1 - \lambda_W - \lambda_A) \Delta \log(Y_{it})$$

$$(\Delta \log(C_{it}) - \Delta \log(Y_{it})) = \alpha + \lambda_W (\Delta \log(C_{Wt}) - \Delta \log(Y_{it})) + \lambda_A (\Delta \log(C_{At}) - \Delta \log(Y_{it}))$$

Data and Estimation

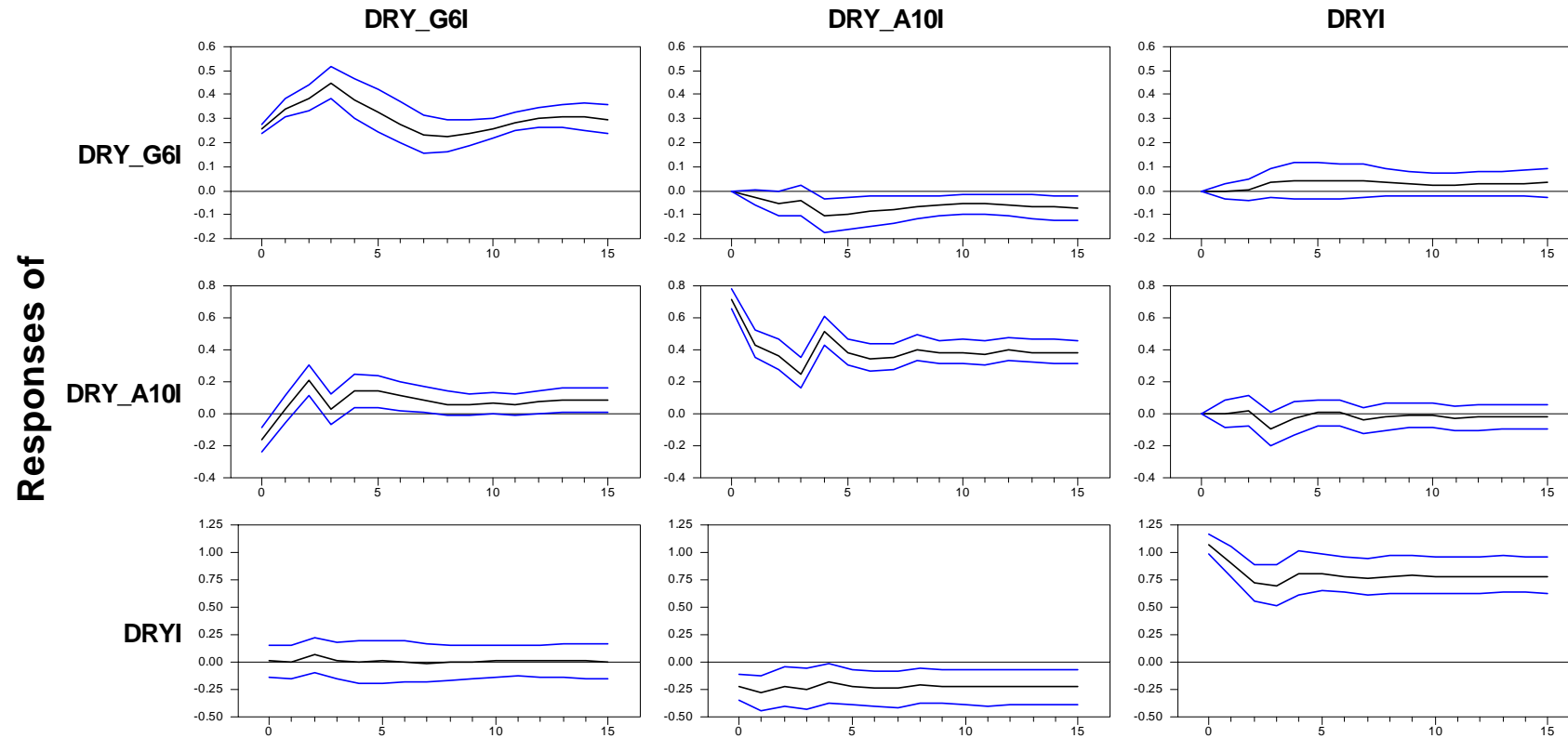
- Quarterly Data
- Estimation Period: 1990-1996 (before Asian crisis), 2000-2007:2 (After Asian crisis)
- World Aggregate (G-7, excluding Japan): US; Germany; France; U.K.; Canada; Italy
- Asian Aggregate (A-10): Rep of Korea; Japan; PRC; Taipei, China; Hong Kong, China; Indonesia; Malaysia; Philippines; Singapore; Thailand; excluding own country

Unit Root and Cointegration Tests

- Panel Unit root tests (Im, Pesaran, and Shin, Levin and Lin tests)
- Panel Cointegration tests (Pedroni)

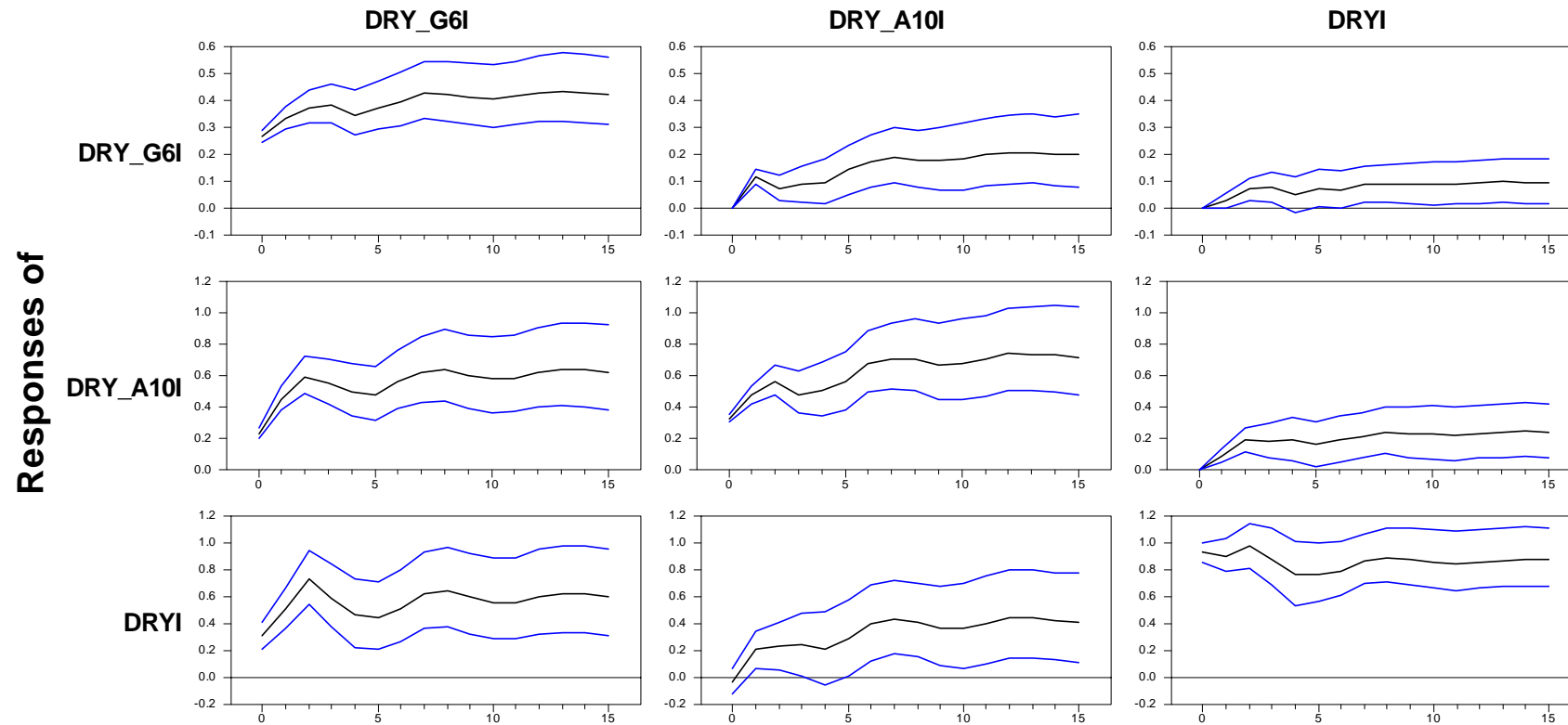
Results for Output VAR

Cumulative Impulse responses (90% Bands), 1990-1996, A10

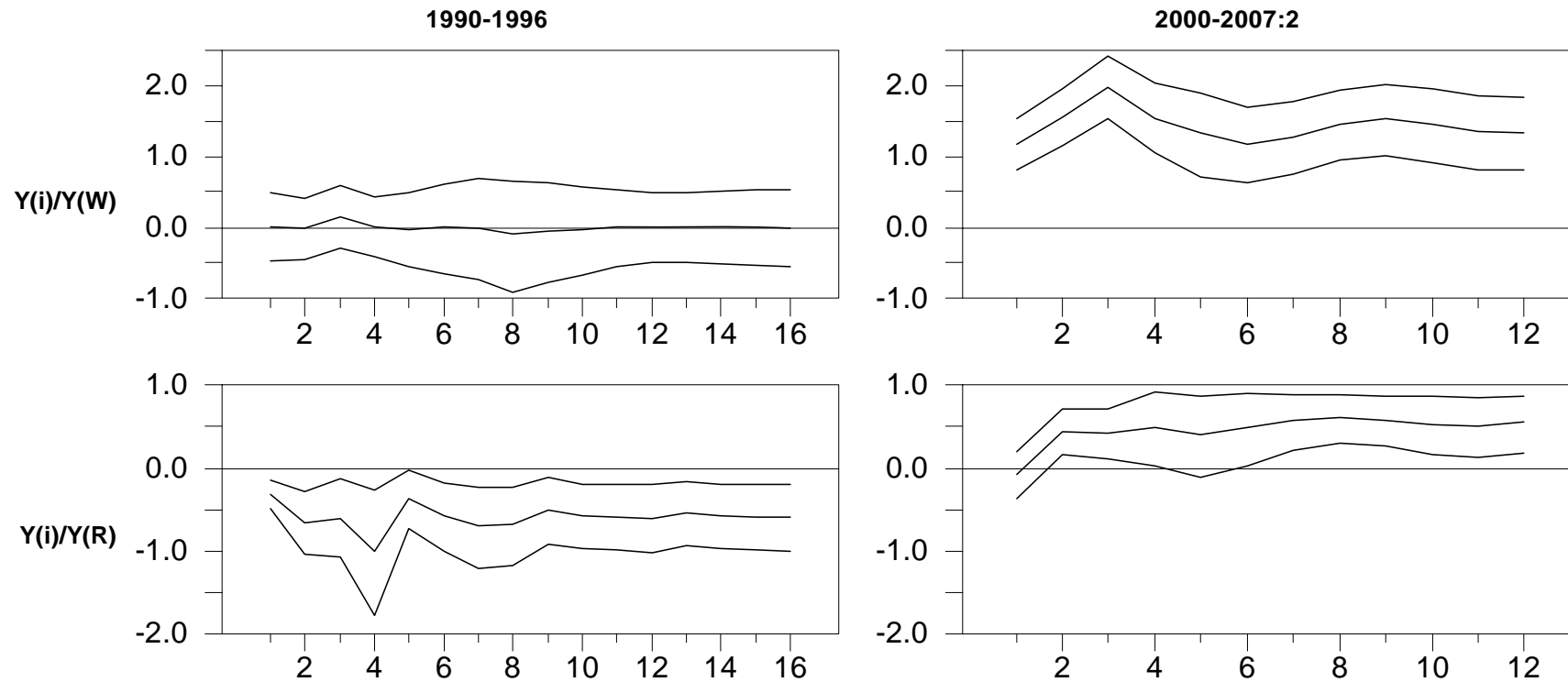


Results for Output VAR

Cumulative Impulse responses (90% Bands), 2000-2007:2, A10



Relative Cumulative Responses (90% Bands), A10, Output VAR

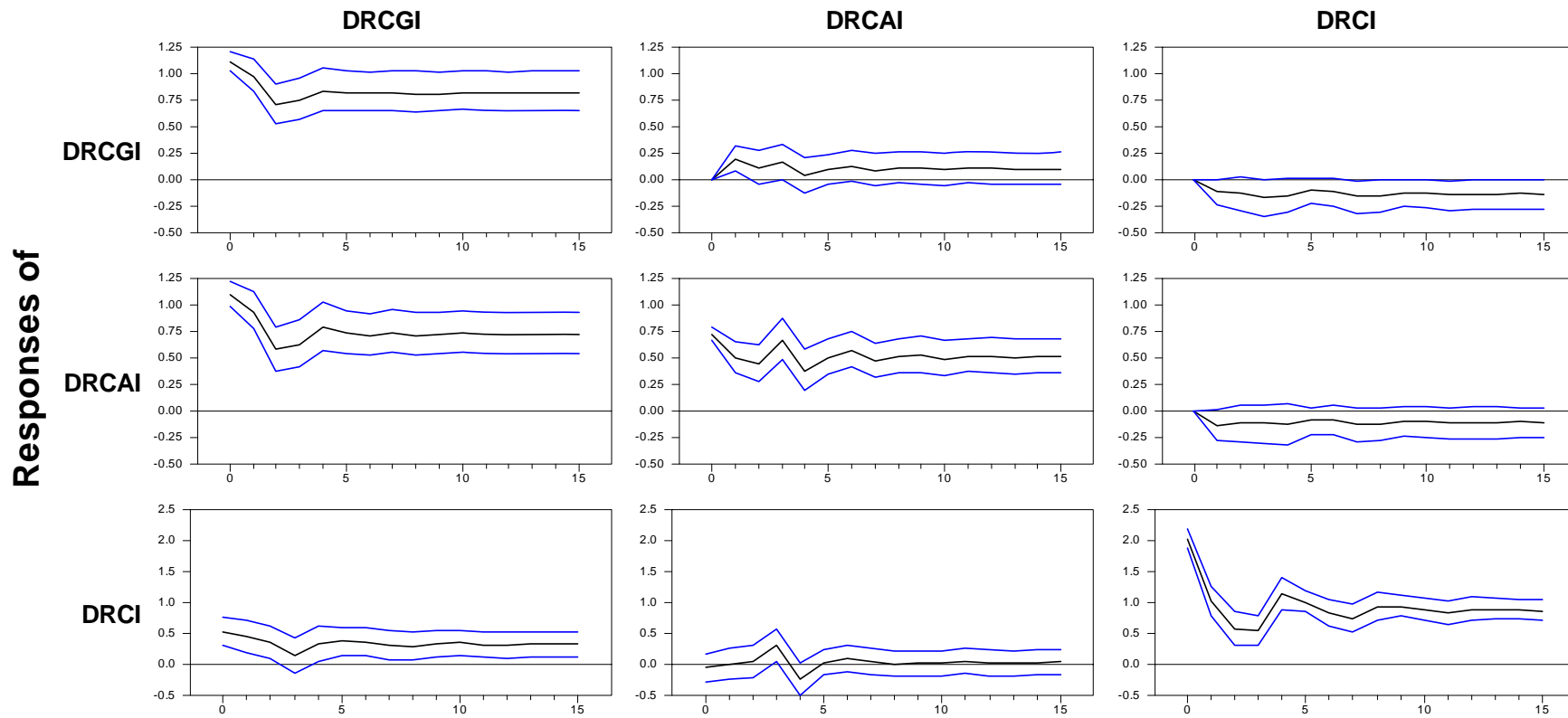


Variance Decomposition of Individual Output Growth Rate

	1990-1996		2000-2007:2	
Horizon	Asian Agg	World Agg	Asian Agg	World Agg
1 quarter	4.2 (0.9,8.8)	0.4 (0.0,1.7)	0.4 (0.0,1.6)	10.3 (4.9,16.8)
4 quarter	5.5 (1.8,10.0)	1.9 (0.4,4.3)	6.2 (2.4,11.0)	18.8 (12.0,26.4)
8 quarter	6.3 (2.5,11.0)	2.3 (0.6,5.0)	8.0 (4.0,13.1)	20.6 (13.5,28.5)
16 quarter	6.5 (2.7,11.5)	2.4 (0.7,5.1)	8.7 (4.4,14.1)	21.1 (13.8,29.0)

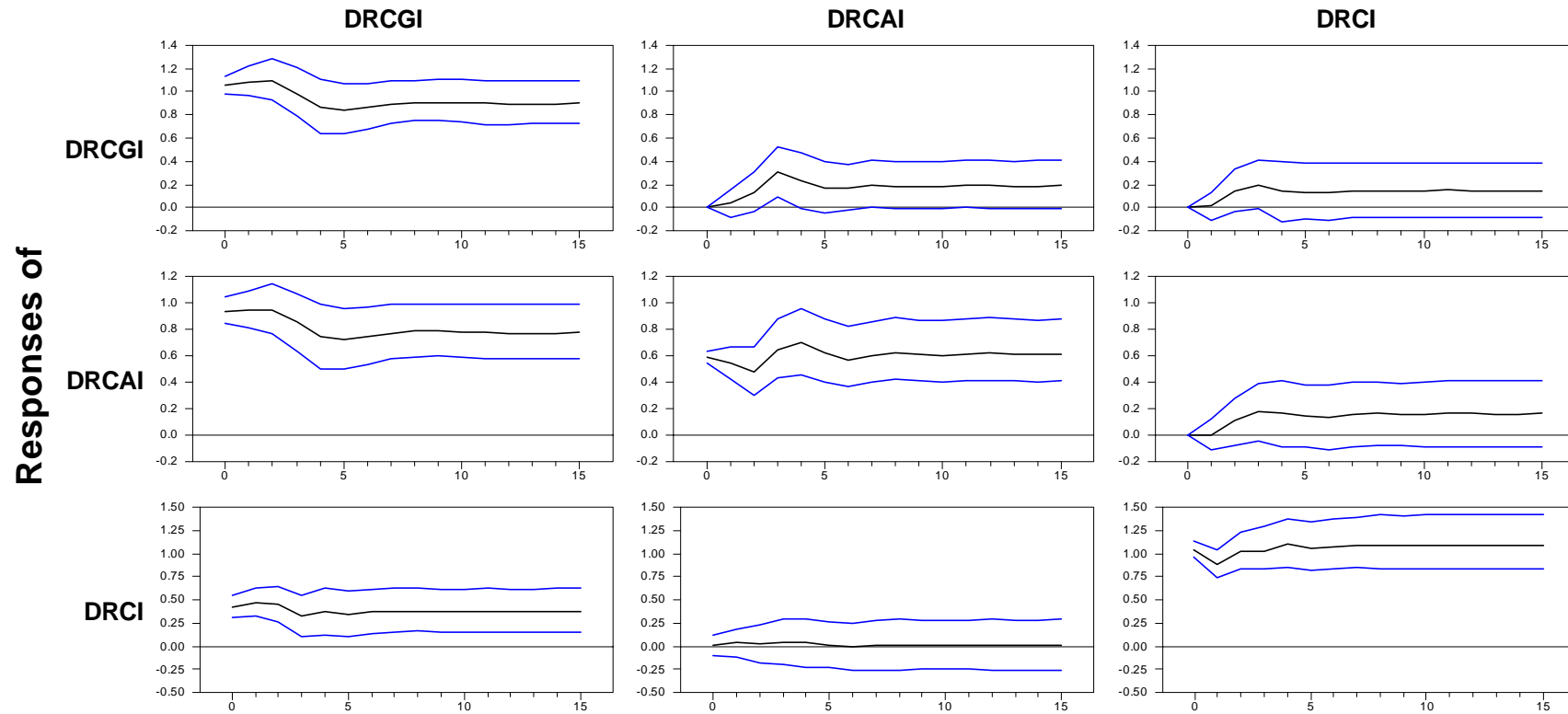
Consumption VAR

Cumulative Impulse responses (90% Bands), 1990-1996, A10

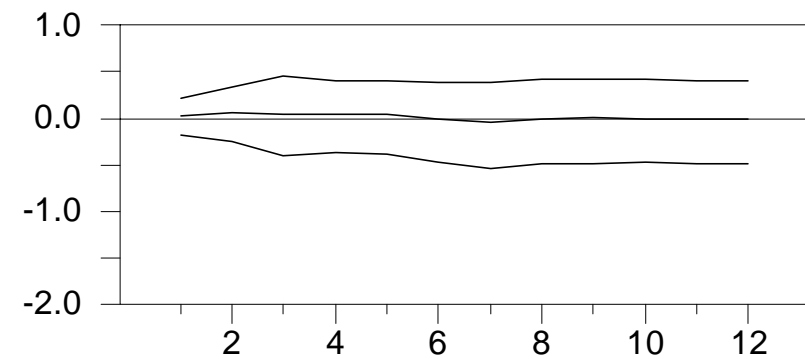
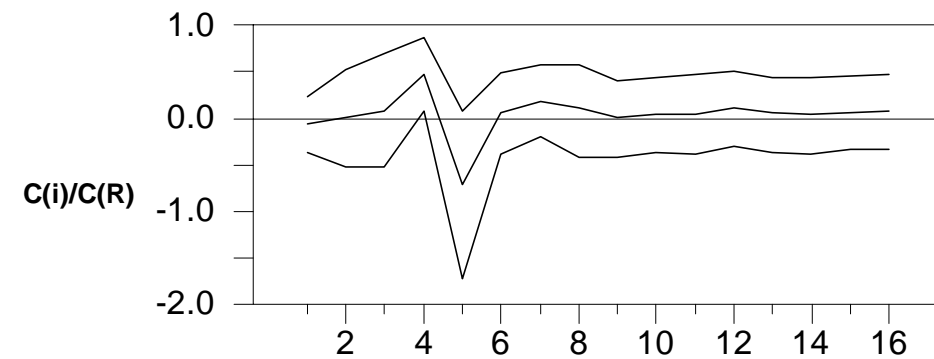
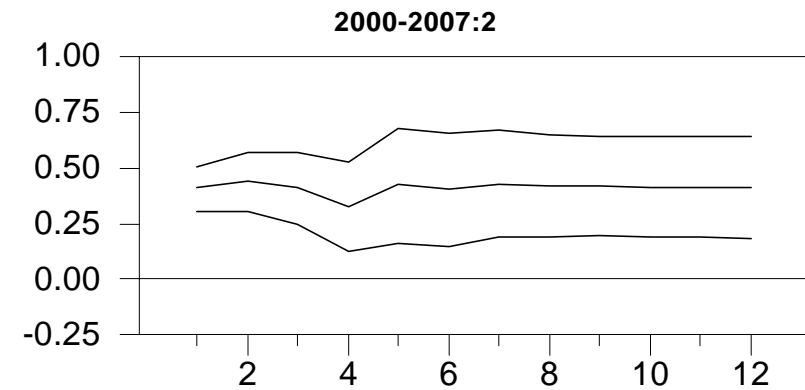
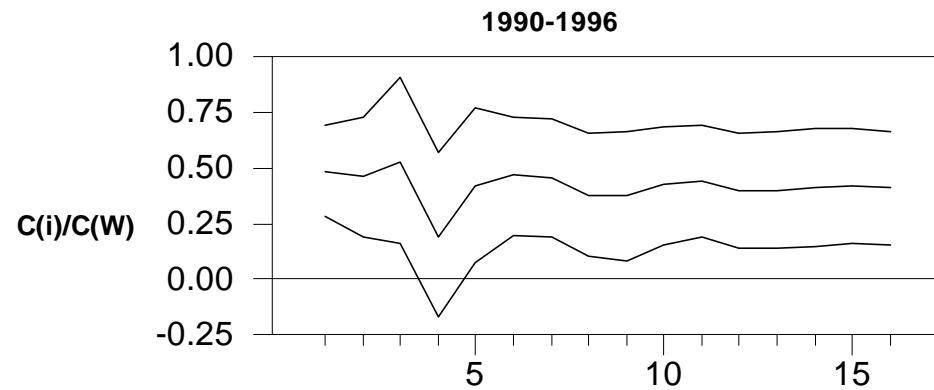


Consumption VAR

Cumulative Impulse responses (90% Bands), 2000-2007:2, A10



Relative Cumulative Responses (90% Bands), A10, Consumption VAR



Variance Decomposition of Individual Consumption Growth Rate

	1990-1996		2000-2007:2	
Horizon	Asian Agg	World Agg	Asian Agg	World Agg
1 quarter	0.4 (0.0,1.7)	6.8 (2.2,12.7)	0.4 (0.0,1.5)	14.6 (8.2,21.3)
4 quarter	2.7 (0.6,5.7)	7.4 (3.0,13.0)	1.7 (0.3,4.0)	15.7 (9.3,22.3)
8 quarter	8.0 (2.8,15.1)	7.9 (3.2,14.1)	2.5 (0.6,5.5)	16.0 (9.6,22.7)
16 quarter	8.1 (2.9,15.3)	8.0 (3.3,14.3)	2.5 (0.6,5.8)	16.0 (9.6,22.6)

Summary of VAR Results

Cross-Country Output Interdependence

- Output interdependence increased substantially after Asian crisis.
- Both regional and global interdependence increased substantially after Asian crisis.
- These results may imply that real and trade integration with Asia and the World increased substantially after Asian crisis.

Cross-Country Consumption Relation

- The degree of international (consumption) risk sharing does not change much.
- The degree of international risk sharing with the world is substantial but that with Asia is nil.
- These results have important implications on financial integration since international risk sharing is mostly achieved by international financial market integration.

Policy Issues for Regional Financial Integration and Stability (I)

- Promote regional financial integration, which lags behind global financial integration and real-side regional integration
 - Continue domestic financial reforms
 - Develop domestic financial markets and institutions
 - Continue to promote capital account liberalization
 - Enhance an enabling environment for local currency bond markets
 - Promote consistent standards and mutual recognition of minimum requirements
 - Build regional infrastructure for payments and settlements

Policy Issues for Regional Financial Integration and Stability (II)

- Growing regional economic interdependence calls for greater regional policy cooperation
 - Increase information sharing in monitoring and regulating financial institutions
 - Strengthen the capacity of central banks and regulatory authorities in addressing near-term stresses and longer-term financial stability
 - Create a regional financial stability dialogue
 - Strengthen regional financing facility (CMI Multilateralization)
 - Cooperate in managing exchange rate and macroeconomic policies

Thank You

For inquiry or comments, please contact:

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