China's Financial Linkages with Asia and the Global Financial Crisis

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What we do

1. Review China's experience with opening its capital account and internationalizing the Rmb

2. Analyze asset market linkages between China and Asia

3. Seek to control for common shocks, i.e. extent to which linkages attributed to shocks from outside the region

What we find

1. Cross-country Asian linkages with Chinese government bond rates are weak

2. Cross-country Asian linkages with China's equity markets increased markedly during the global financial crisis and have remained high in recent years, even after controlling for effects of U.S. economy

3. Asian bond rates rise and equity returns decline with greater global and national risk

Relevant Literature

❑ China capital controls and Rmb internationalization
  ▪ Prasad and Wei (2007)
  ▪ Ma and McCauley (BIS, 2007), McCauley (BIS, 2011)
  ▪ Otani, Fukumoto, Tsuyuguchi (BOJ, 2011)
  ▪ Ito (CFR, 2011)
  ▪ Prasad and Ye (FRBSF, 2012)

❑ Exchange rate co-movements in East Asia
  ▪ Frankel and Wei (1994), Frankel (2009)
  ▪ Ma and McCauley (BIS, 2010).
  ▪ Ogawa and Shimizu (ADBI, 2011)
  ▪ Balasubramaniam, Patnaik, and Shah (2011),

❑ Regional integration
  ▪ Glick and Hutchison (JJIE,1990)
  ▪ Jang (BOJ, 2011),
  ▪ Lee, Huh, and Park (ADB, 2011)

Empirical Literature on Integration

❑ Institutional and regulatory measures

   • Legal restrictions on cross-border flows, e.g, Chinn and Ito

   • Regional ASEAN+3 initiatives

      o Chiang Mai Initiative (CMI)

      o Asian Bond Market Initiative (ABMI) , Asian Bond Funds (ABFs)

   o Regional Economic Surveillance System

❑ Quantity Measures

   ▪ Capital flows (e.g. Lane ansd Milesi-Ferretti)

   ▪ Output correlation, consumption correltaions

   ▪ Savings-investment balances (e.g. Feldstein-Horioka)

❑ Price Measures

   ▪ Cross-country price differentials in asset markets ,

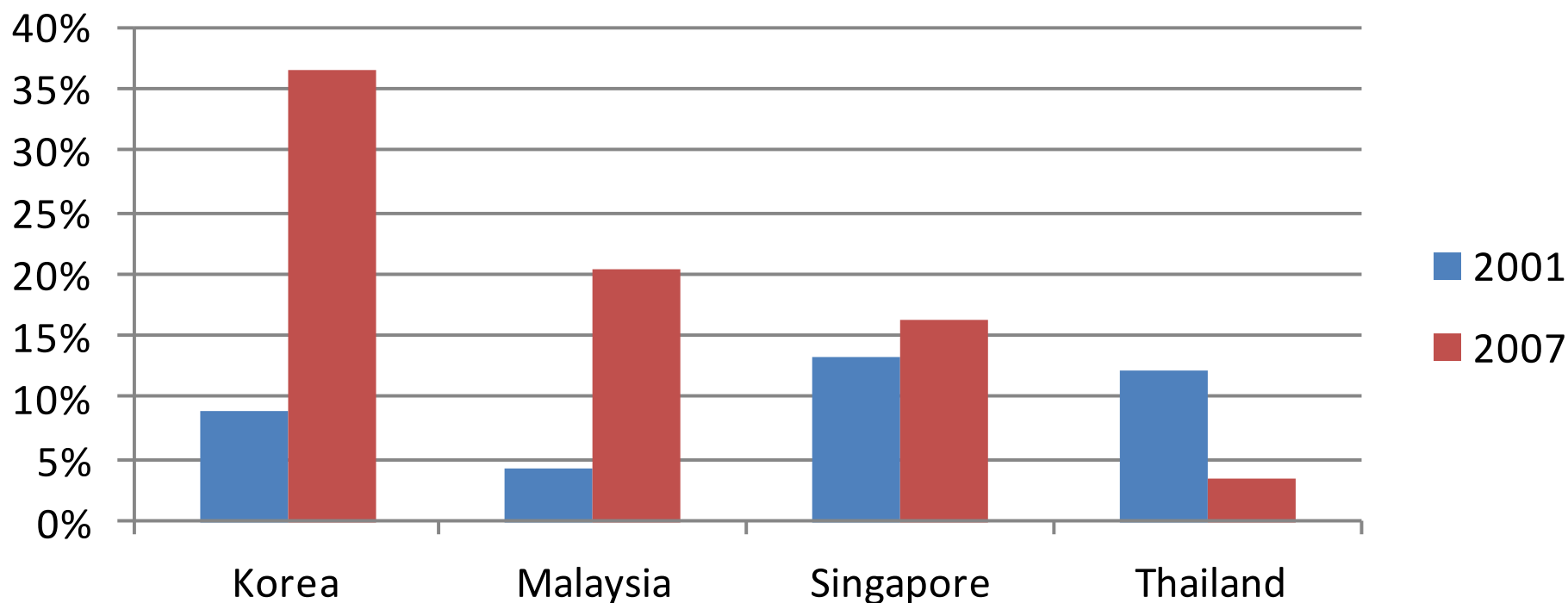   ▪ Convergence of interest rates, market spreads,

   ▪ Asset return correlations

China greater financial openness illustrated by its increasing international capital flows

China Gross Capital Flows, 2000-2010,

US$ bil
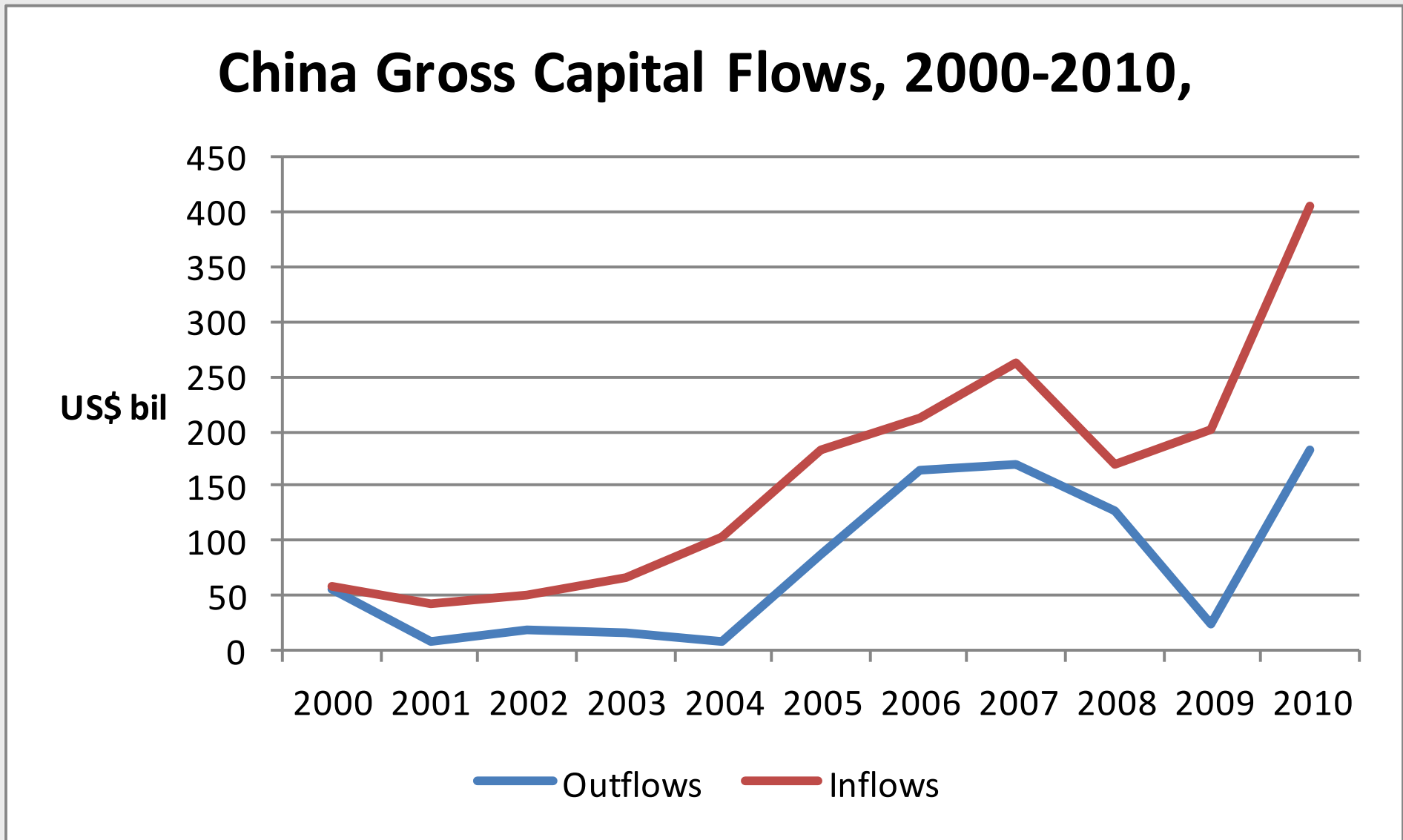
Source: Prasad and Le (2012)

Share of Country's Foreign Portfolio Equity Investment in China and Hong Kong

Source: Lee, Huh, and Park (ADB 2011)

Empirical Methodology

❑ Charts

❑ Correlations

❑ Individual country and panel regressions

Data Sample

❑ Selected Asian countries

China, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, India
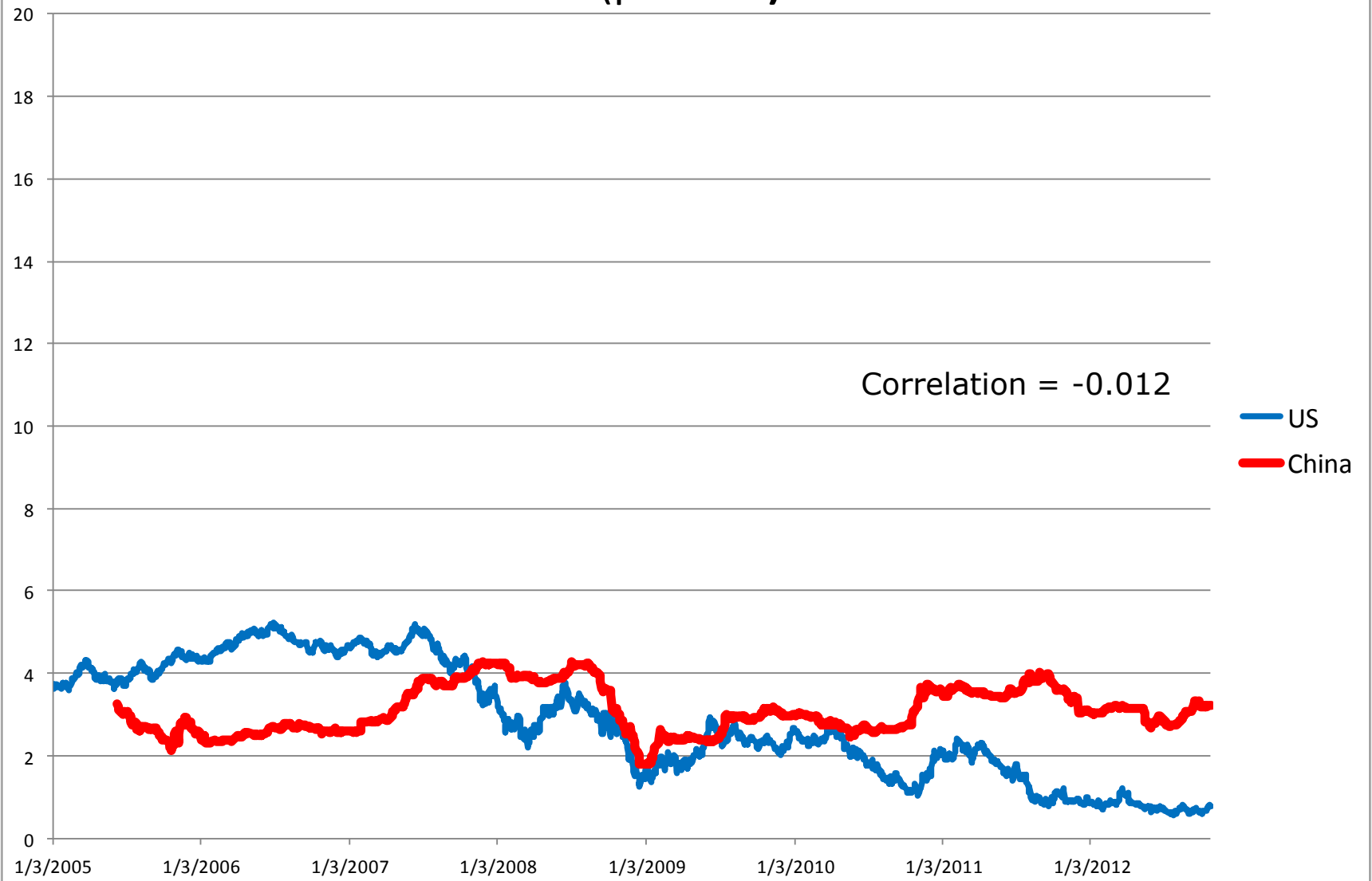
❑ Daily data on government bond rates, equity returns

❑ Full sample period: June 2005 – October 2012 (~1555 obs./co.)

❑ Subperiods: before, during, and after Global Financial Crisis (GFC)

1. Pre GFC: June 2005-July 2008   (~640 obs/co.)
2. GFC: July 2008 – June 2010 (~420 obs/co.)
3. Post GFC: June 2010 – Oct. 2012 (~495 obs/co.)

Figure 1a. Government bond rates, US and China (percent)

Correlation = -0.012

Bond rates in most Asian countries look more correlated with US than with China

Figure 1b. Government bond rates, US, China, and Asia (percent)
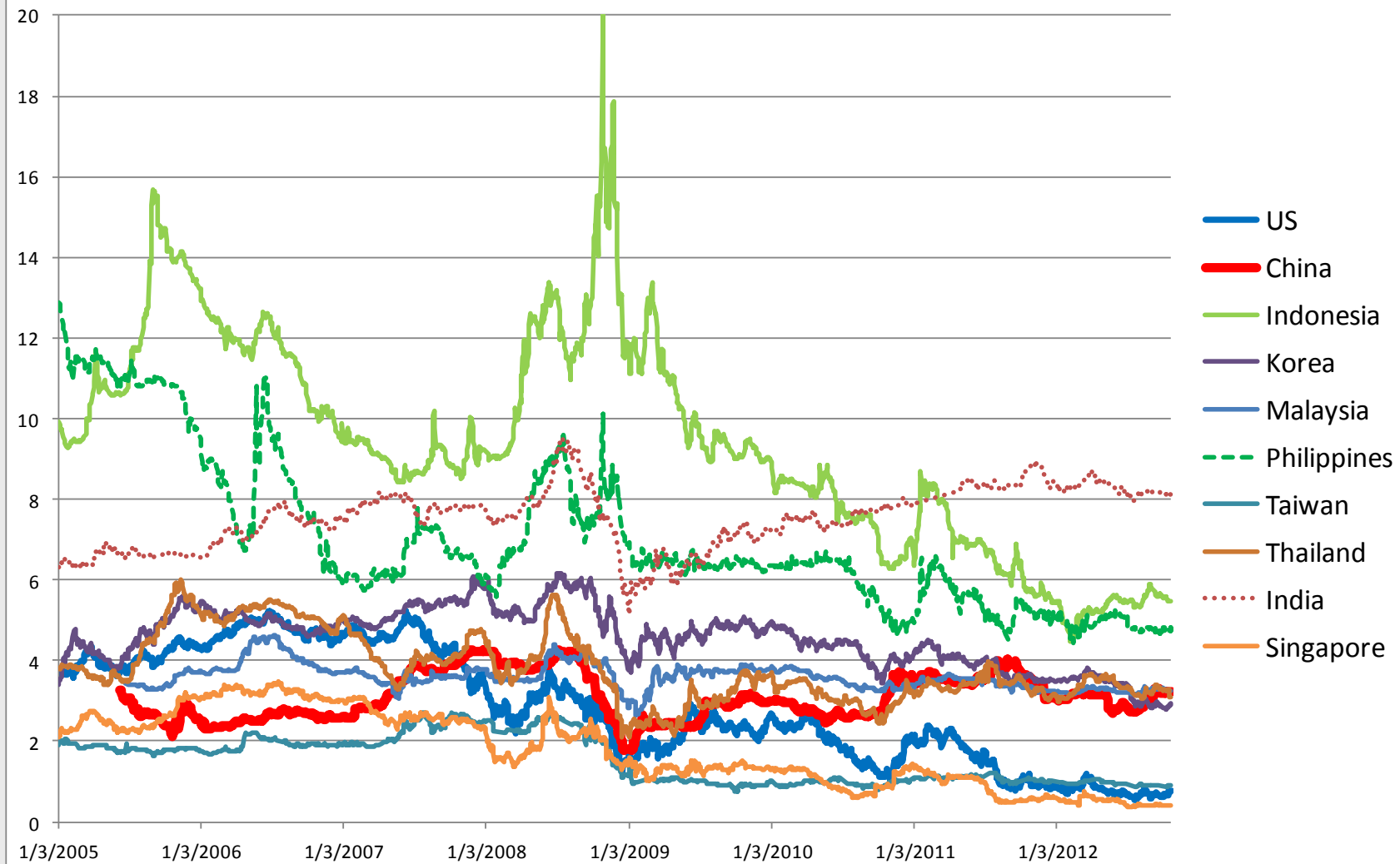
Most Asia bond rates are more correlated with US than with China

Correlation of Bond Rates with China (percentage)
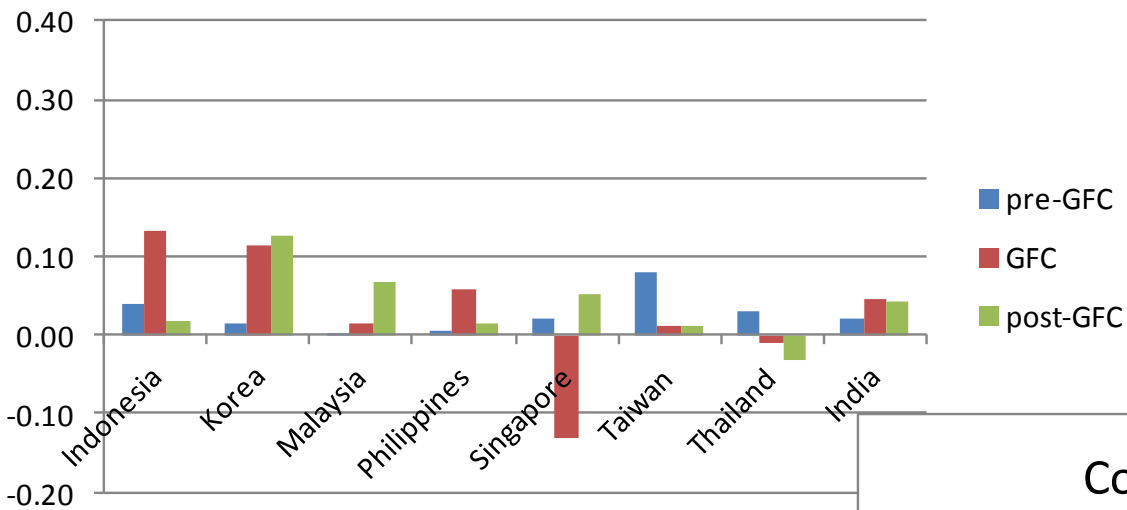
Correlation of Bond Rates with US (percentage)
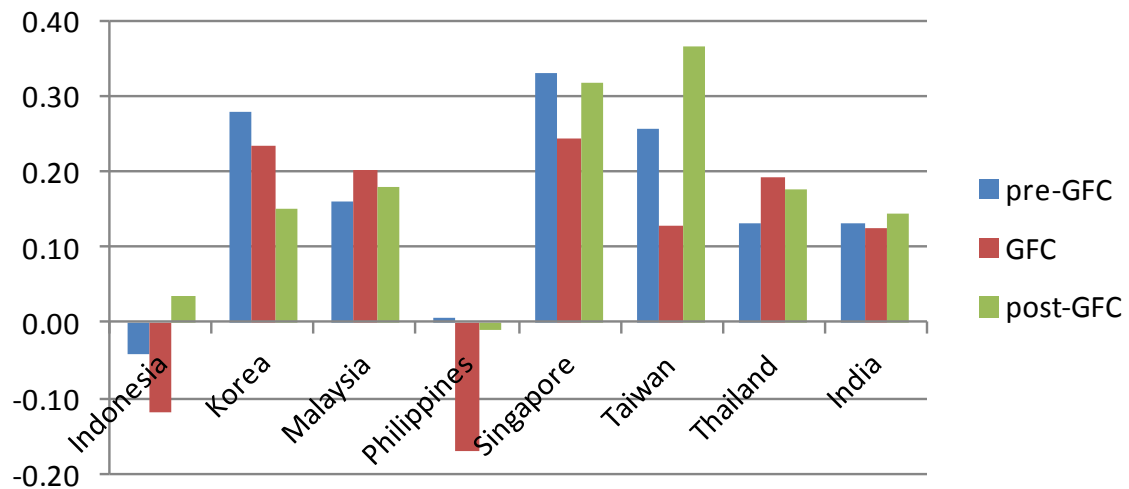
Figure 2a. Equity prices, US and China (1/4/2005=100)

Correlation
Full: .17
Pre-GFC: .14
GFC: .19
Post-GFC: .22

US
China

Figure 2b. Equity prices, US, China, and Asia
(1/4/2005=100)

Legend: US, China, Indonesia, Korea, Malaysia, Philippines, Taiwan, Thailand, India, Singapore
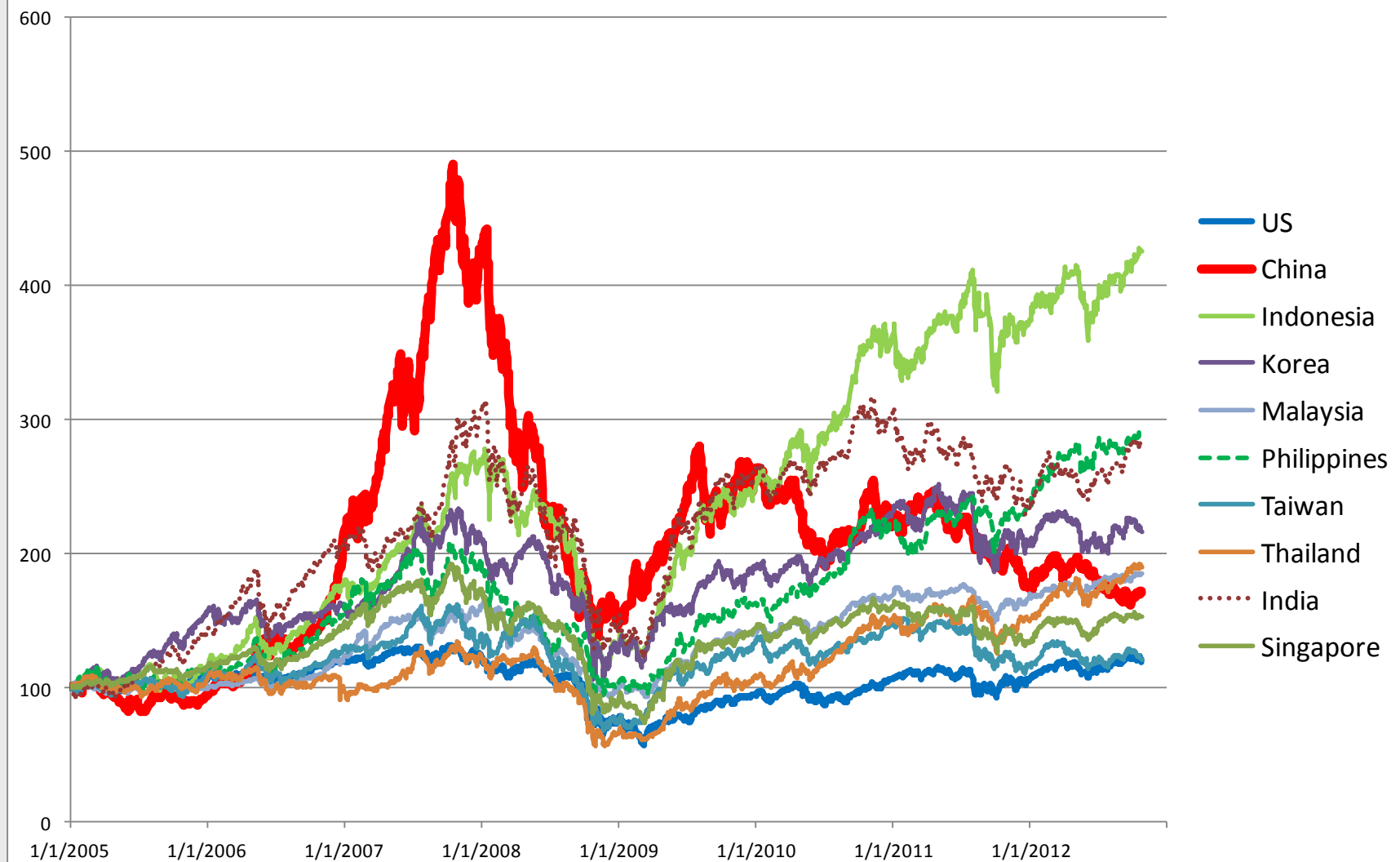
Asian equity returns correlated with US and China; correlation with China has increased over time

Figure 3a. Correlation of Equity Returns with China (percentage)
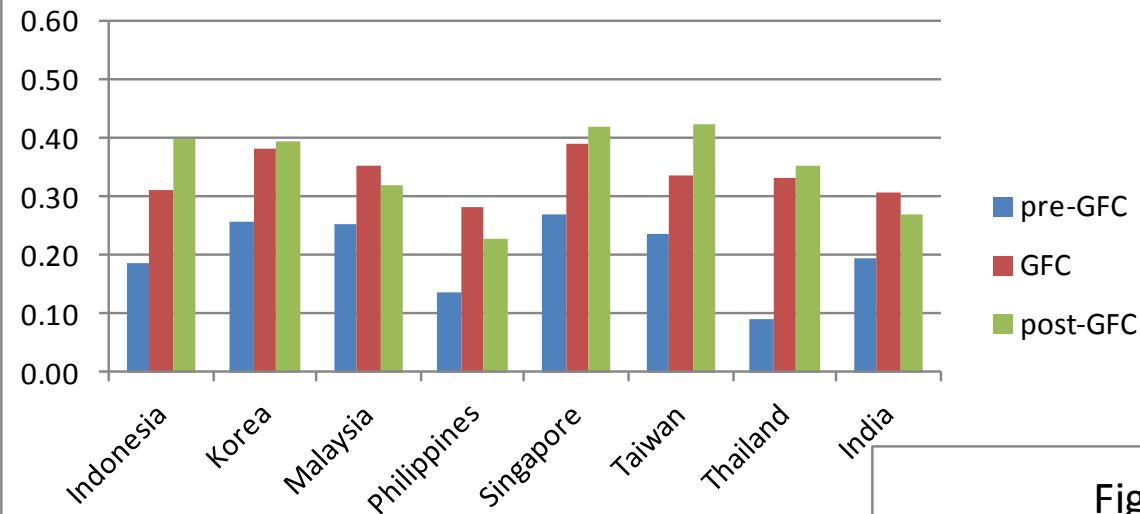
Figure 3b. Correlation of Equity Returns with U.S. (percentage)
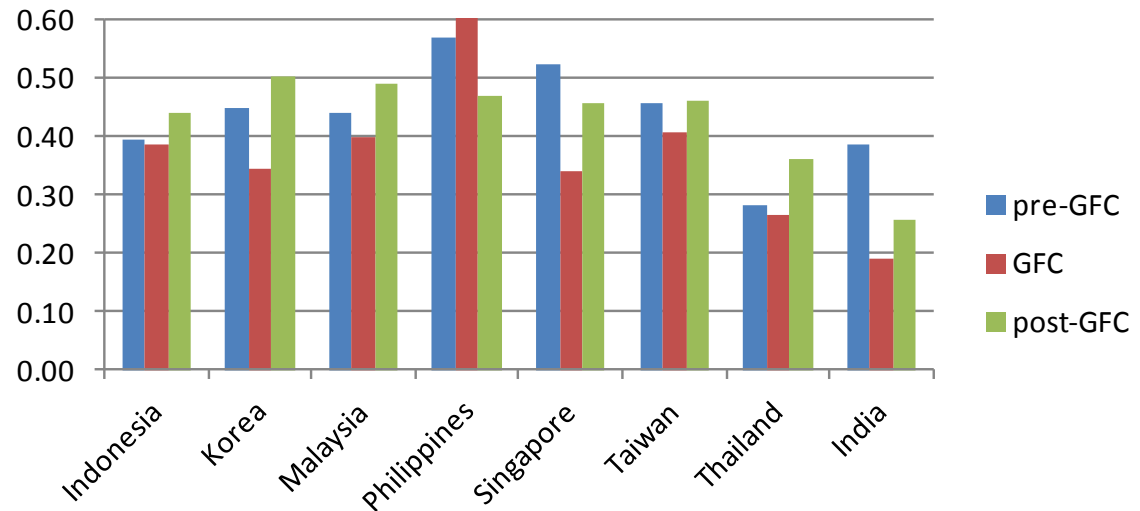
Regression Specification

1. Use a simple regression specification

$$\Delta R_{i,t} = \alpha + \beta_i \Delta R_{us,t-1} + \beta_i \Delta R_{ch,t}$$
$$+ \beta_i \Delta VIX_{t-1} + \beta_i \Delta CDS_{i,t} + \varepsilon_{i,t}$$

where dependent and explanatory variables are in first differences

2. Estimate individual country and panel regressions with fixed effects, errors clustered by country

3. Variants:

    ▪ Introduce interaction effects

    ▪ Replace China asset returns with reserve requirement changes

Vix rate spiked during US and European financial crises

Figure 4a. Vix rate (basis points)
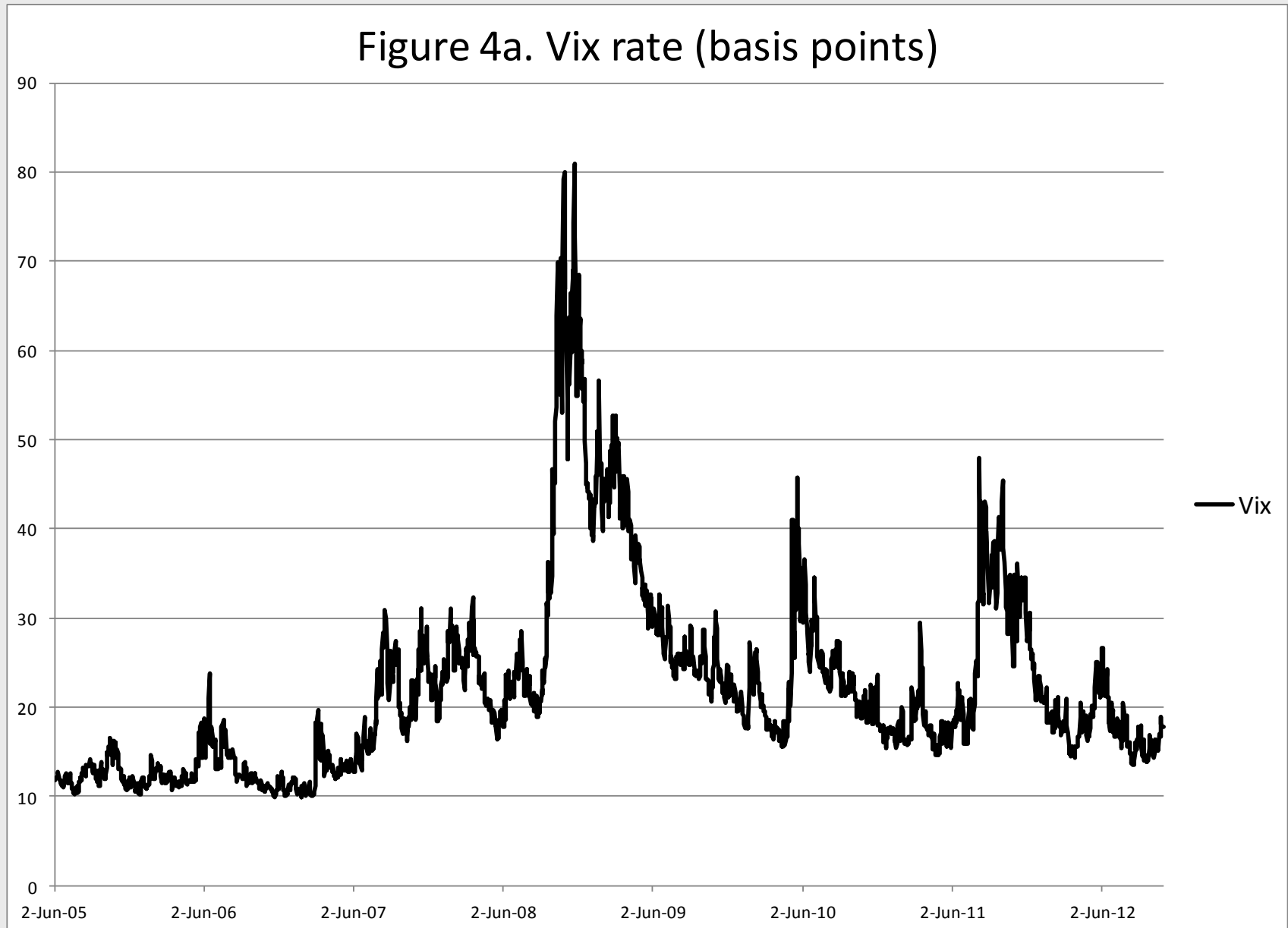
Asia CDS rates spiked during GFC

Figure 4b. CDS Rates (basis points)
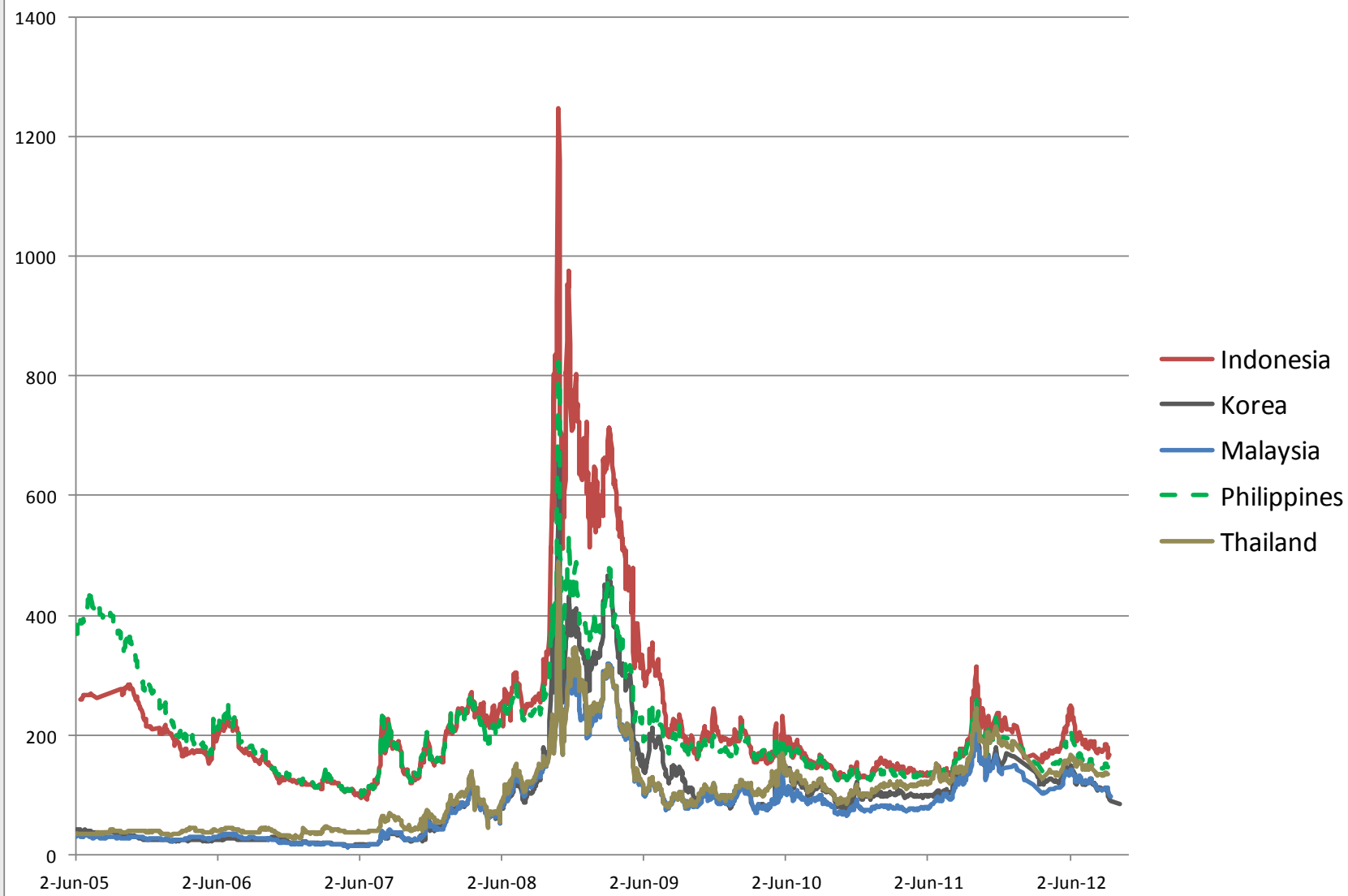
Caveats

❑ Not controlling for capital controls in other countries

❑ Not controlling for exchange rate policies

Asian bond rates and equity changes correlated with China (full sample)

Full sample. Dependent variable: domestic bond rate

	Indonesia	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand	India	panel
US bond t-1	-.03	.17***	.09***	.05	.18***	.09***	.14***	.11***	.10***
China bond t	.38**	.13**	.02	.06	-.02	.04*	.00	0.06	0.11
CDS i, t	.25*	.00	.00	.16**			.01		.18***
VIX t-1	.84	-.14	.08	1.16***	.10	-.004	.06	-0.09	0.38
Adj. R2	.11	.05	.03	.06	.08	.05	.02	0.02	0.05

Full sample. Dependent variable: domestic equity

	Indonesia	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand	India	panel
US equity t-1	.17***	.19***	.08***	.34***	.25***	.31***	.12*	0.10	.18***
China equity t	.14***	.19***	.10***	.06***	.20***	.18***	.13***	.20***	.12***
CDS i, t	-.12***	-.09***	-.05***	-.06***			-.07***		-0.08***
VIX t-1	-.02***	-.02**	-.02***	-.04***	-.02*	-.02*	-.02*	-.04***	-0.02**
Adj. R2	.29	.30	.27	.37	.22	.23	.16	0.11	0.26

Note: all variables in first differences

Asian bond rates are weakly correlated with China, more strongly correlated with US (subperiods)

Dependent variable: domestic bond rate

		Indonesia	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand	India	panel
pre-GFC	US bond t-1	-.02	.24***	.12***	.10	.24***	.12***	.10**	.11***	.12***
	China bond t	.15	.01	-.00	.01	.02	.06**	.04	0.02	.03*
	CDS i, t	.21**	.27***	.07	.22			.03		.21***
	VIX t-1	.55	-.08	.40***	.77*	.30**	.06	.10	.26*	.34**
	Adj. R2	0.02	.0915	.0462	.0111	.1092	.0648	.0080	.0180	0.02
GFC	US bond t-1	-.17	.17***	.09***	.02	.12***	.07***	.17***	.13**	0.08
	China bond t	.81*	.24*	.01	.09	-.14***	.013	-.013	0.13	0.21
	CDS i, t	.24	.00	.00	.15			.01		.18***
	VIX t-1	1.05	-.18	.07	1.61***	.01	-.01	.09	-.15	0.46
	Adj. R2	.14	.05	.02	.20	.06	.02	.03	0.02	0.08
post-GFC	US bond t-1	.16*	.09**	.07***	-.019	.20***	.09***	.18**	.08**	.11***
	China bond t	.09	.15**	.04	.05	.05	.01	-.04	0.04	.06*
	CDS i, t	.29***	-.10**	-.02	.02			-.02		0.08
	VIX t-1	.47***	-.13	-.045	.37	.19**	-.061	-.013	-.16*	0.17
	Adj. R2	.05	.04	.04	-.00	.11	.13	.03	0.03	0.01

Note: all variables in first differences

# Asian equity returns are strongly correlated with China and US (subperiods)

Dependent variable: domestic equity price

		Indonesia	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand	India	panel
pre-GFC	US equity t-1	.24*	.40***	.31***	.42***	.54***	.62***	.26**	.40***	.34***
	China equity t	.06**	.12***	.09***	.03	.10***	.11***	.03	.10***	.07***
	CDS i, t	-.10***	-.03*	-.03**	-.06***			-.04**		-0.04***
	VIX t-1	-.03*	-.02	-.01	-.06***	-.02	.01	-.01	-.04**	-.02***
	Adj. R2	.20	.24	.24	.38	.30	.23	.09	0.16	0.21
GFC	US equity t-1	.19**	.0730	.05	.38***	.25***	.23***	.02	0.05	.14**
	China equity t	.19***	.20***	.10***	.12**	.31***	.23***	.21***	.33***	.17***
	CDS i, t	-.12***	-.18***	-.06***	-.05**			-.12***		-.11***
	VIX t-1	-.00	-.01	-.01	-.02	.01	-.02	-.03*	-.03	-0.01***
	Adj. R2	.34	.43	.35	.45	.22	.23	.24	0.12	0.32
post-GFC	US equity t-1	.16**	.46***	.18***	.30***	.30***	.42***	.20**	.24***	.24***
	China equity t	.26***	.26***	.08***	.08**	.25***	.30***	.21***	.21***	.18***
	CDS t	-.12***	-.08***	-.05***	-.05**			-.12***		-.08***
	VIX t-1	-.02*	.01	.00	-.01	.00	.010	.00	0.01	-0.01
	Adj. R2	.34	.35	.32	.24	.28	.31	.26	0.1	0.29

Note: all variables in first differences

Sensitivity to China equity prices increased between the pre and post GFC periods

Figure 5. Coefficients on China equity return in Table 3b
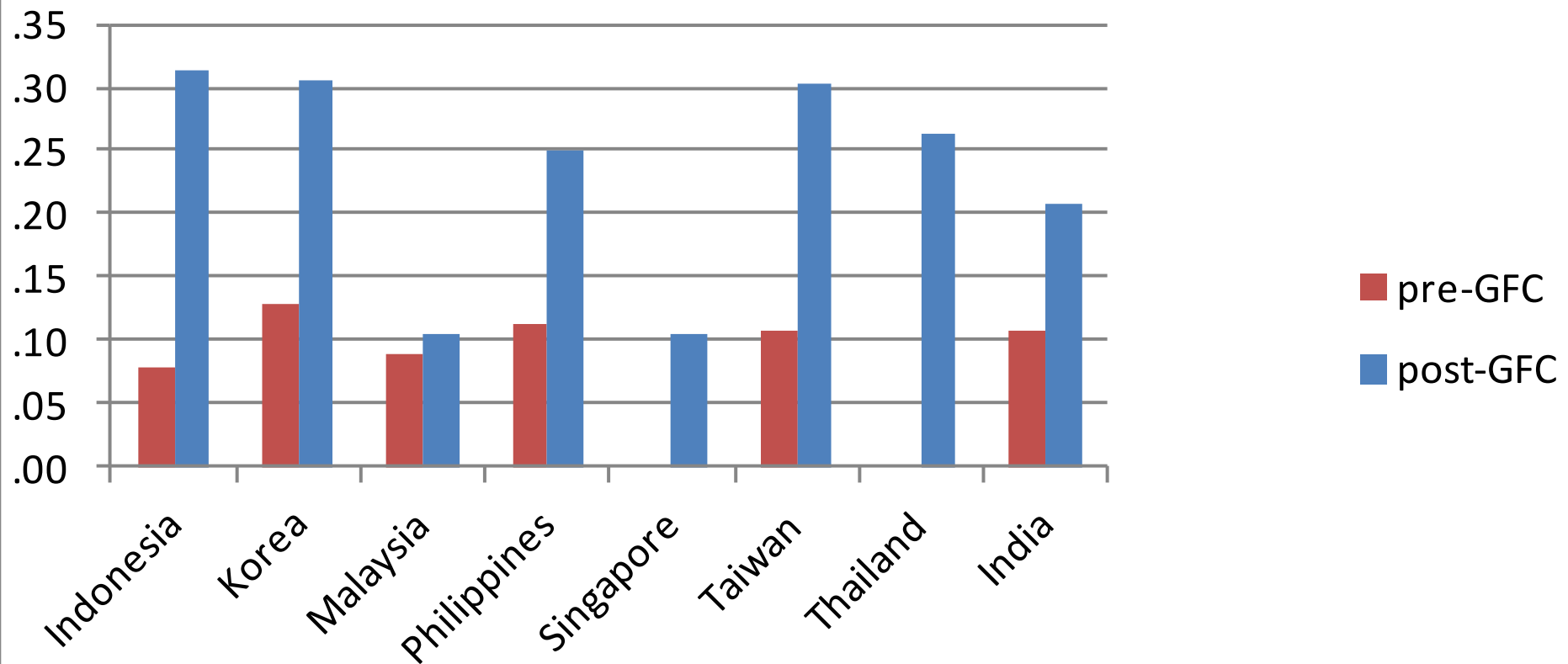
Sensitivity to China equity returns rises with global risk (full sample)

Dependent variable: domestic equity price

		with Sigma =Vix		with Sigma =CDS
Full	US equity t-1	.18***		.18***
Sample	China equity t	.12***		.12***
	CDS i,t	-.08***		-.08***
	VIX t-1	-.023***		-.02***
	US equity*Sigma	.003***		.004**
	China equity*Sigma	.003***		.002
	CDS i,t	-.08***		-.08***
	Adj. R2	0.26		0.26

Note: all variables in first differences

Sensitivity to China equity returns rises with global risk (subperiods)

Dependent variable: domestic equity price

		with Sigma =Vix	with Sigma =CDS
pre-GFC	US equity t-1	.35***	.34***
	China equity t	.07***	.06***
	VIX t-1	-.021**	-.02***
	US equity*Sigma	.01***	.012***
	China equity*Sigma	.00	.01***
	CDS i,t	-.043***	-.04***
	Adj. R2	0.22	.22
GFC	US equity t-1	.14**	.15**
	China equity t	.17***	.17***
	VIX t-1	-.01**	-.01***
	US equity*Sigma	.002**	.003
	China equity*Sigma	.008**	-.001
	CDS i,t	-.10***	-.11***
	Adj. R2	0.32	.32
post-GFC	US equity t-1	.24***	.24***
	China equity t	.18***	.16***
	VIX t-1	-.00	-.01
	US equity*Sigma	.002**	-.001
	China equity*Sigma	.011***	.022***
	CDS i,t	-.08***	-.08***
	Adj. R2	0.30	0.30

Asian equity returns affected by China monetary policy (full sample)

Dependent variable: domestic equity price

		Indonesia	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand	India	Panel
Full Sample	China RR incr	.00	-.36*	-.13	-.53***	-.044	-.147	-.08	.07	-.14
	China RR decr	-.34	.37	.08	.18	.44	.38	.14	-.44	.15
	US equity t-1	.29***	.31***	.16***	.39***	.31***	.34***	.21***	.15**	.27***
	VIX t-1	-.031***	-.028***	-.016***	-.042***	-.015	-.016**	-.018*	-.039***	-.025***
	Adj. R2	.16	.16	.16	.33	.16	.18	.08	.07	.15

Note: all variables in first differences

China reserve requirement hikes ➔ Asian equity returns fall

China reserve requirement cuts ➔ Asian equity returns rise

Asian equity returns affected by China monetary policy (subperiods)

Dependent variable: domestic equity price

		Indonesia	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand	India	Panel
Pre-GFC	China RR incr	.33	-.24	-.24	-.70***	.05	-.09	.07	.16	-.059
	China RR decr									
	US equity t-1	.45***	.55***	.41***	.55***	.64***	.67***	.38***	.52***	.52***
	VIX t-1	-.027	-.014	-.005	-.055***	-.005	.012	-.003	-.030	-.016***
	Adj. R2	.16	.20	.19	.34	.27	.20	.08	.15	.18
GFC	China RR incr	-.32	-.89**	.14	.27***	-.66***	-.39	-.47	.25	-.23
	China RR decr	-.05	.15	.32	.53	.71	-.16	.48	-2.36***	.19
	US equity t-1	.29***	.26**	.14***	.41***	.31***	.27***	.15	.10	.24***
	VIX t-1	-.017	-.019	-.009	-.030*	.012	-.026	-.030	-.037	-.019***
	Adj. R2	.14	.11	.15	.40	.11	.16	.07	.03	.13
Post-GFC	China RR incr	-.40*	-.43	.03	-.39*	-.02	-.09	-.26	.01	-.19
	China RR decr	-.48	.44	-.18	-.03	.23	.90*	-.30	.38	.11
	US equity t-1	.34***	.56***	.25***	.32***	.39***	.42***	.36***	.26***	.36***
	VIX t-1	-.024**	.004	.002	-.019**	.004	-.001	.002	.003	-.003
	Adj. R2	.20	.25	.24	.22	.20	.21	.12	.06	.17

Note: all variables in first differences

Conclusion and Avenues for Further Research

❏ Conclusions

- Asian linkages with China's equity markets increased markedly during the global financial crisis and have remained high in recent years, even after controlling for effects of the U.S.

- Asian bond rates rise and equity returns decline with greater global and national risk

❏ Avenues for further research

- Allow for more dynamics

- Analyze announcement effects of other Chinese indicators

- Examine role of individual country exchange rate policies