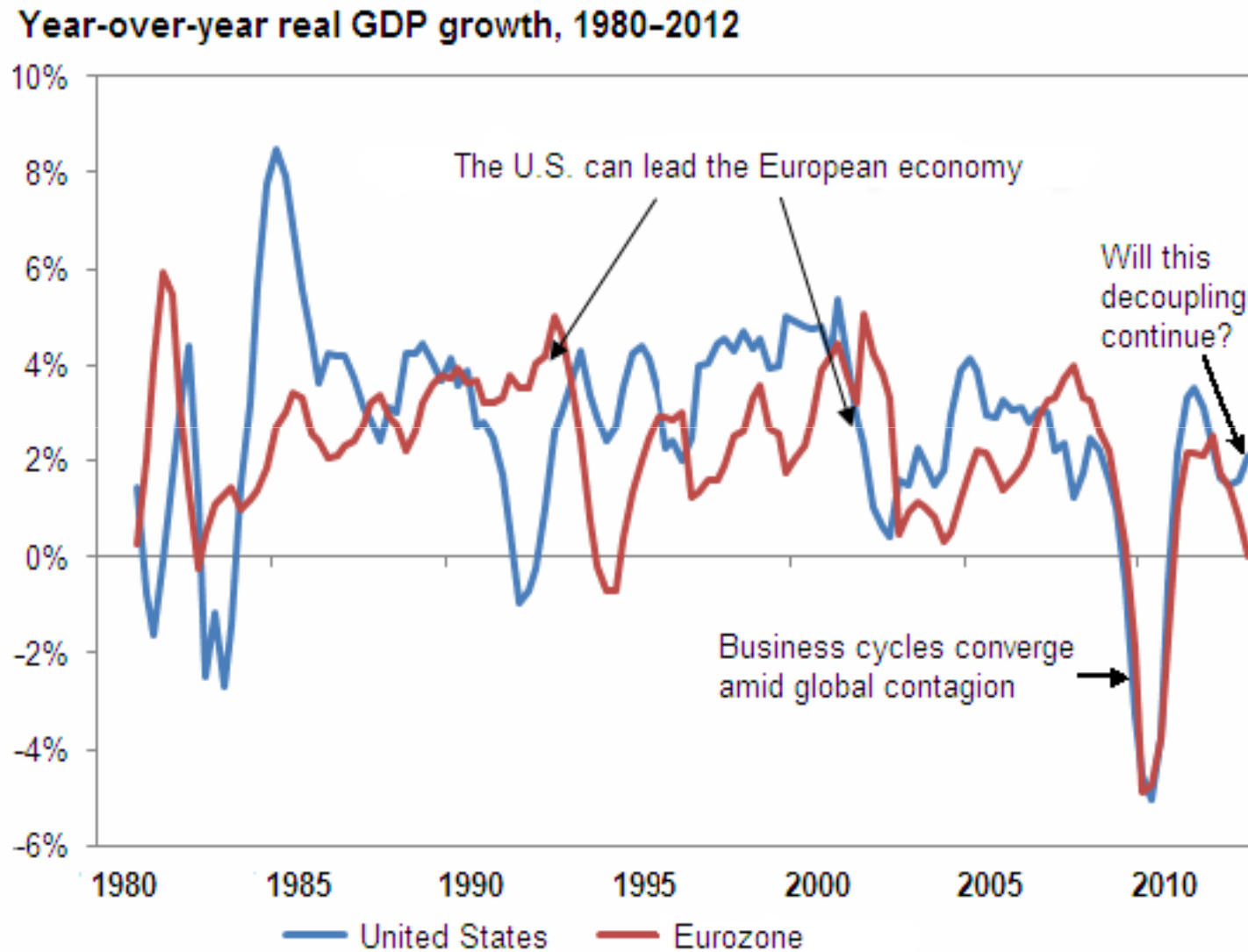# WHAT DRIVES OUTPUT IN THAILAND?

Paul Beaumont, Onsurang Norrbin and Stefan Norrbin

Presentation for CASA – e-leader, Singapore, January 2013

Motivation: How strong is the coupling effect?

Year-over-year real GDP growth, 1980–2012

Motivation

- How strong are spillover effects (coupling) for Thailand ?

- Which countries do spillover effects (coupling) come from?

- Have spillover effects for Thailand changed in the last 20 years?

- Do the spillover effects come from trade connection (growth) or uncertainty (volatility) effects?

Brief History of the Thai Economy, part 1

Mid-1980s to mid-1990s: The Plaza Accord of 1985 led to a rapid appreciation of the yen, improving Thai competitiveness.

February 1991: military coup. Later in May 1992 a massacre of demonstrators by soldiers. The King intervenes.

1993: Liberalization of Thailand's financial system. The government encouraged banks to borrow short-term through its establishment of the Bangkok International Banking Facility (BIBF0, with the approval of the IMF.

1994-1996: Thailand experienced an average current account deficit of 7.3% of GDP.

1997-1998: the flotation of Thai baht on the 2nd of July 1997, followed by a banking crisis. 24 of 50 finance and security companies were closed and nine were merged into two new companies. Only five commercial banks were allowed to continue their operation with a loan from the government.

Sources: Peter G. Warr, "The Thai Economy in Transition," edited by Peter G. Warr, Cambridge University Press, 1993. Asia's Turning Point, Tselichtchev and Debroux, 2009

Brief History of the Thai Economy, part 2

December 2004: A tsunami and devastating earthquake in the six southern provinces adversely affected the tourism.

September 2006: a bloodless military coup ousted Thaksin from power

December 2007: Parliamentary election was held. The People's Power Party, newly formed by Thaksin loyalists, won in a landslide.

May-November 2008: massive anti-government rallies have begun again.

December 2008: the Constitutional court dissolved PAP and banned Somchai from politics for 5 years. The premiership went to Abhisit Vejjajiva, the leader of Democrat Party

2010: "Red-shirt" riots, lead to burning of Bangkok, demanding early elections

August 2011 – present: Yingluck Shinawatra (Pheu Thai)

October-December, 2011: The great flood

Sources: Peter G. Warr, "The Thai Economy in Transition," edited by Peter G. Warr, Cambridge University Press, 1993.
 Asia's Turning Point, Tselichtchev and Debroux, 2009

Industrial production for Thailand
(1987-2012)
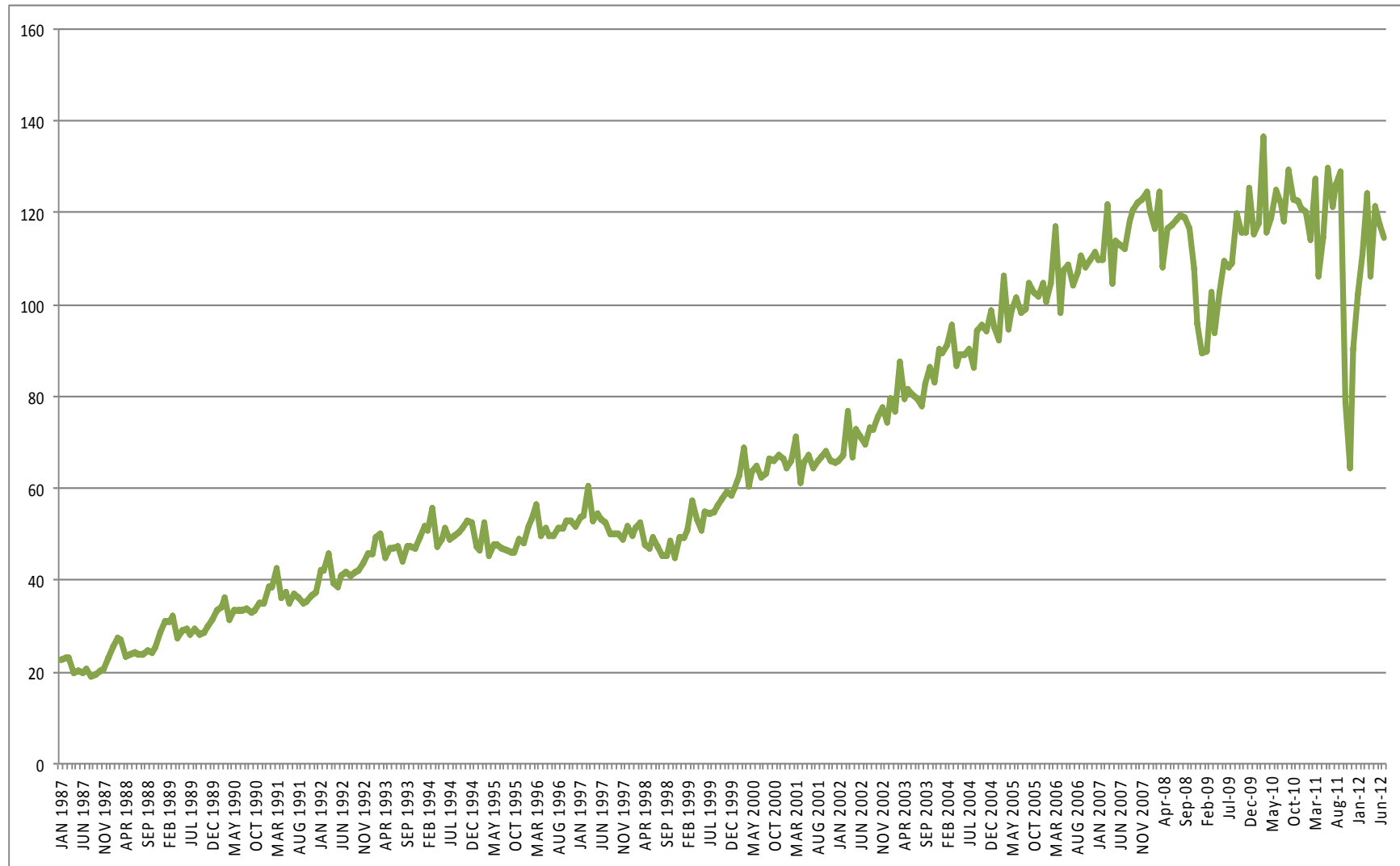
Four Different Potential Sources of Movement

- Own country
  - Growth
  - Volatility

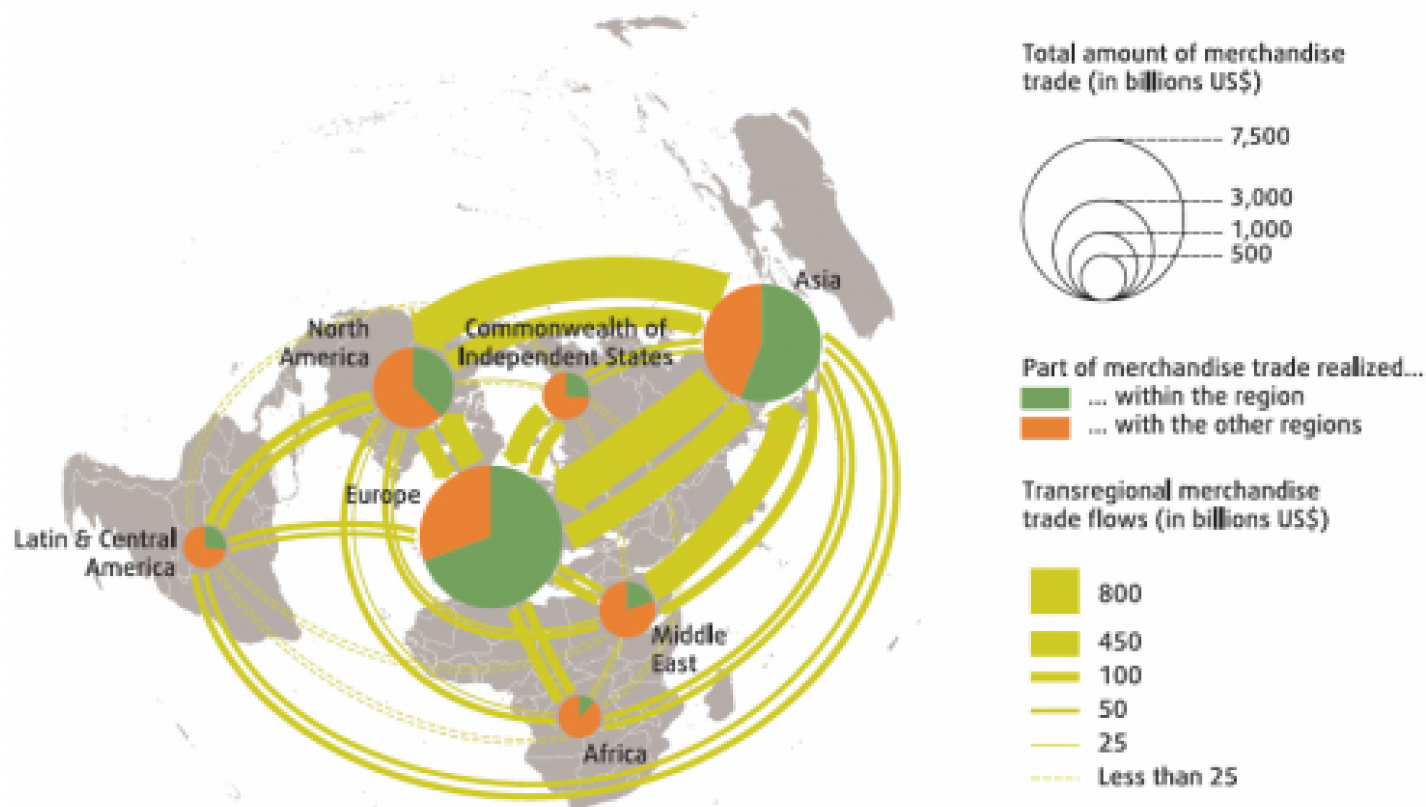- Spillover from other countries
  - Growth
  - Volatility

Own Growth impact

Idiosyncratic movements in output within Thailand

- Resource discovery (e.g. oil)

- Productivity change (e.g. human capital innovation)

- Natural disaster (e.g. flood)

- Domestic conflict (e.g. coup)

$15 trillion in Trade => spillover growth

Figure 2: Almost half of the global goods trade involves Europe
(merchandise trade in 2008, US$ billion)

Source: World Bank staff, based on WTO (2009); see chapter 2.

http://www.zerohedge.com/news/europe-goes-deep-recession-so-does-half-worlds-trade

Spillover growth

Trade linkages from other countries

- demand (e.g. income effects)
- Supply (e.g. intermediate input effects)

Thai Stock Market Volatility

(base period = April 1975)

Theories arguing a positive effect of volatility on growth

- **Higher economic uncertainty raises precautionary saving, increasing investment** -- Mirman (1971)

- **Returns have to compensate for risk** -- Black (1987)

- **Cleansing effect of cycle on growth** – Schumpeter (1939), Caballero and Hammour (1991)

Theories arguing a negative effect of volatility on growth

- **Irreversibility of investment** causes negative effects on investment of volatility-- Bernanke (1983)

- **Credit market imperfections** have negative effects on growth in high volatility – Stiglitz (1993), Aghion and Howitt (2006)

- **Learning-by-doing models** with human capital accumulation being concave to the business cycle disturbance, causes a loss of "learning" in recessions that is not made up in booms – Martin and Rogers (2000)

Data

- Monthly non-seasonally adjusted industrial production (or manufacturing) data for
  - the U.S., and Europe (Germany, U.K., France, and Italy),
  - plus 7 Asian countries:
    Japan, Korea, China, Singapore, Malaysia, Philippines, and Thailand.

- Two periods, 1992-2012 for all nine countries, and 1988-2012 for all except, China and Malaysia.

- Data are seasonally adjusted by year-to-year growth rates (unit root indicates stationarity in growth rates).

- The growth rates are then used to compute volatilities using a GARCH(1,1) for each country.

Growth and Volatility in Thailand
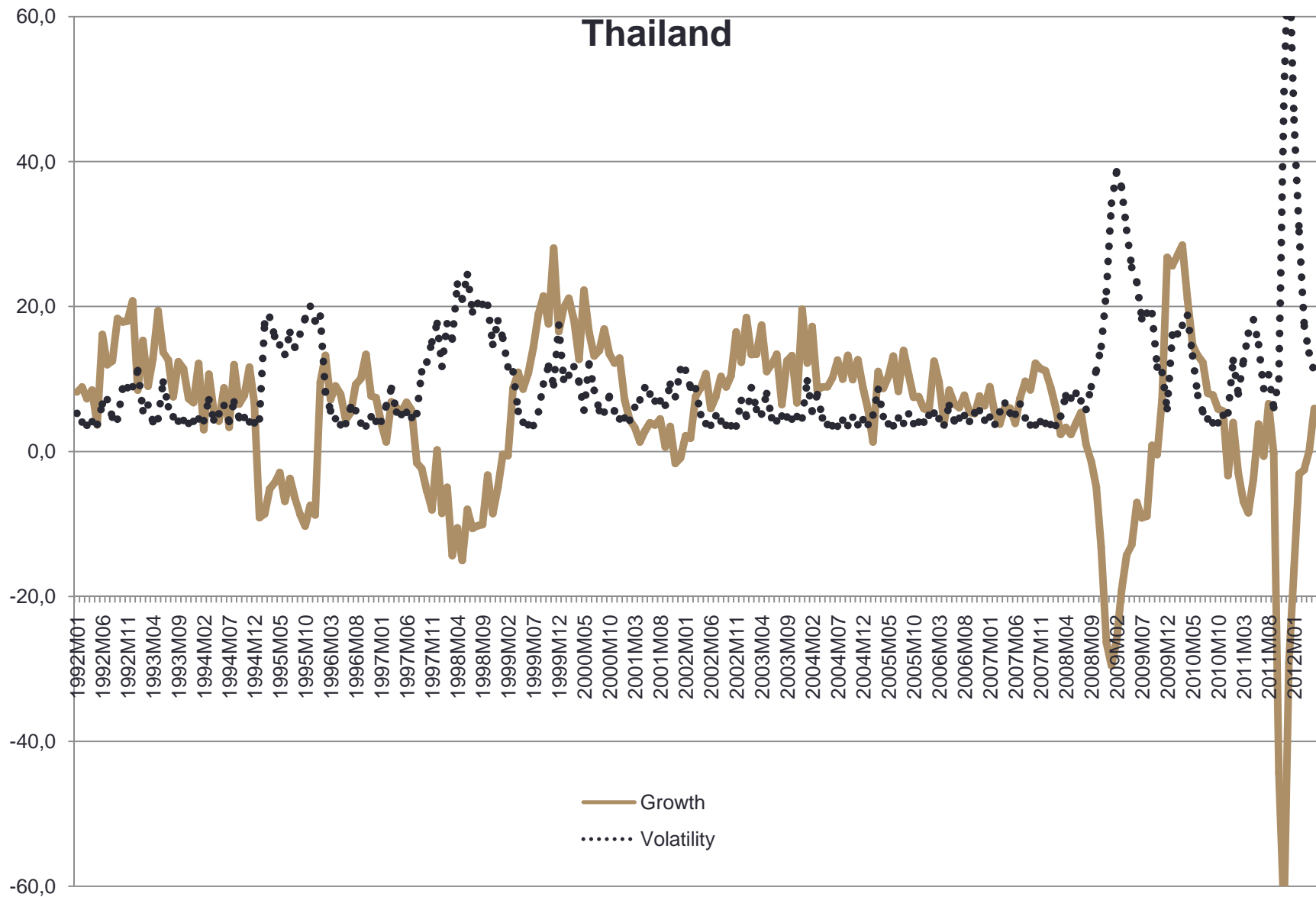
Growth and Volatility for Korea
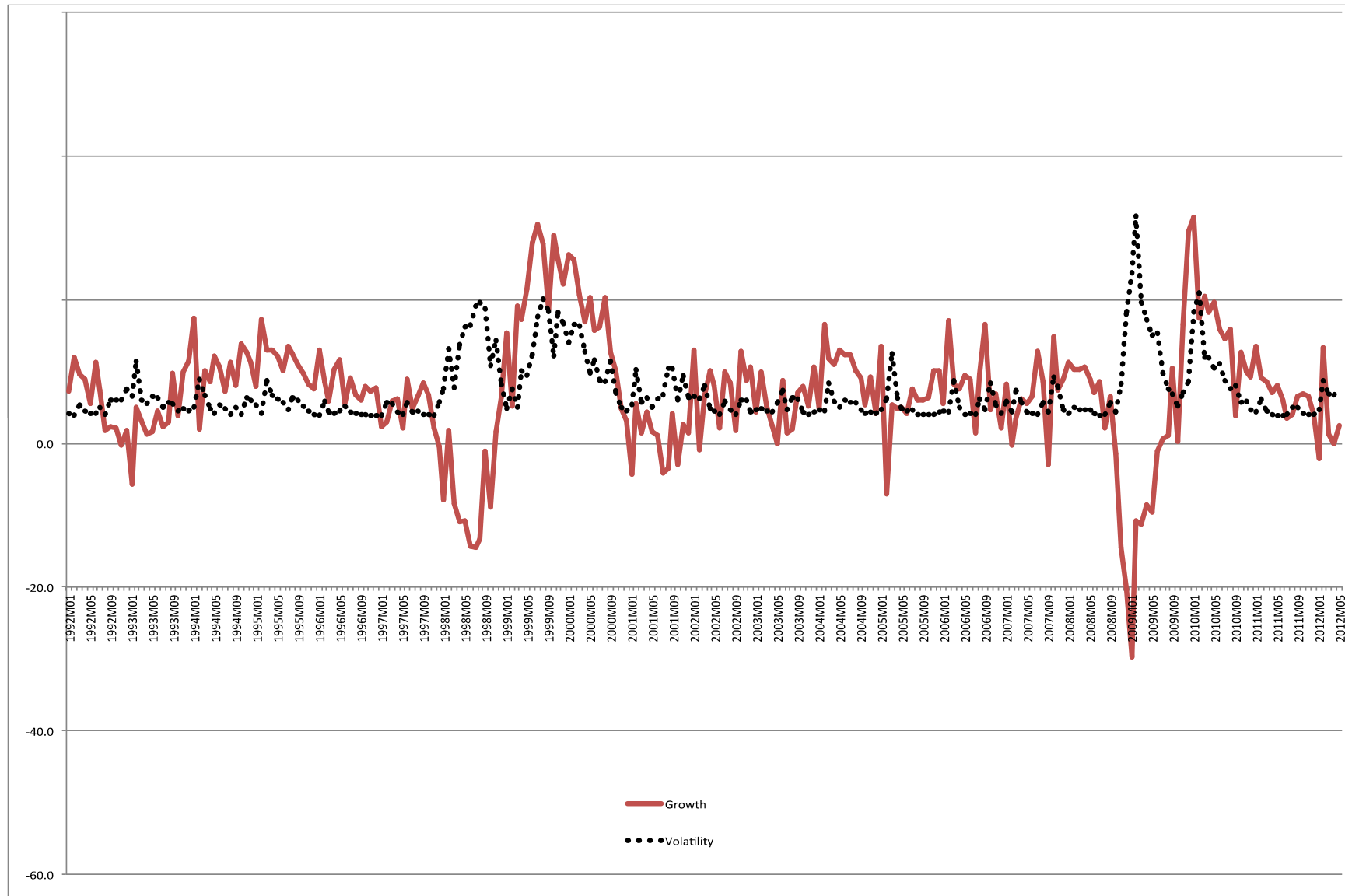
Growth and Volatility in the U.S.
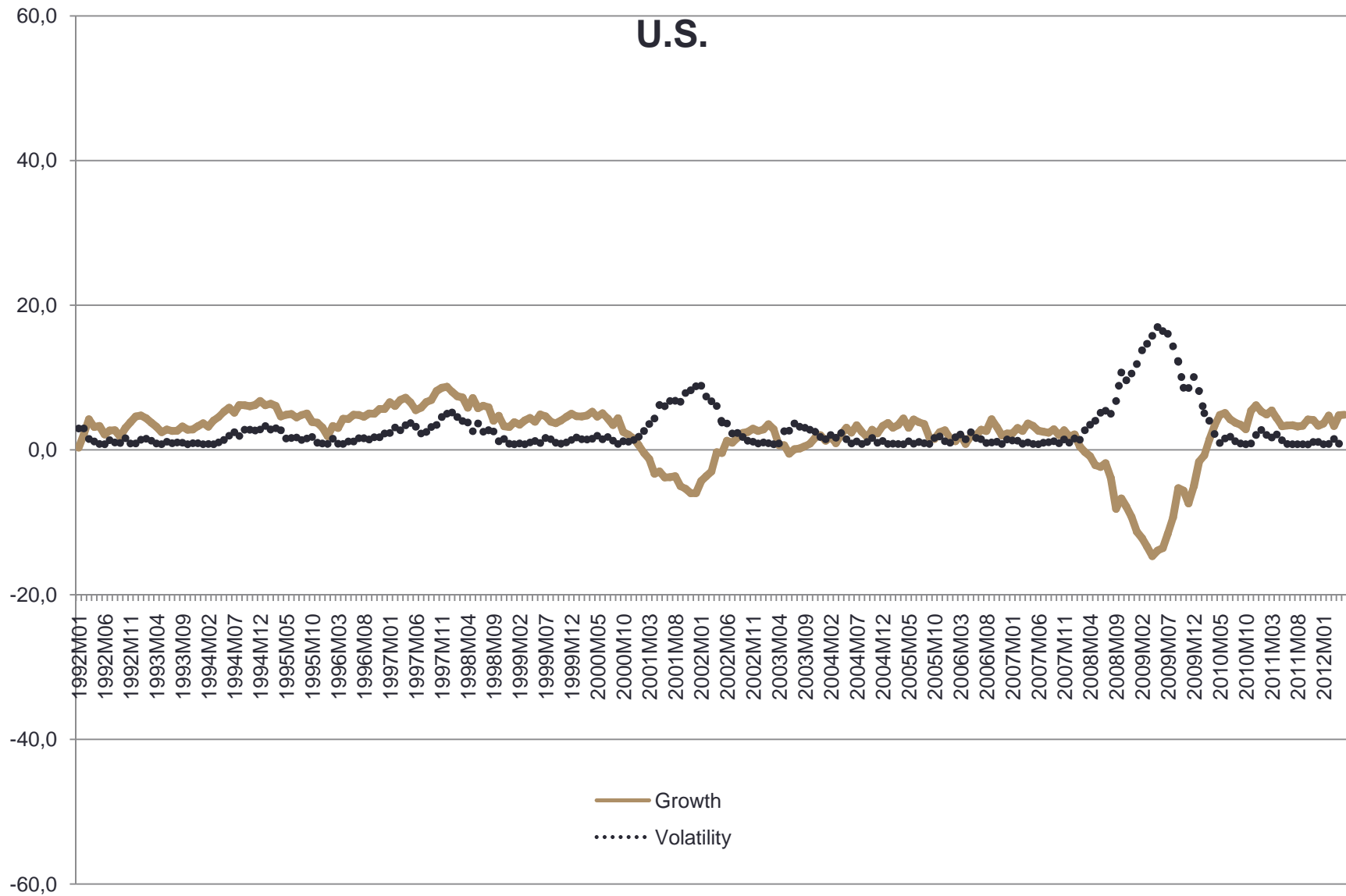
Picking an empirical method

- Structural equations – impossible as we do not know the functional form

- Need atheoretical specification – Vector Autoregression

- Simple bivariate VAR(1)

- $Y_t = Y_{t-1} + X_{t-1} + e_{1,t}$
- $X_t = Y_{t-1} + X_{t-1} + e_{2,t}$

- We can use this to forecast the future Y and X variables.

Orthogonality issue

- But $e_{1,t}$ and $e_{2,t}$ are not orthogonal, so if we want to know the impact of each variable on each other we need a further restriction.

- Most common is a Choleski decomposition.
  - Imposes a contemporaneous ordering.
  - This is sufficient to get results, but we need to *a priori* know who leads.
  - In this paper we want the data to tell us who leads.

- Diebold and Yilmaz (2012) worked out a way to avoid a Choleski restriction.

Generalized VAR method of Diebold and Yilmaz (2012)

$$y_t = \sum_{i=1}^{p} \phi_i y_{t-i} + \varepsilon_t \qquad (1)$$

$$\theta_{ij}(H) = \frac{\sigma_{jj}^{-1} \sum_{h=0}^{H-1} (e_i' A_h \sum e_j)^2}{\sum_{h=0}^{H-1} (e_i' A_h \sum A_h' e_i)} \qquad (2)$$

$$\hat{\theta}_{ij}(H) = \frac{\theta_{ij}(H)}{\sum_{j=1}^{N} \theta_{ij}(H)} \qquad (3)$$

Growth comes from own country and spillover growth from Korea

Table 1

g–g: 1992–2012 with China & Malaysia

from

to

	gChina	gEur	gJap	gKor	gMal	gPhil	gSing	gThai	gUS	2ifo
gChina	59.4	2.7	0.9	6.5	0.8	1.2	3.2	4.9	2.1	22.2
gEur	2.1	27.0	18.3	16.6	1.8	2.4	4.8	9.2	10.2	65.5
gJap	1.5	7.3	35.3	18.8	4.6	3.1	2.2	8.2	3.6	49.3
gKor	3.7	6.7	6.4	47.5	6.2	3.2	4.5	7.4	1.0	39.1
gMal	5.4	3.4	2.5	13.3	38.3	6.0	2.2	8.8	7.2	48.8
gPhil	5.8	5.7	4.8	9.9	8.2	44.3	1.3	5.2	4.0	45.0
gSing	4.5	4.7	6.0	10.4	5.7	2.2	45.5	3.3	2.8	39.6
gThai	3.6	5.2	5.3	9.0	2.6	1.9	0.9	56.0	0.3	28.7
gUS	5.6	1.7	6.0	9.1	3.5	1.4	6.7	4.9	48.6	39.0

Own Growth: 44.6

Growth Spillover: 41.9

Volatilities have a minor effect on Thai growth, except U.S. volatility

Table 2

g–σ: 1992–2012 with China & Malaysia

	σChina	σEur	σJap	σKor	σMal	σPhil	σSing	σThai	σUS	2ifo
gChina	0.2	3.0	0.9	3.3	0.2	0.9	0.8	0.5	8.6	18.2
gEur	0.2	1.4	0.7	0.8	0.0	1.7	0.5	0.9	1.2	6.1
gJap	1.5	1.4	1.1	1.2	0.3	3.9	0.4	0.5	5.1	14.3
gKor	0.4	0.6	0.5	3.6	1.3	1.0	0.8	0.9	4.3	9.7
gMal	0.5	1.5	0.4	0.6	0.6	1.6	2.2	0.3	5.3	12.3
gPhil	0.8	1.1	0.4	1.4	0.2	1.2	1.3	1.3	2.9	9.5
gSing	0.2	1.7	2.8	1.9	0.5	2.8	1.2	1.0	3.0	13.8
gThai	0.2	0.7	0.2	1.9	0.1	0.8	1.6	2.0	7.8	13.3
gUS	0.1	0.7	1.5	1.8	0.1	2.2	5.4	0.2	0.5	11.9

Own Volatility: 1.3

Volatility Spillover: 12.1

Volatilities are explained by own volatilities and U.S. spillover volatility

Table 3

σ:–σ: 1992–2012 with China & Malaysia

	σChina	σEur	σJap	σKor	σMal	σPhil	σSing	σThai	σUS	2ifo
σChina	66.7	0.3	0.3	5.7	0.0	1.3	1.8	1.3	0.5	11.2
σEur	1.5	17.9	3.0	6.6	0.1	2.1	4.0	1.3	7.9	26.6
σJap	2.1	2.7	12.2	11.5	0.2	4.4	2.9	4.3	10.5	38.8
σKor	11.2	1.1	0.9	50.5	0.2	5.5	2.6	3.6	9.5	34.5
σMal	7.5	0.3	1.9	11.4	21.0	8.2	0.7	1.5	16.3	47.7
σPhil	0.7	2.4	1.3	6.1	0.6	31.4	0.9	0.4	6.4	18.6
σSing	0.4	1.9	3.7	7.3	0.6	1.8	39.7	2.3	3.4	21.3
σThai	1.3	1.0	1.5	5.5	0.2	1.7	0.4	23.4	9.0	20.6
σUS	0.4	2.3	1.6	1.6	0.1	3.7	8.3	0.4	26.0	18.4

Own Volatility: 32.1

Volatility Spillover: 26.4

But volatilities also come from own growth

Table 4

σ:–g: 1992–2012 with China & Malaysia

	gChina	gEur	gJap	gKor	gMal	gPhil	gSing	gThai	gUS	2ifo
σChina	7.8	1.2	5.3	3.0	1.1	1.4	0.2	2.1	0.1	14.3
σEur	2.0	6.4	14.4	12.2	1.1	1.6	2.4	8.5	7.0	49.1
σJap	3.6	1.3	9.3	10.3	2.6	2.3	2.3	9.2	8.0	39.7
σKor	8.2	0.3	1.5	0.4	0.6	1.7	0.2	1.1	1.1	14.6
σMal	9.0	1.5	3.1	4.0	4.8	2.6	0.9	2.9	2.4	26.5
σPhil	4.9	3.7	4.4	10.1	2.5	8.6	1.0	10.1	4.6	41.4
σSing	3.4	3.0	1.4	0.4	2.5	4.5	6.4	2.7	14.7	32.6
σThai	4.1	1.7	1.6	2.3	0.5	1.2	0.3	43.6	0.6	12.3
σUS	5.9	0.8	7.7	7.9	1.0	1.2	6.6	7.0	17.5	38.1

Own Growth: 11.6

Growth Spillover: 29.9

Robustness tests Effect on Thailand's growth

	gChina	gEur	gJap	gKor	gMal	gPhil	gSing	gThai	gUS	total
1992-2012	3.6	5.2	5.3	9.0	2.6	1.9	0.9	56.0	0.3	28.7
1992-2006	2.2	4.3	4.8	6.3	5.7	0.8	1.8	40.9	4.6	30.5
1988-2012	--	2.8	7.5	10.9	--	1.4	1.1	61.4	0.6	24.2

	σChina	σEur	σJap	σKor	σMal	σPhil	σSing	σThai	σUS	total
1992-2012	0.2	0.7	0.2	1.9	0.1	0.8	1.6	2.0	7.8	13.3
1992-2006	1.1	0.3	3.1	4.4	0.3	0.2	0.2	1.7	17.2	27.0
1988-2012	--	0.8	0.2	0.7	--	2.7	3.0	1.8	5.3	12.6

Effect on Thailand's volatility

	gChina	gEur	gJap	gKor	gMal	gPhil	gSing	gThai	gUS	total
1992-2012	4.1	1.7	1.6	2.3	0.5	1.2	0.3	43.6	0.6	12.3
1992-2006	1.1	2.7	7.1	1.5	1.1	0.1	2.1	9.9	8.8	24.4
1988-2012	--	0.7	1.6	3.8	--	0.7	0.4	41.6	0.7	7.8

|	σChina	σEur	σJap	σKor	σMal	σPhil	σSing	σThai	σUS	total
1992-2012	1.3	1.0	1.5	5.5	0.2	1.7	0.4	23.4	9.0	20.6
1992-2006	1.0	0.3	1.4	3.5	0.6	1.2	2.3	40.3	14.8	25.3
1988-2012	--	2.0	2.0	5.2	--	3.7	0.7	30.4	6.6	20.2

Have the drivers of Thai output changed?

- We examine a rolling VAR with an eight-year window, giving us 96 data points for each regression

- We use the longer time series, 1988-2012 to have data prior to the Asian financial crisis. So we have results from 1996-2012.

- We plot the effects in the following graphs

Rolling regressions of growth equations show an increase in globalization starting around 2003, and volatility spikes in crises
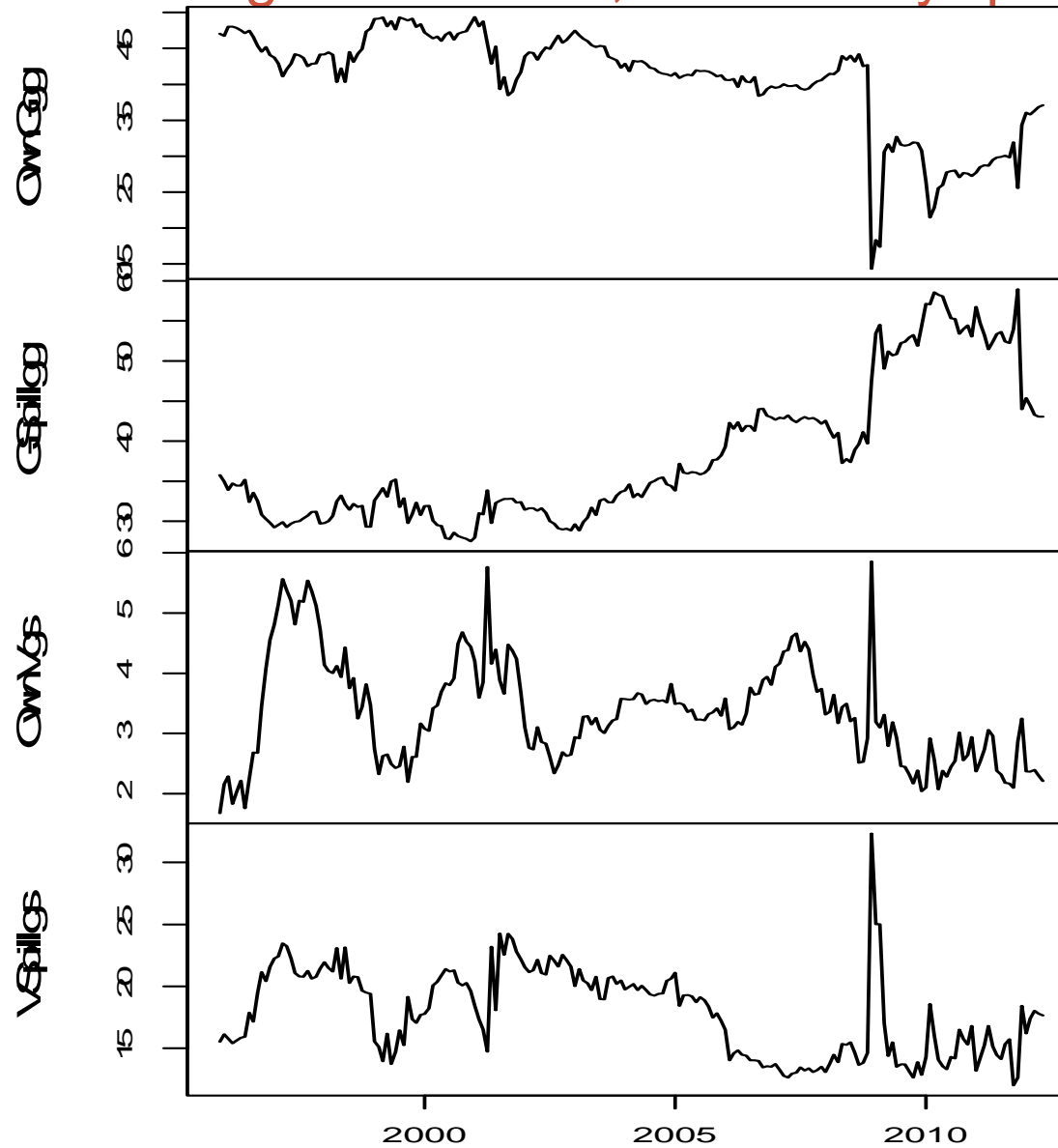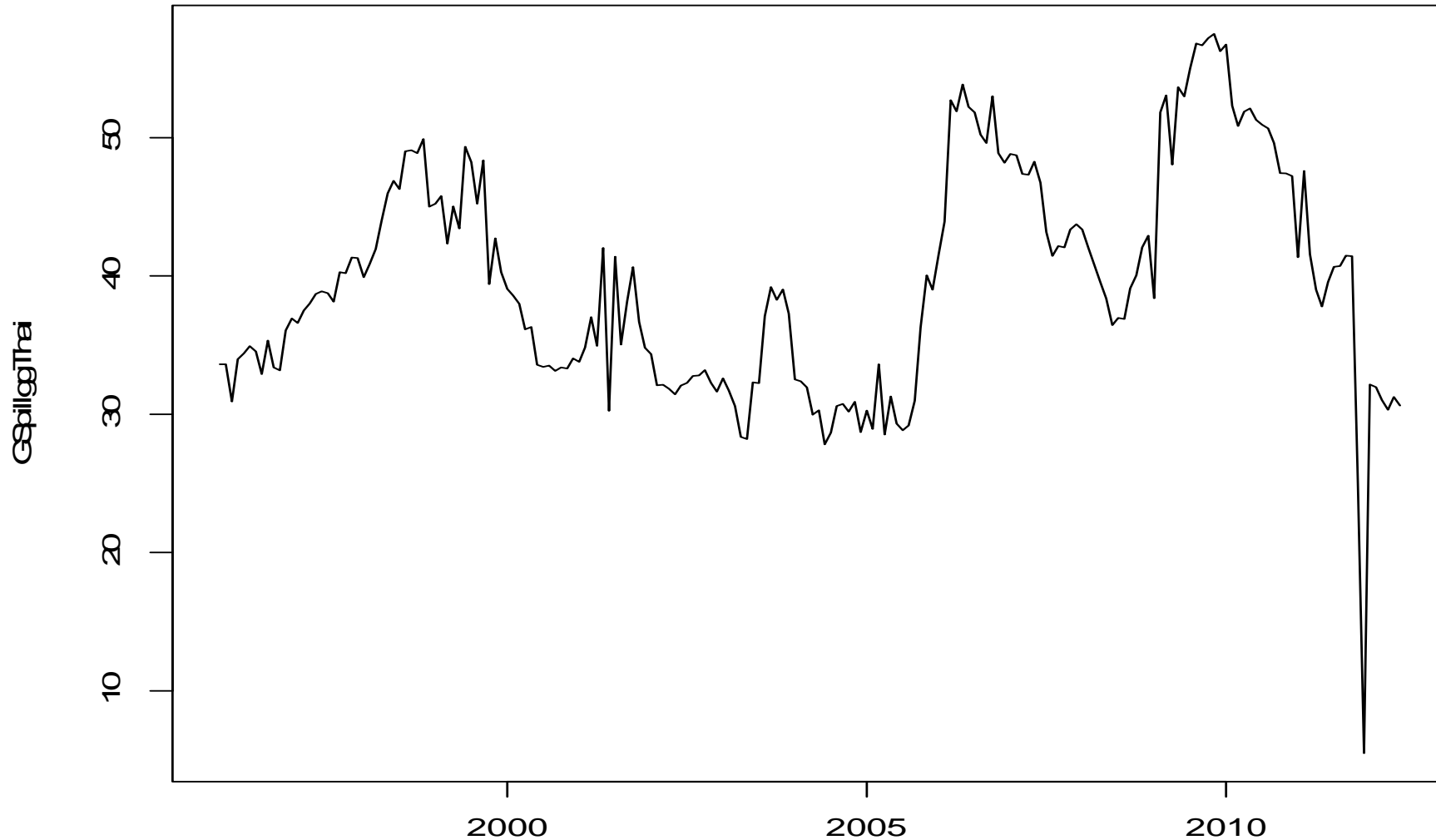
Rolling regressions of volatility regressions show a decrease in own volatility and an increase in spillover growth to volatility
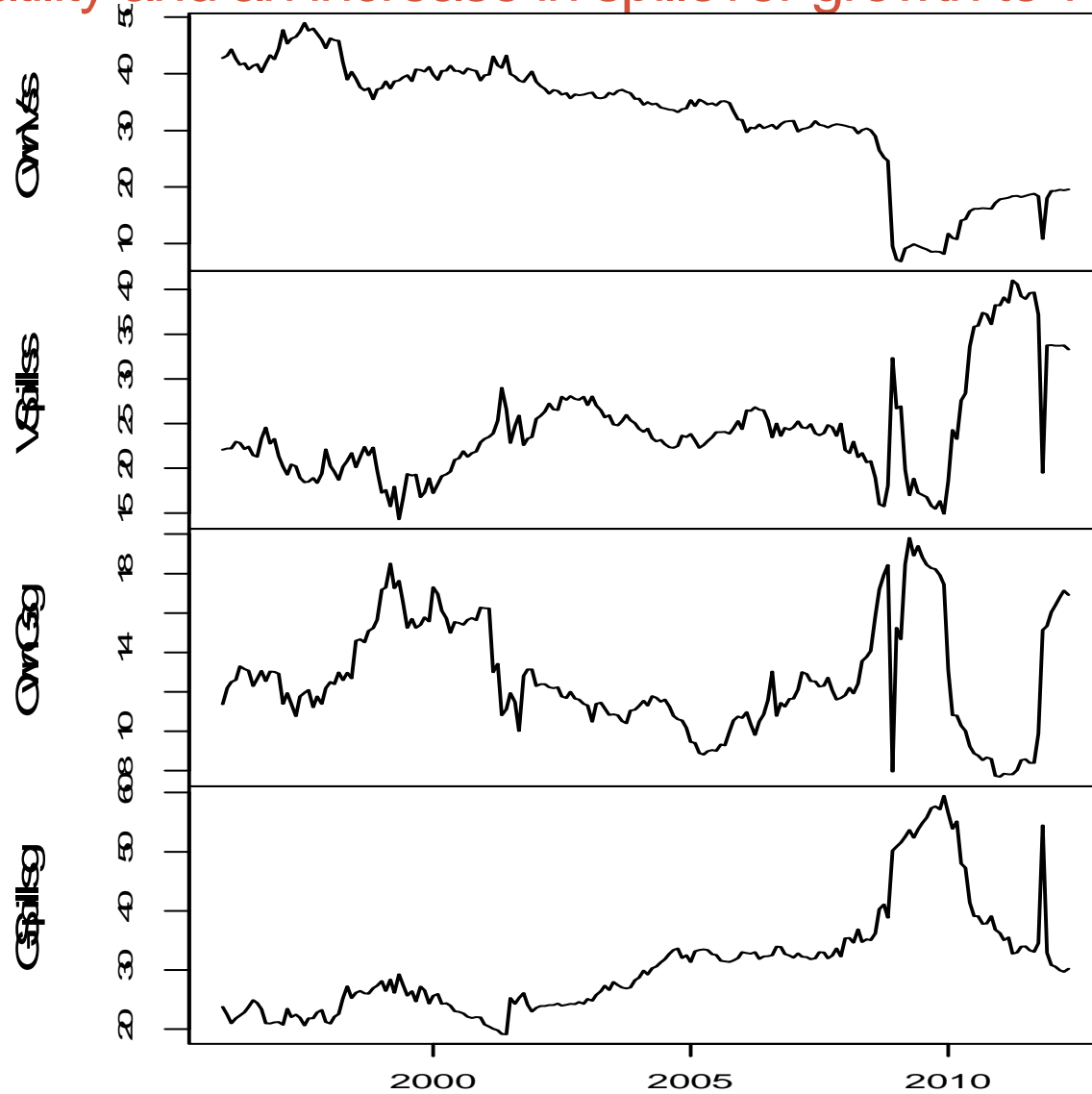
Own growth has been decreasing in importance in Thai output, except for flood
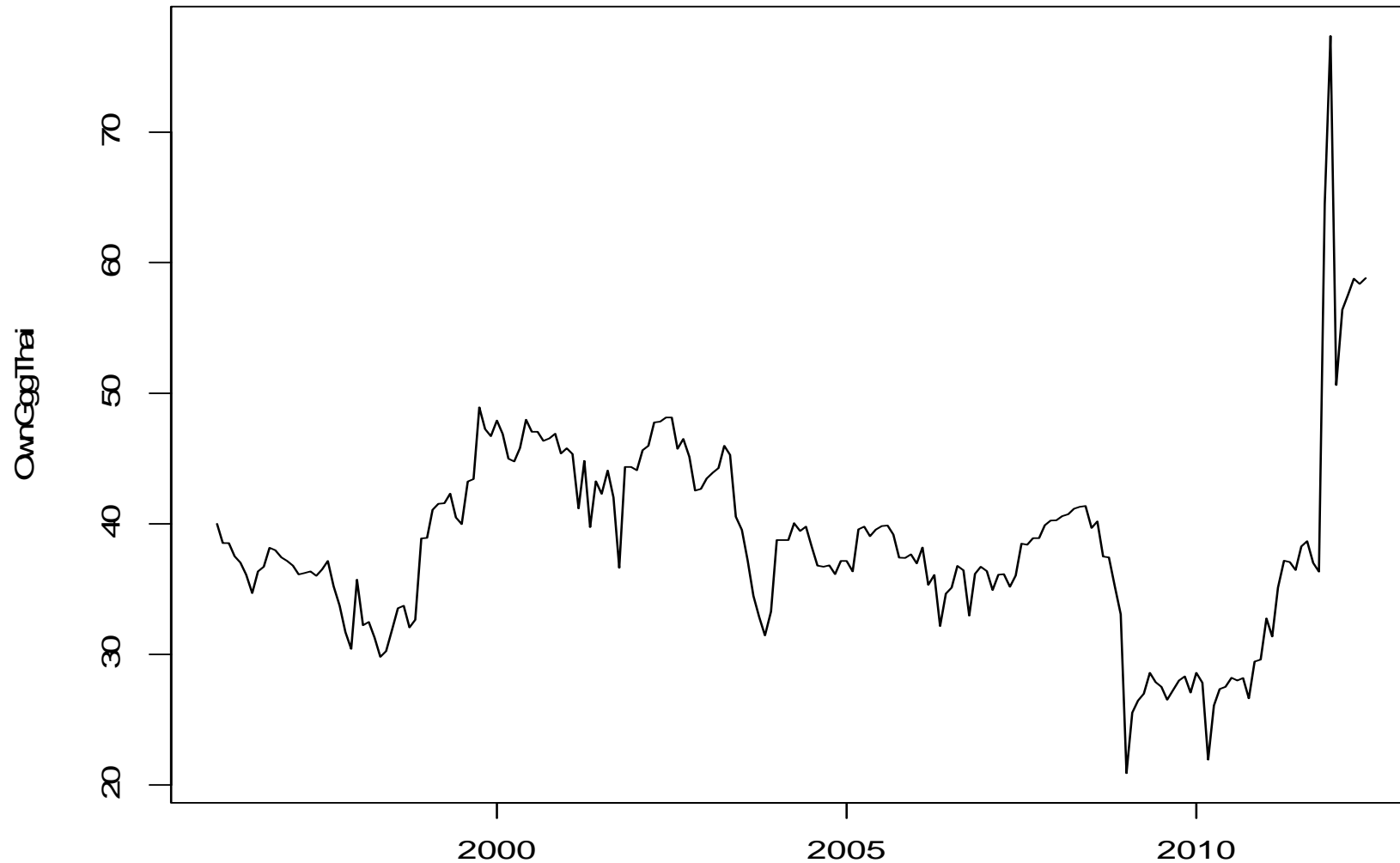
Trend towards higher globalization, except for flood

Growth spillovers on volatility high for Thailand, especially in latest financial crisis
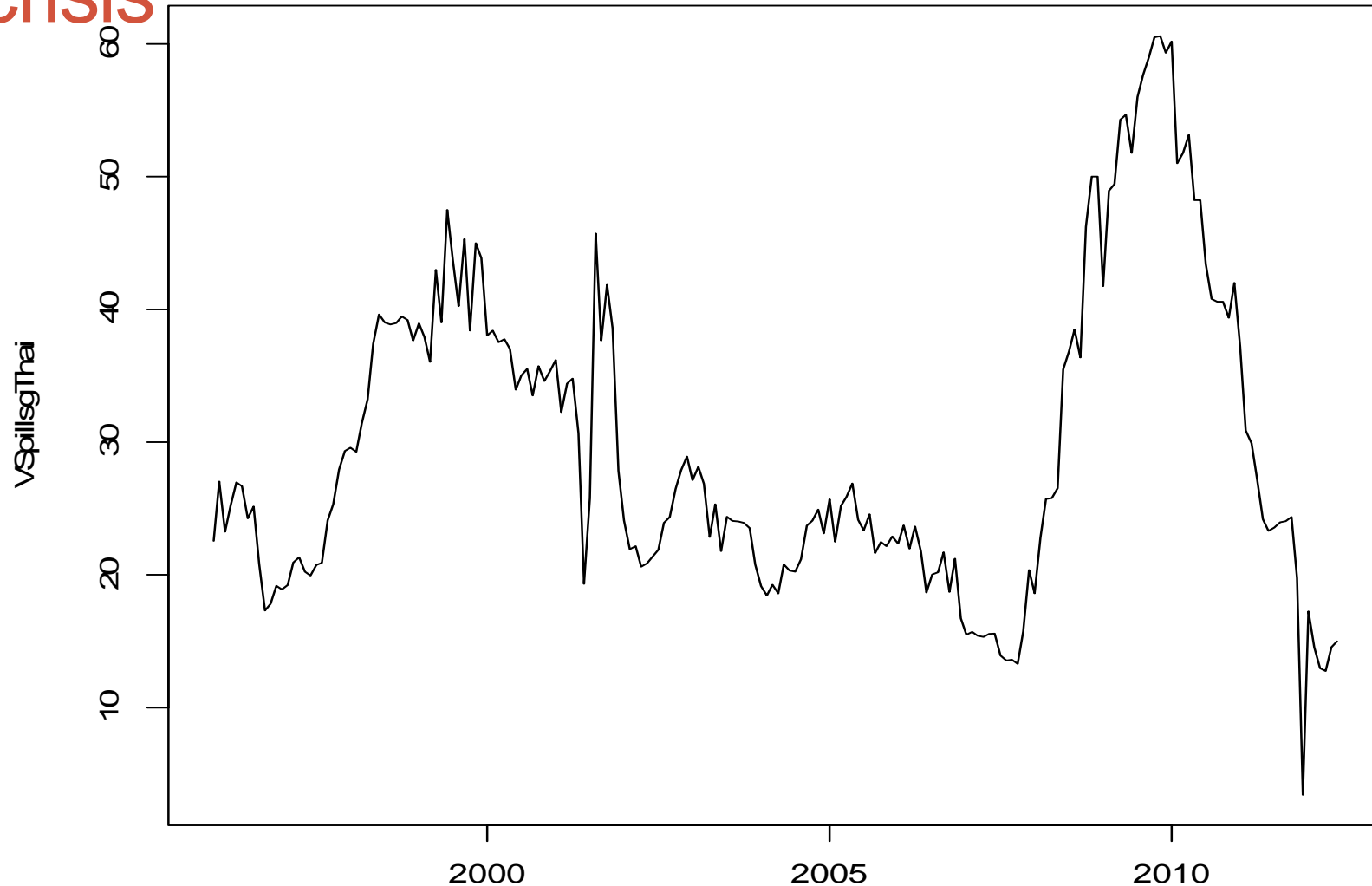
Conclusions

- Spillover growth effects are strong for Thai output
  - Interaction is primarily through trade linkages
  - Korea has become the main driver for Thai output and for the rest of Asia.

- Thailand sensitive to volatility in other countries, in particular volatility from the U.S.

- Globalization has intensified for Asian countries, especially since 2003.

Extensions

- Estimate the volatility using financial markets.

- Investigate spillover effects of disaggregate industrial production.

Before the U.S. financial crisis less growth spillover

Table 5

g–g: 1992–2006 with China & Malaysia

	gChina	gEur	gJap	gKor	gMal	gPhil	gSing	gThai	gUS	2ifo
gChina	51.5	0.8	0.4	8.6	1.8	1.1	5.2	4.1	2.4	24.3
gEur	0.6	35.9	10.6	11.4	2.2	3.5	8.5	2.6	7.8	47.4
gJap	0.1	2.9	38.4	14.7	7.7	5.7	8.1	2.9	1.8	43.9
gKor	6.1	1.0	5.7	52.9	6.0	1.9	8.6	4.1	0.5	33.8
gMal	2.7	1.3	7.9	20.5	36.4	3.1	3.2	7.7	2.8	49.1
gPhil	5.5	1.4	1.3	4.8	7.2	52.0	2.2	1.8	1.9	26.1
gSing	6.4	1.8	4.1	14.8	6.5	1.2	44.1	3.0	2.1	39.8
gThai	2.2	4.3	4.8	6.3	5.7	0.8	1.8	40.9	4.6	30.5
gUS	6.2	0.1	0.2	7.3	3.9	8.0	3.2	0.9	62.9	29.6

Own Growth: 46.1

Growth Spillover: 36.1

Slightly more volatility spillover *before* the crisis, but still not much own volatility

Table 6

g–σ: 1992–2006 with China & Malaysia

	σChina	σEur	σJap	σKor	σMal	σPhil	σSing	σThai	σUS	2ifo
gChina	1.4	8.5	0.7	3.3	0.2	0.9	0.4	0.1	8.5	22.7
gEur	2.0	1.2	4.4	0.6	0.3	1.9	0.6	4.8	0.9	15.5
gJap	0.3	1.2	1.8	0.4	0.2	2.2	1.3	2.7	7.6	15.9
gKor	2.3	0.2	0.7	3.0	0.8	0.5	0.0	0.7	5.1	10.4
gMal	0.5	4.3	0.5	0.4	0.5	0.3	0.4	0.2	7.4	14.1
gPhil	1.0	6.9	0.6	3.4	0.3	1.4	1.3	1.6	5.4	20.4
gSing	0.1	3.4	0.4	0.3	1.3	1.8	1.4	0.6	6.8	14.7
gThai	1.1	0.3	3.1	4.4	0.3	0.2	0.2	1.7	17.2	27.0
gUS	0.1	0.6	0.1	3.4	0.4	1.0	0.5	0.8	0.7	6.8

Own Volatility: 1.5

Volatility Spillover: 16.4

Robustness check w/o China and Malaysia, 1988-2012; Own growth and spillover explains 88% of growth

Table 9

g–g : 1988–2012 without China & Malaysia

	gEur	gJap	gKor	gPhil	gSing	gThai	gUS	2ifo
gEur	30.3	18.5	16.7	2.1	5.1	9.1	9.5	60.9
gJap	5.9	40.5	21.4	0.9	3.4	12.5	2.3	46.3
gKor	4.0	6.7	63.4	0.9	6.0	9.0	1.0	27.6
gPhil	4.6	6.0	10.5	53.4	2.1	7.5	1.2	32.0
gSing	3.2	8.1	11.9	1.6	53.4	5.3	3.3	33.4
gThai	2.8	7.5	10.9	1.4	1.1	61.4	0.6	24.2
gUS	1.0	3.5	10.5	1.9	7.7	3.0	61.8	27.5

Own Growth: 52.0

Growth Spillover: 36.0

Volatility effects on output remain very small

Table 10

g–σ : 1988–2012 without China & Malaysia

	σEur	σJap	σKor	σPhil	σSing	σThai	σUS	2ifo
gEur	2.0	0.3	0.9	1.7	0.8	1.3	1.8	6.8
gJap	1.9	0.7	0.8	4.3	1.1	0.3	4.1	12.5
gKor	1.0	1.0	0.7	1.2	0.4	1.4	3.2	8.2
gPhil	1.2	0.3	2.9	1.4	5.9	0.5	2.4	13.2
gSing	2.4	2.0	1.1	2.5	1.9	0.9	2.4	11.4
gThai	0.8	0.2	0.7	2.7	3.0	1.8	5.3	12.6
gUS	0.8	1.0	2.0	1.4	4.2	0.5	0.9	9.7

Own Volatility: 1.3

Volatility Spillover: 10.6

Volatility effects on Thai output are large at times, especially from the U.S.