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Regional Business Cycle Synchronization in Asia: Internal or External Integration? Trade or Financial Integration?

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- Trends in Economic Integration and Business Cycles in Asia
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Introduction

- In recent years, we observed two interesting changes of Asian economies.
- International economic linkages of Asian countries increased over time.
  - trade integration: lowering trade barriers, forming FTA…
  - financial globalization: capital account liberalization, policy cooperation…
  - for both global and regional levels (FTA, CMIM, ABMI…)
- Business cycle comovements of Asian countries increased substantially in the 2000s.
- What are the effects of economic integration on business cycle comovments in Asia?

Effects of Economic Integration on Business Cycle Synchronization

- Differently from many past studies, we analyze effects of various types of economic integration on business cycle comovements.
- Trade vs. Financial Integration
- Internal (integration within Asia) vs. External (linkages of Asia with the ROW)
  - Most past studies did not consider internal vs. external linkages separately but it is important to separate them.
  - Internal and external integration may have a different effect on (internal) business cycle comovements.
  - By controlling external linkages, effects of internal integration on business cycle comovements can be better inferred, especially because external shocks are likely to have substantial effects on Asian BC.

Trends in Economic Integration

- International trade and financial transactions of Asian countries increased substantially.
  - Trade: 3.5% (1990) → 17.5% (2010) of world GDP
  - Assets: 21.07% (1990) → 59.50 % (2009) of world GDP
- Proportion of intra-regional trade and financial transactions increased substantially.
  - Trade: 37.8% (1990) → 44.6% (2009), ASEAN+3
  - Portfolio (liability): 7.9% (1990) → 17.6% (2010)
- In terms of volume, trade and financial transactions between Asian countries and the ROW also increased.
- Overall, internal and external integration, and trade and financial integration of Asian countries increased over time.

Trends in Business Cycle Comovements

- Business cycle comovements among Asian countries increased in the 2000s.
  - Bilateral correlation of cyclical real GDP among Asian countries increased for most countries.
- Business cycle comovements between Asian countries and major industrial countries also increased in the 2000s.
  - Bilateral correlation of cyclical real GDP of Asian countries and G6 increased from near 0 (1990s) to over 0.6 (2000s).

Empirical Method

- Simple model

$$\rho_{ij} = \alpha_0 + \alpha_1 T_{ij} + \alpha_2 F_{ij} + \varepsilon_{ij}$$

- Add external linkages

$$\rho_{ij} = \alpha_0 + \alpha_1 T_{ij} + \alpha_2 F_{ij} + \alpha_3 EXT_{ij} + \alpha_4 EXF_{ij} + \varepsilon_{ij}$$

  - External shocks can affect BCS of Asian economies through external linkages of Asian economies with the rest of the world.
  - EXT, EXF: external trade and financial linkages generating BCS of i and j

Equation System

- T, F, EXT, and EXF may interact with each other.
- Equation system

$$\rho_{ij} = \alpha_0 + \alpha_1 T_{ij} + \alpha_2 F_{ij} + \alpha_3 EXT_{ij} + \alpha_4 EXF_{ij} + \varepsilon_{ij}^1$$

$$T_{ij} = \beta_0 + \beta_1 F_{ij} + \beta_2 I_{ij}^T + \beta_3 EXT_{ij} + \beta_4 EXF_{ij} + \varepsilon_{ij}^2$$

$$F_{ij} = \gamma_0 + \gamma_1 T_{ij} + \gamma_2 I_{ij}^F + \gamma_3 EXT_{ij} + \gamma_4 EXF_{ij} + \varepsilon_{ij}^3$$

  - I: instruments
  - Estimated by 3SLS

Measurement

- Trade integration (T)

$$T_{i,j} = \frac{1}{2T} \sum_{t} \frac{(X_{i,j,t} + M_{i,j,t}) Y_t^W}{Y_{i,t} * Y_{j,t}}$$

- Financial integration (F)

$$F_{i,j} = \frac{1}{2T} \sum_{t} \frac{(I_{i,j,t} + I_{j,i,t}) Y_t^W}{Y_{i,t} * Y_{j,t}}$$

  - I: cross-border portfolio investments
- These measures are used in Imbs (2004, 2006), Clark and van Wincoop (2001), based on theoretical model of Deardorf (1998). These measures do not depend on country size. Asian countries are diversified in terms of their size.

Measurement

- EXT_{ij}: external trade linkage of Asian countries i and j with G6 (k) that generates business cycle correlation of i and j

$$EXT_{ij} \equiv \sum_{k=1}^{6} w_k \{MAXT - |T_{i,k} - T_{j,k}|\} \min\{T_{i,k}, T_{j,k}\}$$

  - w_k: relative weight of G6 countries
  - MAXT: the largest value of T in the sample
  - $\{MAXT - |T_{i,k} - T_{j,k}|\}$: similarity of external trade integration of i and j with k (G6)
  - $\min\{T_{i,k}, T_{j,k}\}$: size of the common part of external trade integration of i and j with k (G6)
  - EXT is large when the common external trade linkage is large and external trade linkages are similar.

Measurement

- EXF; external financial linkage of Asian countries i and j with G6 (k) that generates business cycle correlation of i and j

$$EXF_{ij} \equiv \sum_{k=1}^{6} w_k \{MAXF - |F_{i,k} - F_{j,k}|\} \min\{F_{i,k}, F_{j,k}\}$$

  - EXF is large when the common external financial linkage is large and external financial linkages are similar.
- Instruments
  - Trade: distance of capital cities, border, common official language
  - Finance: sum and difference of per capita real GDP

Data

- ASEAN+3 (Korea, Japan, China, Malaysia, Indonesia, Thailand, the Philippines, Hong Kong, Singapore)
- ASEAN+7 (ASEAN+3, Australia, New Zealand, India, Pakistan)
- External countries: G6 (excluding Japan)
- 2001-2009
- Business cycle correlation: correlation of cyclical real GDP (log)
  - HP filter, annual data

Correlation among Various Measures

A. ASEAN+3

	ρ	T	F	EXT	EXF_1
ρ	1				
T	0.261	1			
F	0.297	0.904	1		
EXT	0.382	0.675	0.811	1	
EXF	0.439	0.284	0.600	0.591	1

B. ASEAN+7

	ρ	T	F	EXT	EXF_1
ρ	1				
T	0.208	1			
F	0.232	0.864	1		
EXT	0.281	0.712	0.757	1	
EXF	0.333	0.249	0.606	0.437	1

Single Equation Model

ASEAN+3

ρ	OLS	OLS	OLS	OLS
T	0.00537(1.58)		-0.00091(-0.110)	0.0272(2.56)**
F		0.0188(1.82)*	0.0213(0.87)	-0.109(-2.61)**
EXT				0.0154(1.45)
EXF				0.0902(3.2)***
$\overline{R}^2$	0.068	0.0885	0.0888	0.360

ASEAN+7

P	OLS	OLS	OLS	OLS
T	0.0060(1.86)*		0.0009(0.14)	0.0177(2.09)**
F		0.0200(2.08)**	0.0177(0.92)	-0.0687(-2.24)**
EXT				0.0107(1.18)
EXF				0.0673(3.16)***
$\overline{R}^2$	0.0434	0.0538	0.0541	0.191

***, **, * : significant at 1%, 5%, and 10% level.

T and F are highly correlated; they are not significant when they put together. Most coefficients are significant when all are included together. Adjusted R^2 increased. All variables except for F have positive effects.

Equation System

	ASEAN+3	ASEAN+7
GDP correlations (ρ) equation		
T	0.0699(2.84)***	0.0326(1.60)
F	-0.303 (-2.82)***	-0.155(-2.07)**
EXT	0.0383(2.20)**	0.0234(1.71)*
EXF	0.186(3.28)***	0.112(2.63)***
Trade (T) equation		
F	3.941(7.02)***	3.794(5.47)***
EXT	-0.285(-1.16)	-0.0587(-0.22)
EXF	-1.950(-5.32)***	-2.0263(-5.42)***
Finance (F) equation		
T	0.217(7.18)***	0.243(5.95)***
EXT	0.122(2.09)**	0.0443(0.494)
EXF	0.473(4.34)***	0.517(6.24)***

Summary of Results

- Similar and strong external trade and financial linkages have significant positive effects on business cycle comovments within Asia.
- After controlling for external linkages, internal trade integration has a positive effect on business cycle comovements but internal financial integration has a negative effect.
- The negative effect of internal financial integration is especially interesting, because past empirical studies often reported a positive effect although theories suggest a negative effect.
  - Under complete international financial market, a country specific productivity shocks induce capital inflows sharply and increase investment more than autarky. So output differential becomes larger with financial integration. (BKK, 1992)
  - Financial integration can promote investments on risky projects, leading countries to specialize based on comparative advantages. This makes business cycle correlation weaker. (Obstfeld, 1994)

Relative Importance Index

- proportion of variance of dependent variables linearly accounted by each independent variable. Averaging over various orderings. (Kruskal, 1987)

Variable	ASEAN+3	ASEAN+7
T	0.0599	0.0235
F	0.0627	0.0267
EXT	0.0212	0.0076
EXF	0.0911	0.0514

- Financial linkage seems to be more important.
- External financial linkage is the most important one.

Robustness

- Real GDP in Log Difference to calculate business cycle correlation
- Alternative Measures for External Linkages
  - Consider only common size of external linkages

$$EXT1_{ij} \equiv \sum_{k=1}^{6} w_k \min\{T_{i,k}, T_{j,k}\}$$

$$EXF1_{ij} \equiv \sum_{k=1}^{6} w_k \min\{F_{i,k}, F_{j,k}\}$$

- Reverse Causation? Construct integration measures based on 2001 data, but business cycle comovement measures based on 2002-2009 data.
- exclude EXT in F equation, exclude EXF in T equation

	d log GDP		EXT1, EXF1	
	ASEAN+3	ASEAN+7	ASEAN+3	ASEAN+7
GDP correlations (ρ) equation				
T	0.0642(3.18)***	0.0316(1.83)*	0.0742(3.54)***	0.344(1.69)*
F	-0.290(-3.29)***	-0.165(-2.6)***	-0.328(-3.46)***	-0.165(-2.17)**
EXT	0.0394(2.71)***	0.0258(2.17)**	5.250(2.46)**	3.040(1.77)*
EXF	0.168(3.61)***	0.106(2.91)***	6.264(3.96)***	3.690(2.71)***
Trade (T) equation				
F	4.034(7.26)***	3.713(5.4)***	4.154(7.48)***	3.869(5.35)***
EXT	-0.318(-1.31)	-0.0289(-0.11)	-45.454(-1.47)	-9.926(-0.28)
EXF	-2.000(-5.51)***	-1.988(-5.37)***	-2.057(-5.63)***	-65.298(-5.32)***
Finance (F) equation				
T	0.223(7.44)***	0.241(5.99)***	0.221(7.96)***	0.244(6.09)***
EXT	0.113(1.95)*	0.0476(0.75)	14.150(2.05)**	5.010(0.66)
EXF	0.496(4.66)***	0.511(6.29)***	15.808(4.70)***	16.562(6.57)***

2001 Data for Integration Measures
2002-2009 Data for Business Cycle Comovement Measures

	ASEAN+3	ASEAN+7
GDP correlations (ρ) equation		
T	0.0699(2.84)***	0.0326(1.60)
F	-0.303 (-2.82)***	-0.155(-2.07)**
EXT	0.0383(2.20)**	0.0234(1.71)*
EXF	0.186(3.28)***	0.112(2.63)***
Trade (T) equation		
F	3.941(7.02)***	3.794(5.47)***
EXT	-0.285(-1.16)	-0.0587(-0.22)
EXF	-1.950(-5.32)***	-2.0263(-5.42)***
Finance (F) equation		
T	0.217(7.18)***	0.243(5.95)***
EXT	0.122(2.09)**	0.0443(0.494)
EXF	0.473(4.34)***	0.517(6.24)***

	ASEAN+3	ASEAN+7
GDP correlations (ρ) equation		
T	0.782(3.22)***	0.0280(1.38)
F	-0.326(-3.03)***	-0.145(-1.92)*
EXT	0.0300(1.71)*	0.0247(1.81)*
EXF	0.212(3.8)***	0.110(2.57)***
Trade (T) equation		
F	1.580(2.41)**	0.722(1.34)
EXT	0.465(1.36)	0.982(3.57)***
EXF		
Finance (F) equation		
T	0.271(16.31)***	0.271(17.5)***
EXT		
EXF	0.564(7.25)***	0.518(8.24)***
R^2	0.0988	0.0507

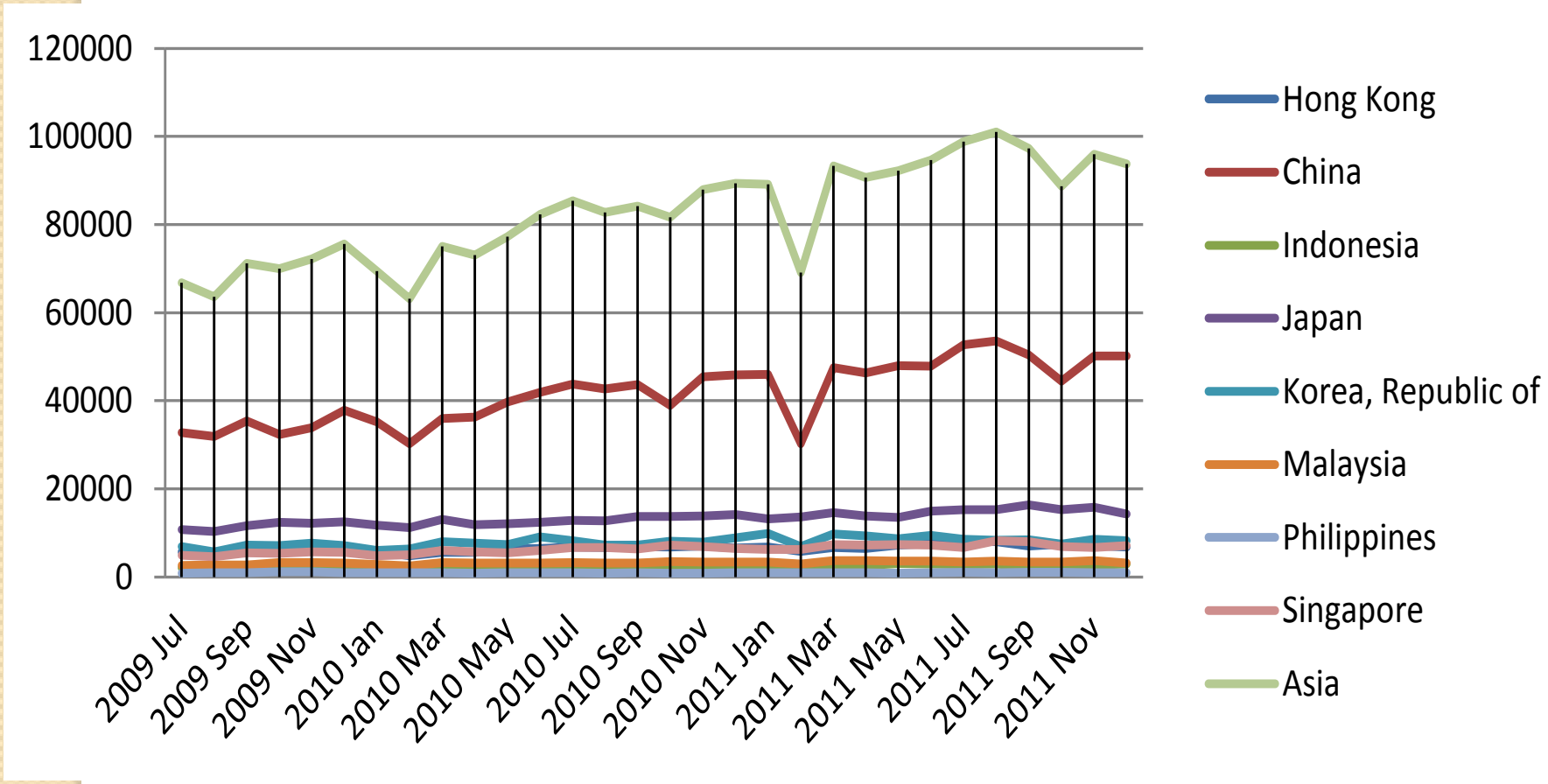
Conclusion

- This paper examined effects of internal vs. external and trade vs. financial integration on business cycle synchronization of Asian countries.
- Similar and strong external linkages have significant positive effects.
- Internal trade integration has a positive effect but internal financial integration has a negative effect. The negative effect of financial integration is particularly interesting because many past empirical studies found a positive effect, in contrast to the theoretical prediction.

Conclusion

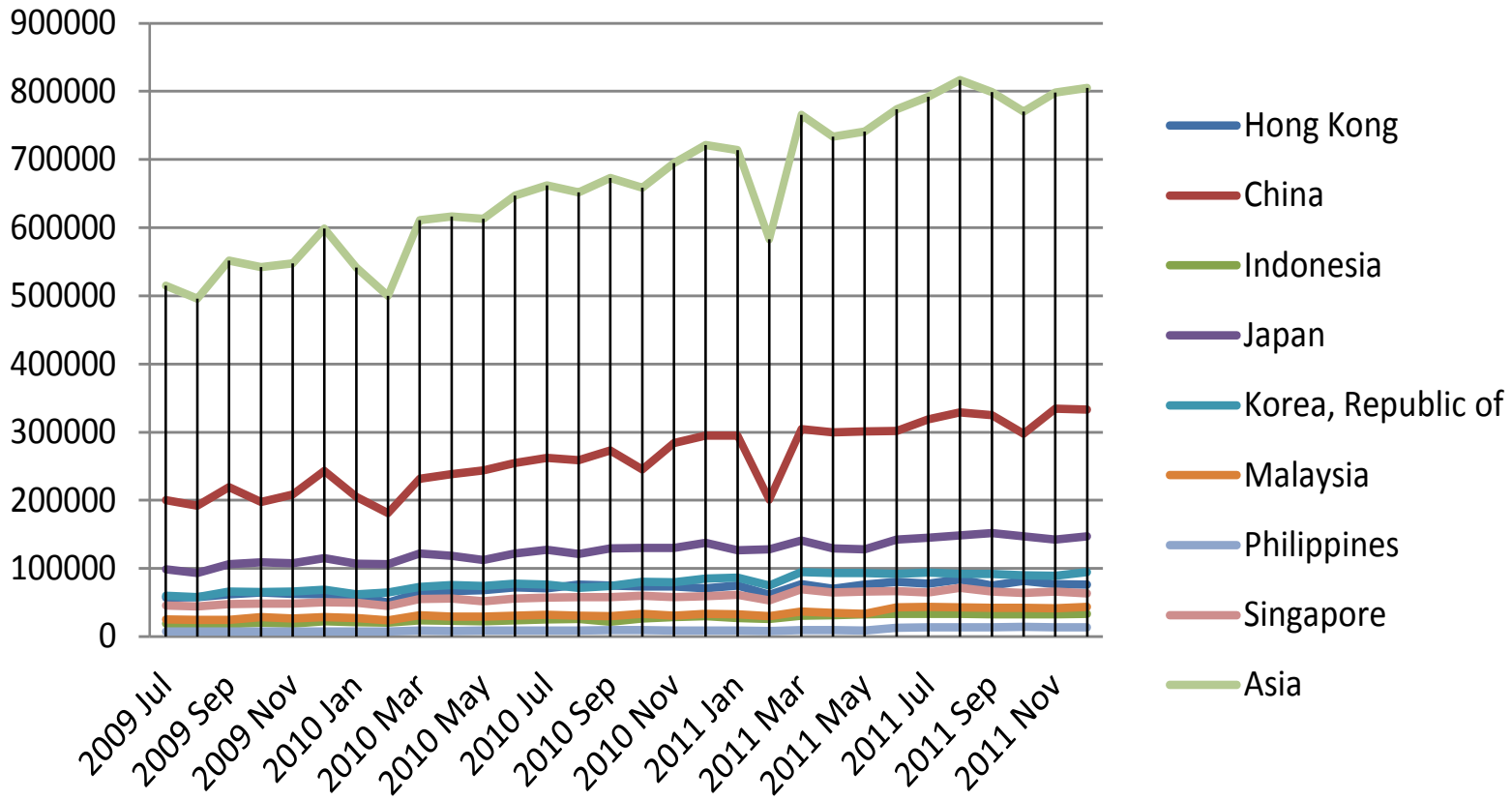
- The results suggest that regional policy efforts on trade integration within Asia such as FTA among ASEAN+3 are likely to increase business cycle comovements of member countries.
- However, the regional efforts on financial integration within Asia, such as ABMI and ACMI are likely to decrease business cycle comovements within the region.
- Whatever the effects of regional integration, similar and common external economic linkages play an important role in determining business cycle synchronization within the region.

Graph 4 the trend of total EU trade volume in Asia countries.

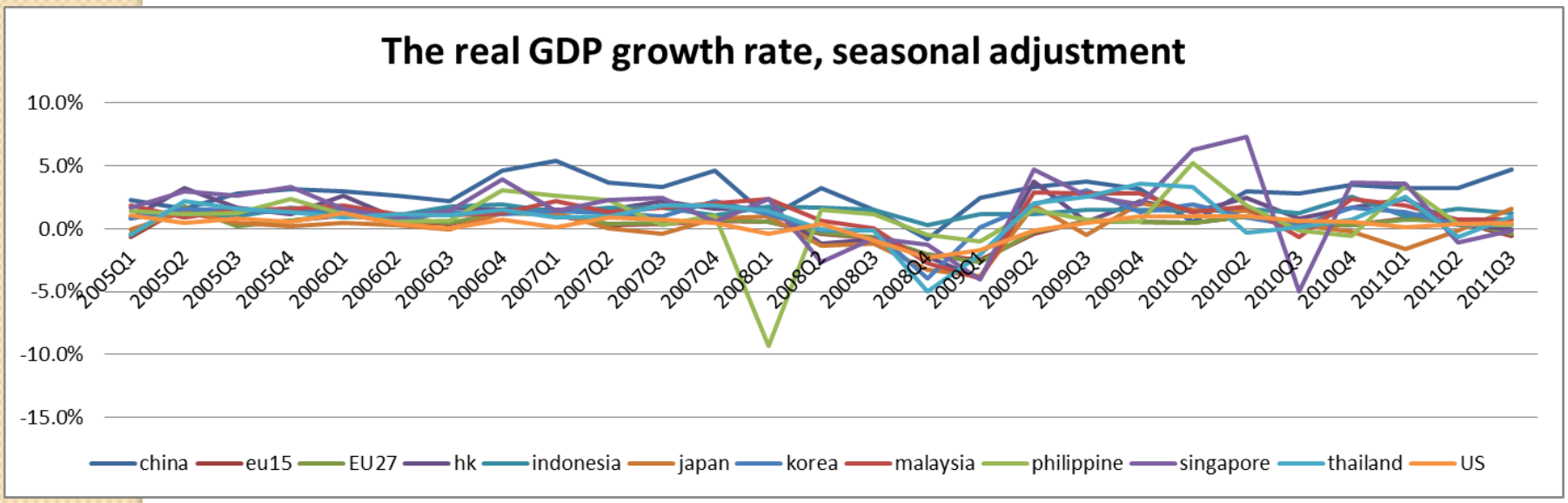


A sharp drops in trade volume with EU are found occasionally. But there was an increasing trend. The increasing trend changed to a decreasing trend from the summer of 2011.

Graph 3 the trend of total world trade volume during in Asia countries.



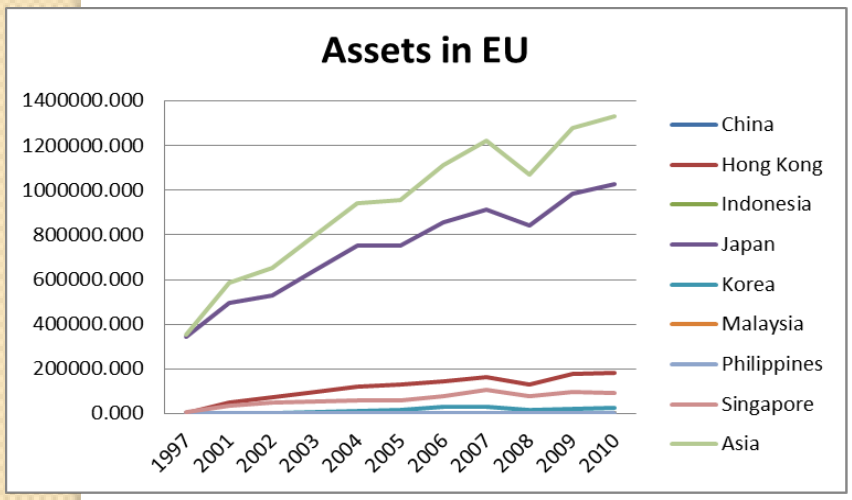
Total trade volume also shows increasing trend; the size of increase is larger. A decreasing trend in the very recent period is not clearly found. So effects of Euro crisis does not seem to be very strong for Asian countries.

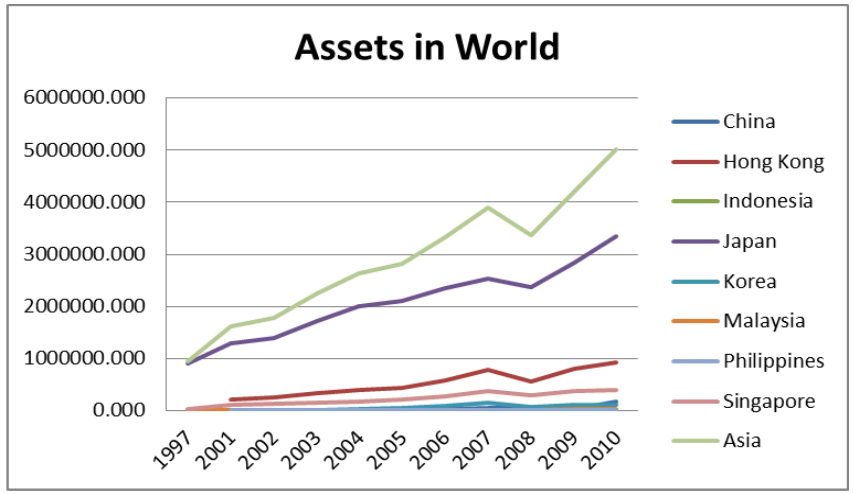


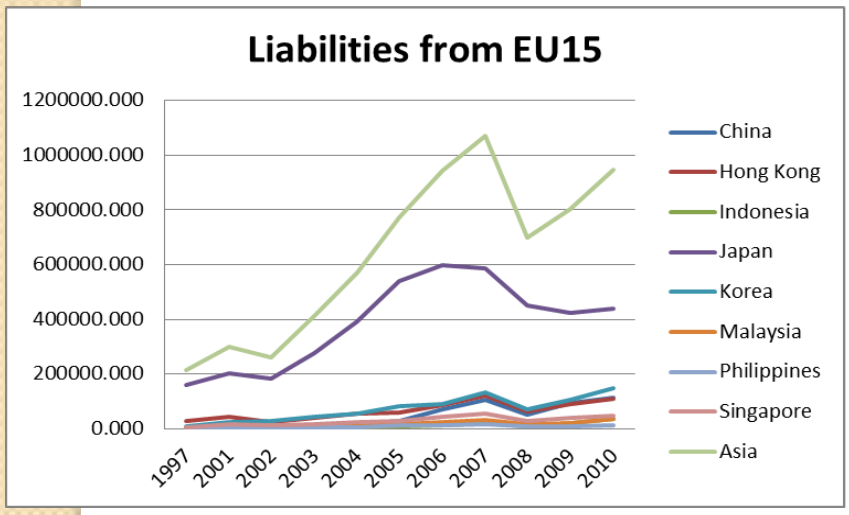
The effect of Euro crisis on A3 is relatively weak, especially compared to 2008 global financial crisis. This probably reflects a relatively weak trade linkage of Asia with EU (about 10% of total trade).

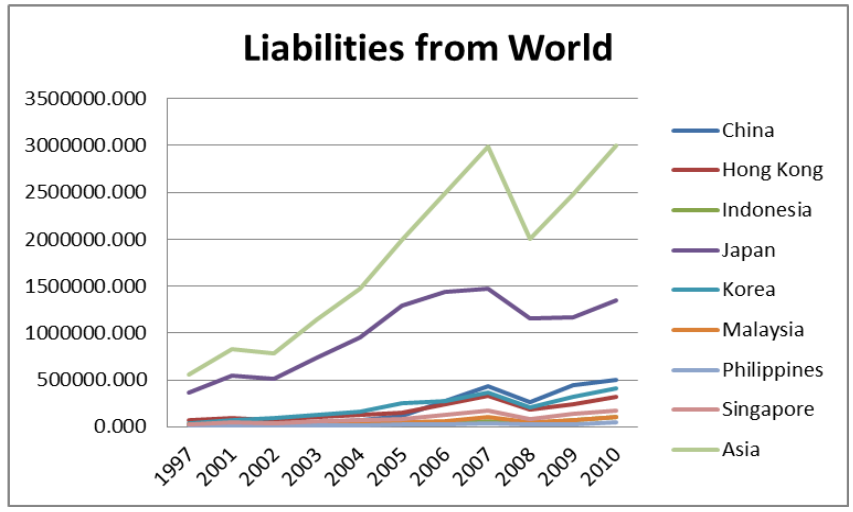
Graph 5 the total portfolio investment trend in Asia Countries

Million USD









From IMF Coordinated Portfolio Investment Survey (CPIS)

Portfolio assets of Asia increased rapidly. Portfolio liabilities of Asia increased also but there was a huge drop during the global financial crisis. Before the crisis, portfolio investments with Europe increased as fast as that of total. After the crisis, portfolio investments with Europe falls behind total. The effect of euro crisis may be similar – less investments in Europe because of the increase in risk, less investments from Europe because of income reduction and flight to quality.

Measures for A3

- Among A3, China-Korea has the strongest internal trade linkage while Korea-Japan has the strongest internal financial linkages.
- China and Korea has a similar and relatively strong external linkage while Japan and Korea has a similar and relatively strong external linkage.

	Finance	Trade
Internal (China-Japan)	0.025	0.635
Internal (China-Korea)	0.090	2.034
Internal (Japan-Korea)	0.171	0.857
External: Euro11+UK (C-J)	0.072	0.032
External: Euro11+UK (C-K)	0.078	0.082
External: Euro11+UK (J-K)	0.709	0.033
External: G4 in Europe (C-J)	0.055	0.022
External: G4 in Europe (C-K)	0.059	0.057
External: G4 in Europe (J-K)	0.539	0.022
External: US (C-J)	0.013	0.048
External: US (C-K)	0.021	0.088
External: US (J-K)	0.204	0.046