Convergence in EMU Equity Portfolios

Maela Giofré
CeRP-CCA
(Center for Research on Pensions and Welfare Policies- Collegio Carlo Alberto)

2nd FIW Research Conference in "International Economics", Vienna University of Economics and Business Administration

December 2008

Motivation

Research question

- Is there any *convergence* towards a Euro area representative investor?
    - In other words, does the birth of a common currency area induce member countries to invest more similarly?
- The peculiar elements characterizing the EMU integration process are identified in two basic factors: the "common currency" factor and the "common monetary policy" factor. Which is the role of these two factors in determining EMU countries' allocation decisions?

Motivation

Existing literature on EMU integration

The European Monetary Union (EMU) has been the greatest attempt ever made of financial integration. Much work to measure integration

- price based measures: correlation among stock returns (different interpretation of the same results by Fratzscher, 2002; Adjaouté and Danthine, 2000); cointegration analysis (Yang et al., 2003)
- quantity based measures: *home bias* (Adam et al., 2002; Lane and Milesi-Ferretti, 2007)
  - *home bias* is a measure with focus on *global* integration. The benchmark for stock market, in terms of allocation, is the value weighted portfolio (each country is weighted according to its stock market capitalization)

Motivation

Our contribution

We are interested in capturing

1. the degree of *local* integration, i.e. the integration *within* a subgroup of countries which experienced the same process of monetary integration (*regardless* the degree of integration with the rest of the world).
   - tool: we adopt a quantity based measure, a "bilateral dispersion measure" of EMU countries' portfolios
2. the determinants of the integration process: is more relevant the "common monetary policy" factor (inflation convergence) or the "common currency" factor (investment barriers' convergence)?

Data

Investing and destination countries: six EMU countries (Austria, Belgium, Finland, France, Italy, Netherlands) and six NON EMU countries (Canada, Denmark, Japan, United Kingdom, United States). They represent 75% of world market capitalization and about 85% of the portfolio investment of the considered investing countries.

Period: 1997 as pre-EMU period and 2004 as post-EMU period (2001 as alternative post-EMU period, for robustness check)

Portfolio positions: Coordinated Portfolio Investment Survey released by IMF, reports bilateral "foreign" portfolio holdings.

Financial data (market shares, stock returns): Datastream

Inflation rates: CPI indices from International Financial Statistics (IMF)

Theoretical Framework

Adler and Dumas (1983) model

$$\mathbf{w}_l = \Sigma^{-1}\left\{\frac{1}{\lambda}([\boldsymbol{\mu} - r\mathbf{i}] + \left(1 - \frac{1}{\lambda}\right)[\boldsymbol{\varpi}_l]\right\}$$

Investor l's equity portfolio is made up of two components

- the "logarithm portfolio", that is the portfolio driven by excess return and variance-covariance
- the "hedge portfolio", that is the portfolio hedging the investor's inflation risk.

Theoretical Framework

Adler and Dumas (1983) model with investment barriers

We follow Gehrig (1993) approach in modelling investment barriers: each investor is assumed to have a different "perceived" variability of stock returns (for a given level of returns)
Let us define by $\mathbf{C}_l$ the diagonal matrix of investor l-specific investment barriers then the optimal portfolio is now investor specific

$$\mathbf{w}_l^* = \frac{1}{\lambda}\Sigma_l^{-1}\left\{\tfrac{1}{\lambda}([\mu - r\mathbf{i}] + \left(1-\tfrac{1}{\lambda}\right)[\varpi_l]\right\} = \mathbf{C}_l^{-1}\Omega^{-1}\left\{\tfrac{1}{\lambda}([\mu - r\mathbf{i}] + \left(1-\tfrac{1}{\lambda}\right)[\varpi_l]\right\}$$

where $\Sigma_l = \Omega\mathbf{C}_l$ (and therefore $\Sigma_l^{-1} = \mathbf{C}_l^{-1}\Omega^{-1}$ where Ω is the "true" variance-covariance matrix).

Theoretical Framework

equilibrium condition

The equilibrium condition, equating stock demand and stock supply, will be such that the vector of market shares **MS** of stock market indexes (supply side) equates the (weighted) sum of stock indexes' demands (demand side). Φ is a diagonal positive definite matrix where the generic element $\phi_j = \sum_{l=1}^{L} MS_l \dfrac{1}{C_{lj}}$ is the average investment "advantage" in holding asset j

Then, defining $\mathbf{D}_l = \Phi \mathbf{C}_l$ the vector of weights held by investor l is

$$\mathbf{w}_l = \mathbf{D}_l^{-1}\mathbf{MS} + \left(1 - \tfrac{1}{\lambda}\right)\mathbf{C}_l^{-1}\Omega^{-1}\left(\varpi_l - \sum_{l=1}^{L} MS_l \varpi_l\right)$$

Theoretical Framework

inflation hedging coefficient

The vector $\mathbf{b}_l$ represents the inflation hedging coefficient of the regression of inflation deviation on stock returns (Cooper and Kaplanis, 1994)

$$\Omega^{-1}\left(\varpi_l - \sum_{l=1}^{L} MS_l \varpi_l\right) = \mathbf{b}_l$$

This coefficient is obtained from the following regression where p_l is country l's inflation rate and R^j is country j stock return

$$(p_l - \sum_{l=1}^{L} MS_l p_l)_t = b_l^0 + \sum_{j=1}^{N} b_l^j R_t^j + \varepsilon_{l,t}^j$$

Theoretical Framework

optimal asset j weight

$(\gamma = 1/\lambda)$

$$w_l^j = \left(D_l^j\right)^{-1} MS^j + \gamma \left(C_l^j\right)^{-1} b_l^j$$

$$\frac{1}{D_l^j} = \frac{\frac{1}{C_l^j}}{\phi^j}$$

$\frac{1}{D_l^j}$ represents the *relative* (with respect to world average) "advantage" of country l investing in asset j. In other words, the investor l will demand a share of assets greater than the market share in proportion to $\frac{1}{D_l^j}$ (inverse of relative investment cost).

Dispersion measure

the investment cost wedge

Let us consider two investing countries l and y. We define by k^j_{ly} the *investment cost wedge*, that is the difference in bilateral investment barriers between country l and j in asset j's investment.

$$C^j_y = (1 + k^j_{ly})\, C^j_l \Longrightarrow \left(C^j_l\right)^{-1} = (1 + k^j_{ly})\left(C^j_y\right)^{-1}$$

Dispersion measure

The asset j wedge

We define by Δ^j_{ly} the *asset j wedge* for the couple of countries l and y , that is the relative (to country y's portfolio share) wedge between the shares invested in asset j by the two countries

$$\frac{\left|w^j_l - w^j_y\right|}{w^j_y} = \left| \left(1 + k^j_{ly}\right) \left(1 + \gamma \frac{\left(b^j_l - b^j_y\right)}{\frac{MS^j}{\phi^j} + \gamma b^j_y} \right) - 1 \right| \equiv \Delta^j_{ly}$$

The Δ^j_{ly} depends on the *investment cost wedge* k^j_{ly} and on the difference between the inflation hedging coefficients of country l and y in asset j.

Dispersion measure

growth of asset j wedge

The objective of our analysis is the *growth rate* of the Δ^j_{ly}, that is its variation from pre-EMU to post-EMU period

$$\frac{\left(\Delta^j_{ly}\right)_{post}-\left(\Delta^j_{ly}\right)_{pre}}{\left(\Delta^j_{ly}\right)_{pre}}=\frac{\left|\left[1+\left(k^j_{ly}\right)_{post}\right]\left(1+\gamma\frac{\left(b^j_l\right)_{post}-\left(b^j_y\right)_{post}}{\left(\frac{MS^j}{\phi^j}+\gamma b^j_y\right)_{post}}\right)-1\right|}{\left|\left[1+\left(k^j_{ly}\right)_{pre}\right]\left(1+\gamma\frac{\left(b^j_l\right)_{pre}-\left(b^j_y\right)_{pre}}{\left(\frac{MS^j}{\phi^j}+\gamma b^j_y\right)_{pre}}\right)-1\right|}-1$$

In general $b^j_l \neq b^j_y$ so the growth rate of Δ^j_{ly} will depend both on the variation in the distance of hedging coefficients and on the variation of the *investment cost wedge* k^j_{ly}.

Dispersion measure

growth of asset j wedge

However, if $b_l^j = b_y^j$ in both pre- and post-integration the above expression reduces to

$$\frac{\left(\Delta_{ly}^j\right)_{post} - \left(\Delta_{ly}^j\right)_{pre}}{\left(\Delta_{ly}^j\right)_{pre}} = \frac{\left|\left(k_{ly}^j\right)_{post}\right| - \left|\left(k_{ly}^j\right)_{pre}\right|}{\left|\left(k_{ly}^j\right)_{pre}\right|}$$

that is the growth rate of Δ_{ly}^j reduces to the growth rate of the *investment cost wedge* k_{ly}^j.

Dispersion measure

bilateral portfolio wedge

To obtain the wedge between overall portfolios rather than between individual assets we need to compute the *bilateral portfolio wedge* (*bpw*) between country l and y. This is obtained adding up the *asset j wedges* and attaching to each asset j a weight equal to MS^j (asset $j's$ market share)

$$bpw_{ly} = \frac{\sum_j MS^j \Delta^j_{ly}}{\sum_j MS^j}$$

This measures quantifies the distance between the observed equity portfolios of country l and y.

- "growth in bilateral portfolio dispersion" is obtained considering the growth of Δ^j_{ly} rather than its level

Dispersion measure

aggregate portfolio wedge

The *aggregate portfolio wedge* (*apw*) of country l is a more synthetic measure quantifying the dispersion of country l's portfolio from a group Y of n countries. The *apw* of country l with respect to group Y is obtained by adding up the *bpw* with respect to each country y in the pool Y either attaching the same weight to each country y (unweighted *apw*) or weighting each country y by its market share (weighted *apw*) in the pool.

$$apw_{l,Y} = \frac{1}{n} \sum_{y \in Y} bpw_{ly} \qquad apw_{l,Y} = \frac{\sum_{y \in Y} MS^y \, bpw_{ly}}{\sum_{y \in Y} MS^y}$$

unweighted apw — weighted apw

- "growth in aggregate portfolio dispersion" is obtained considering the growth of Δ^j_{ly} rather than its level in the *bpw*

Preliminary evidence of convergence:

Level and growth in aggregate portfolio dispersion

A. level of *aggregate portfolio wedge (apw)*

	1997			2004		
	ALL	**EMU**	**NON EMU**	**ALL**	**EMU**	**NON EMU**
Austria	5.0	4.2	5.8	3.6	2.2	5.1
Belgium	11.9	5.0	18.9	9.9	3.1	16.6
Finland	32.7	10.2	55.1	6.7	3.0	10.4
France	5.8	3.3	8.3	5.7	2.0	9.5
Italy	29.1	12.9	45.3	10.1	4.1	16.1
Netherlands	3.9	3.0	4.7	2.3	1.8	2.7
EMU weighted average	*12.5*	*5.9*	*19.1*	*6.4*	*2.6*	*10.3*
Canada	8.5	8.5	8.5	8.2	8.9	7.2
Denmark	4.6	2.5	7.6	3.3	2.6	4.2
Japan	18.7	20.5	16.0	10.3	10.6	9.8
Sweden	5.5	4.3	7.1	3.5	3.1	4.1
United Kingdom	3.5	3.0	3.6	2.6	2.4	2.4
United States	4.7	4.5	5.0	4.1	4.2	3.9
NON EMU weighted average	*7.4*	*7.6*	*7.1*	*5.2*	*5.4*	*5.0*
ALL weighted average	*8.1*	*7.3*	*8.7*	*5.4*	*5.0*	*5.7*

B. correlation (growth rate of *apw* - initial level of *apw*)

	ALL	**EMU**	**NON EMU**
NON EMU	*-0.45*	*-0.65*	*-0.22*
EMU	*-0.84*	*-0.92*	*-0.81*

- Lower level of *apw* for both NON EMU and EMU countries: evidence of global integration
- Convergence? Let us look at *bilateral portfolio wedge*

Preliminary evidence of convergence:

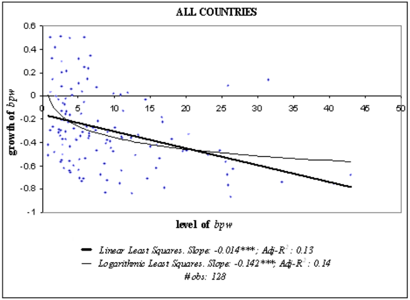
Growth in bilateral portfolio dispersion

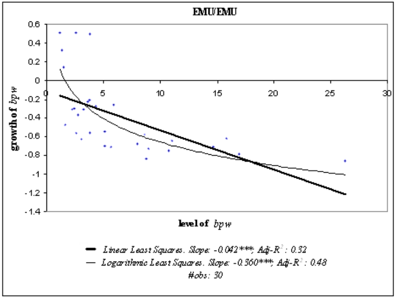
	oe	bel	fin	fr	it	nl	can	dk	jp	swe	uk	us
oe	-	**-6%**	**-72%**	**-30%**	**-40%**	**41%**	42%	50%	-38%	4%	-22%	-11%
bel		-	**-29%**	**-52%**	**-73%**	**-58%**	70%	-46%	-2%	-18%	-16%	-24%
fin			-	**-78%**	**-83%**	**-60%**	-66%	-35%	-32%	-37%	-42%	-38%
fr				-	**-65%**	**11%**	60%	-16%	-18%	2%	-27%	1%
it					-	**-58%**	-62%	-11%	-25%	-34%	-39%	-34%
nl						-	-25%	-7%	-17%	-17%	-25%	-32%
can							-	-8%	-43%	-14%	-40%	-11%
dk								-	-27%	-20%	-29%	-23%
jp									-	-36%	-41%	-38%
swe										-	-40%	-4%
uk											-	-41%
us												-

- Sharp drop in portfolio dispersion within the EMU group; drop much stronger in some countries (Italy and Finland)

Evidence of portfolio convergence

all countries and within EMU

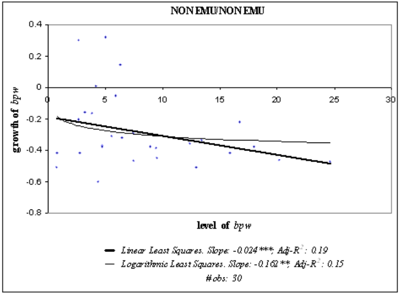


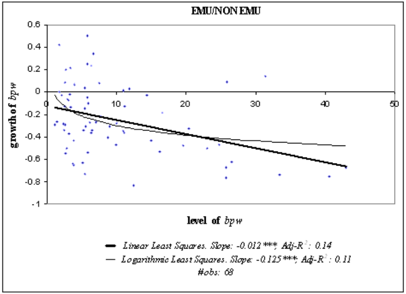


- Evidence of global financial integration
- Evidence of stronger convergence *within EMU countries*

Evidence of portfolio convergence

within NON EMU and EMU-NON EMU cross convergence

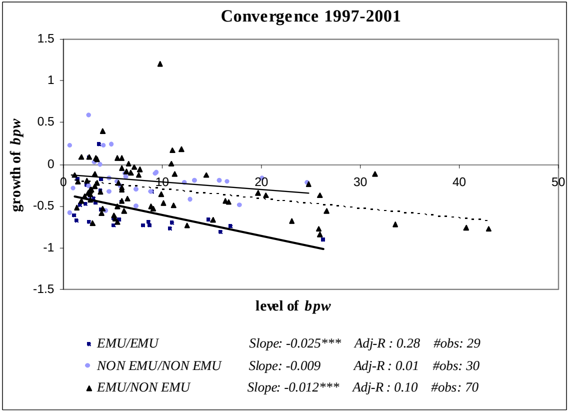




- lower *within NON EMU* integration and EMU-NON EMU *cross convergence*

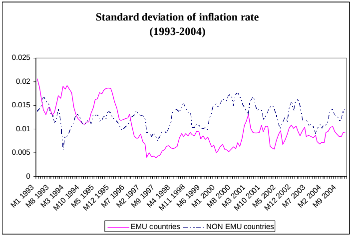
Evidence of portfolio convergence

Robustness: 1997-2001 convergence



- Within EMU group convergence process already at work in 2001 but at lower speed (-0.025 rather than -0.042)
- Non significant convergence for NON EMU countries in 2001

The role of inflation convergence



	mean	average standard deviation	average correlation	average covariance $(1*10^3)$
pre-EMU (1993-1998)				
all countries	0.020	0.011	0.134	0.016
-EMU countries	0.021	0.010	0.445	0.027
-NON EMU countries	0.018	0.012	-0.027	-0.002
post-EMU (1999-2004)				
all countries	0.019	0.011	0.260	0.017
-EMU countries	0.020	0.007	0.485	0.028
-NON EMU countries	0.017	0.013	0.150	0.010

- Evidence of lower dispersion in inflation among EMU countries *however* not evidence of stronger comovement in inflation rate after EMU inception $\Longrightarrow$ we expect *a priori* no relevant role of inflation convergence
- The Wald test does not reject the null hypothesis of equal hedging coefficients (1% confidence level) for 96% of the cases before EMU integration and for 100% for the post-EMU period. Negligible size of statistically significant distances: dispersion measures unaffected

The role of investment barriers

	ALL		EMU		NON EMU	
	unweighted	weighted	unweighted	weighted	unweighted	weighted
Austria	-32%	-20%	-49%	-28%	-15%	-19%
Belgium	-38%	-25%	-54%	-38%	-21%	-23%
Finland	-72%	-75%	-73%	-76%	-71%	-75%
France	-29%	-9%	-65%	-34%	7%	-6%
Italy	-61%	-64%	-66%	-50%	-56%	-65%
Netherlands	-47%	-52%	-56%	-35%	-37%	-55%
Canada	-12%	-12%	-18%	2%	-4%	-11%
Denmark	-19%	-34%	-13%	19%	-27%	-15%
Japan	-51%	-38%	-54%	-34%	-47%	-12%
Sweden	-39%	-38%	-43%	-23%	-33%	-18%
United Kingdom	-44%	-35%	-40%	-5%	-49%	-10%
United States	-23%	-23%	-31%	-3%	-12%	-32%
EMU	-55%	-39%	-68%	-52%	-42%	-35%
NON EMU	-31%	-27%	-33%	-9%	-29%	-24%

- No relevant role of inflation hedging convergence $\Longrightarrow$ explanation falls on investment barriers.
  - For EMU the dispersion in investment barriers has been reduced to one third (one half) when considering the unweighted (weighted) measure.

Conclusions

1. Significant convergence of EMU countries' portfolios
2. Determinants of convergence: inflation hedging convergence and/or investment barriers' convergence?

- no support for the inflation convergence ("common monetary policy" effect): a remarkable comovement in inflation rates was already present before EMU integration

$$\Downarrow$$

- convergence in bilateral investment barriers ("common currency" effect) is responsible for the observed portfolio convergence

$$\Downarrow$$

- it is possible to quantify the convergence of the (unobservable) investment barriers: the dispersion in investing barriers is indeed halved and the reduction is even stronger for countries starting more distant from the EMU group