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Parallel Session

CONTAGION BETWEEN MARKETS

Discussant

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Important questions concerning contagion between markets:

- "Is the volatility of market leading the volatility of other markets?"
- "Is the volatility of an asset transmitted to another asset
  directly [through its conditional variance]
  or indirectly [through its conditional covariances]?"
- "Does a shock on a market increase the volatility of another market,
  and by how much?"
- "Is the impact the same for negative and positive shocks of the same amplitude?"
- "are the correlations between asset returns time-varying?"
  ↪ "are they higher during periods of higher volatility
  (sometimes associated with financial crisis)?"
  ↪ "are they increasing in the long run,
  perhaps because of the globalization of financial markets?"

- Such issues are frequently studied by means of **Multivariate (Nonlinear Stationary!!!) Models** for **Index Returns**, and raise the question of the specification of the Dynamics of Variances and Correlations.

↪ From : Bauwens, Laurent and Rombouts (2006, JAE): "Multivariate GARCH Models: A Survey".

- **MVGARCH models** [Bollerslev, Engle and Wooldridge (1988), Engle and Kroner (1995)],
- **Constant Conditional Correlation (CCC) models** [Bollerslev (1990)],
- **Dynamic Conditional Correlation (DCC) models** [Engle (2002)],
- **General Dynamic Covariance (GDC) models** [Kroner and Ng (1998), Idier (2006)].
- **Markov Switching Multifractal (MSM) models** [Calvet, Fisher, and Mandelbrot (1997), Calvet and Fisher (2001, 2002, 2004), Idier (2008)].
- **Wishart Autoregressive (WAR) process** [Gourieroux, Jasiak and Sufana (2004), Gourieroux, Monfort and Sufana (2005)].

"Co-Integration of Stock Markets using Wavelet Theory and Data Mining"
by: R. Sahu and P.B. Sanjeev

a) The paper uses Discrete Wavelet Transformation (DWT) to study co-movements of (highly non-linear and non-stationary) stock market indices (price levels!).

b) Wavelet methodology decomposes the time series (signal) into a "smooth component" (the long-run trend), and "details" (short-run movements).
↪ The distinction between the "smooth" part and "details" is determined by the resolution (time scale).
↪ For any given scale, the decomposition approximates the time series by ignoring the details at the lower scales.

c) The proposed approximation is the one associated to the Haar mother wavelet.

d) The 7 Stock Market Indices (France, Germany, GB, USA...) are decomposed into a "smooth component" and a "detail": only the smooth parts are considered to study pairwise interdependencies (Pearson correlation).

e) Several degrees of (long-term) interdependence (weak, moderate, strong) among pairs of Indices are determined.

Comments/Suggestions:

- I think it is better to talk about "Interdependence" instead of "Co-integration". Indeed, the reader is induced to think about Cointegration Analysis
  $\hookrightarrow$ cointegrated processes, cointegration tests, unit roots...

- I suggest to the authors to propose in the paper a (brief but precise) section dedicated to wavelet methodology and its application in economics and finance
  $\rightarrow$ see Ramsey (2002), Gencay, Selcuk and Whitcher (2002)

- Several papers propose Wavelet-based prediction of economic and financial time series $\rightarrow$ see Cao, Hong, Zhao and Deng (1996), Aussen, Campbell, Murthagh (1998), Milidiu, Machado and Rentera (1999), Fryzlewicz, Van Bellegem, von Sach (2002).

$\Longrightarrow$ are Wavelet-based Long Horizon out-of-sample forecasts of stock indices better than those coming from a Vector Error Correction Model (VECM)? ...or from a General Dynamic Covariance Model?

"Investigation of 1998 'Russian Contagion' for the Hungary-Germany pair of Interest Rates in a Reduced-Form Model" by: P. Lerner

a) This paper studies German (risk-free) and Hungarian (risky) bonds, around the Russian crisis in 1998, using a parametric reduced-form defaultable bond pricing model. → where contagion effects are "recorded" ?

b) The joint dynamics of the risk-free rate (r_t) and of the default rate (λ_t) is described by a bivariate Black-Karasinski process with correlated Brownian Motions.

c) The bond pricing model is implemented using a variable geometry tree algorithm, developed by Leippold and Wiener (2000).

The tree-building and fitting procedure is in the same spirit as Schonbucher (1999).

d) The author observes significant changes (after Russian crisis) in the German rate process and in the correlation between German and Russian rates.

He does not observe (before Russian crisis) an anticipation of the contagion via the hazard function.

Comments/Suggestions:

- If we follow Forbes and Rigobon (2002), and Idier (2006), we can consider two different kinds of **links** [i.e. shocks transmission] **between interest rates over countries**:
  - **Interdependence = long-term link**
  - **Contagion = short-term link**

  in order to **separate** the **Interdependence effects** from **Contagion effects**

- The model proposed by the author does not introduce

  stochastic variance-covariance matrix for (r_t, λ_t)

  $\Rightarrow$ Short-run effects (Contagion!) are probably not explained!

  $\Rightarrow$ If we introduce this generalization, are the paper conclusions

  going to change or not?

- I suggest also to propose a wider ”comparison” (theoretical, fitting, forecasts) with other competing models in the literature,
  like Schonbucher (1999), Duffie, Pedersen and Singleton (2003),
  in continuous time.

- Which are the conclusions if we follow the (more flexible) discrete time approach proposed by Gourieroux, Monfort and Polimenis (2006)?
  $\longrightarrow$ here Compound Autoregressive (Car) processes describe factor dynamics.
  $\hookrightarrow$ much larger set of affine dynamics, better data fit and out-of-sample forecasts.

APPENDIX

- Following Forbes and Rigobon (2002), Idier (2006) describes two different kinds of **links** [i.e. shocks transmission] **between asset prices (p_t) over countries** in a European (Stock Exchange) Consolidation Setting :
  - **Interdependence = long-term link**
  - **Contagion = short-term link**

  in order to **precisely isolate and study** the **Interdependence link**

  and to give an **answer** to the previously mentioned **questions**

- Dynamics of the N-dimensional vector of log-index returns $\Delta p_t = \log(p_t/p_{t-1})$ is described by **VECM** with **Asymmetric BEKK [MVGARCH]** noise
  - ☐ **VECM** part : **conditional mean of $\Delta p_t \equiv$ Interdependence**
  - ☐ **A-BEKK** part : **conditional variance of $\Delta p_t \equiv$ Contagion**

- **The proposed model - VECM part :**

$$\Delta p_t = \left(\sum_{s=1}^{S} \Phi_s - I_N\right) p_{t-1} + \sum_{j=1}^{S-1} \Gamma_j \Delta p_{t-j} + \mu + \varepsilon_t$$

  with $\Pi := \left(\sum_{s=1}^{S} \Phi_s - I_N\right) = \alpha\beta'$, $\Gamma_j = -\sum_{m=j+1}^{S} \Phi_m$, $\alpha =$ matrix of adjustment coefficients, $\beta =$ matrix of long run coefficients;

A-BEKK part: particular Asymmetric Dynamic Covariance (ADC) model

[see Kroner and Ng (1998, RFS) and Bauwens, Laurent and Rombouts (2006, JAE)];

$$\varepsilon_t = \sqrt{H_t} u_t\,, \quad u_t \sim IIN(0, I_N)\,, \quad \varepsilon_t | I_{t-1} \sim N(0, H_t)$$

$$H_t = D_t R_t D_t = (h_{ij,\,t}) = (\rho_{ij} \sqrt{h_{ii,\,t} h_{jj,\,t}})\,, \text{ (N, N)-matrix}$$

$$D_t = diag\left[h_{11,\,t}^{1/2}, \ldots, h_{NN,\,t}^{1/2}\right] \Rightarrow R_t = D_t^{-1} H_t D_t^{-1}$$

$$H_t = \left(\overline{H} - B'\overline{H}B - G'\overline{H}G - A'\mathcal{F}'_t\overline{H}\mathcal{F}_t A\right) + B'\varepsilon_{t-1}\varepsilon_{t-1}^{'}B + G'H_{t-1}G + A'\eta_{t-1}\eta_{t-1}^{'}A$$

$\mathcal{F}_t = diag\left[\mathbb{I}_{[\varepsilon_{1,t}<0]}, \ldots, \mathbb{I}_{[\varepsilon_{N,t}<0]}\right]$, $\overline{H} = E[\varepsilon_t\, \varepsilon_t^{'}]$, $\eta_t = \mathcal{F}_t\, \varepsilon_t$,

(A, B, C) are diagonal parameter matrices.

∘ Small number of parameters (3×N) BUT Cond. Corr. with different dynamics

↪ Comparison with Asymmetric Dynamic Conditional Correlation (ADCC) model :

∘ larger number of parameters BUT Cond. Corr. obey the same dynamics