Uncertainty and Economic Activity: A Global Perspective

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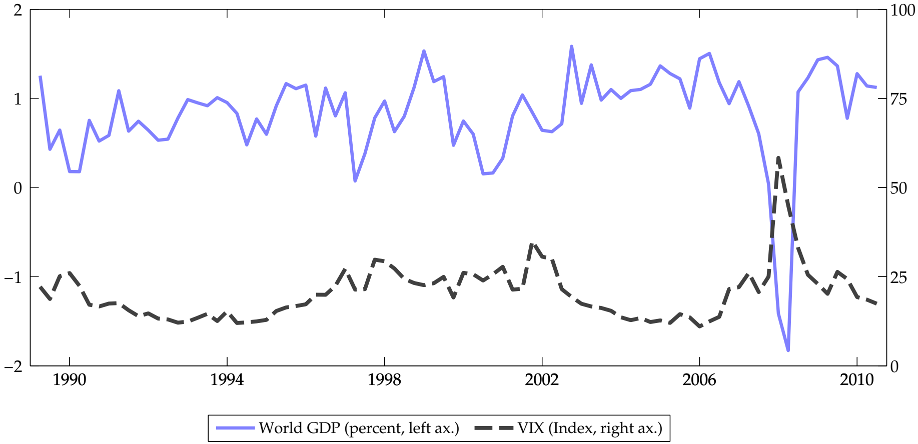
The relation between uncertainty and economic activity



- During the recent global financial crisis the world economy experienced a sharp and synchronized contraction in economic activity...
- ... and an exceptional increase in macroeconomic and financial uncertainty/volatility

What we do in this paper

- **Main question**: what is the impact of uncertainty on economic activity?
  - We model the interrelation between uncertainty and macroeconomic dynamics as a *two-way process*
  - We adopt a *global perspective*

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- **Main question**: what is the impact of uncertainty on economic activity?
  - We model the interrelation between uncertainty and macroeconomic dynamics as a *two-way process*
  - We adopt a *global perspective*
- Identifying assumptions
  - Both uncertainty and the business cycle are driven (with a different timing) by a similar set of global common factors
  - Conditional on these global factors, country-specific macro dynamics are cross-sectionally weakly correlated

Methodology – A global model of volatility and the business cycle

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  - Model (global) volatility
  - Identify volatility innovations that are orthogonal to global factors
- Investigate the explanatory power of identified volatility innovations for economic activity

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- Main contribution to the literature
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- Other contributions
  - Data set of quarterly measures of realized volatilities (as a proxy for uncertainty) using daily returns across 109 asset prices from 4 asset classes worldwide
  - Empirical model of volatility and the business cycle for 33 countries representing over 90 percent of the world economy

Main findings

Theoretical

- In a bivariate VAR with output growth and volatility (akin to what is typically done in the literature), the output growth equation is mis-specified as associated least squares estimates are inconsistent

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Empirical

- Realized volatilities strongly co-move within asset classes, but are not as highly correlated across asset classes
- Strong negative statistical association between future output growth and current volatility
- Exogenous changes to volatility have no statistically significant impact on economic activity over and above that of its common component

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  - Bachmann et al (2013): confidence ordered before uncertainty
  - Gilchrist et al (2013): credit spreads ordered before uncertainty

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- Challenging the wait and see assumption: the "by product" assumption
  - Bachmann et al (2013): confidence ordered before uncertainty
  - Gilchrist et al (2013): credit spreads ordered before uncertainty
- Recent attempts to determine causality
  - Baker and Bloom (2013) instrumental variable approach
  - Caldara et al (2013) two-steps penalty function approach

Outline

1. A simple factor model
2. The GVAR-VOL model
3. Data: realized volatility measures
4. Empirical results
5. Conclusions

A factor model of volatility and macro dynamics

- We consider the following dynamic specification for $\mathbf{v}_t$ and $\Delta \boldsymbol{y}_{it}$

$$\mathbf{v}_t = \mathbf{\Phi}_{1v}\mathbf{v}_{t-1} + \mathbf{\Lambda}\mathfrak{n}_t + \boldsymbol{\xi}_t, \qquad \text{(volatility equation)}$$

$$\Delta \boldsymbol{y}_{it} = \mathbf{\Phi}_{1i}\Delta \boldsymbol{y}_{i,t-1} + \mathbf{\Gamma}_i\mathfrak{n}_{t-1} + \boldsymbol{\zeta}_{it} \quad \text{(macro equation)}$$

for $i = 0, 1, ..., N$

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- Unobserved global factors ($\mathfrak{n}_t$) capture the dynamics of the world economy, political events, wars, natural disasters, or noisy information
- **Main assumption**: financial markets and their volatility are more immediately affected by such global factors $\mathfrak{n}_t$ as compared to the real economy
  - Habits, adjustment costs, government regulation,...

Solving the factor model for the volatility equation

- Since $\mathfrak{n}_t$ is unobserved, a direct relationship between $\Delta \boldsymbol{y}_{it}$ and $\mathbf{v}_t$ can be established if $\mathfrak{n}_t$ is eliminated from the above system of equations

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- Taking averages across countries, the macro equation can be written as

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- Solve for $\mathfrak{n}_{t-1}$ and substitute into the volatility equation

$$\mathbf{v}_t = \mathbf{\Phi}_{1v} \mathbf{v}_{t-1} + \mathbf{\Psi}_{1,v} \Delta \bar{y}_{t+1} + \mathbf{\Psi}_{0,v} \Delta \bar{y}_t - \mathbf{\Psi}_{1,v} \bar{\zeta}_{t+1} + \xi_t$$

- Volatility responds to expected changes in economic activity

Analyzing the volatility equation

- **Estimation issue**: there is an endogeneity problem since $\Delta \bar{y}_{t+1}$ and $\bar{\zeta}_{t+1}$ are correlated

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- By using a small open economy assumption and the law of large numbers applied to cross-sectionally weakly correlated processes, we can address the endogeneity problem and *achieve identification*!

Solving the factor model for the macro equation

- Solve for $\mathfrak{n}_t$ in the volatility equation and substitute in the macro equation

$$\Delta y_{it} = \mathbf{\Phi}_{1i} \Delta y_{i,t-1} + \Xi_{i1} \mathbf{v}_{t-1} - \Xi_{i2} \mathbf{v}_{t-2} + \underbrace{\zeta_{it} - \Xi_{i1} \boldsymbol{\xi}_{t-1}}_{\mathbf{u}_{it}}$$

- The above expression has the familiar appearance of the reduced form equation of Δy_{it} in a bivariate VAR for Δy_{it} and $\mathbf{v}_t$ as typically considered by the literature

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- But due to the dependence of $\mathbf{v}_{t-1}$ on $\boldsymbol{\xi}_{t-1}$ OLS estimates are inconsistent!
  - Again, this result does not depend on the timing assumption...
  - ... and it holds even if we adopt a "global perspective"

A more general framework – The GVAR-VOL model

- While the bivariate representation above is appealing for its simplicity, in practice there are many sources of volatility and many countries in the world economy
- High dimensional nature of the problem $\Longrightarrow N$ must be sufficiently large

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- High dimensional nature of the problem $\Longrightarrow N$ must be sufficiently large
- The GVAR-VOL
  - A GVAR model for $\mathbf{y}_{it}$ (where $i = 0, 1, ..., N$) is developed by estimating separate country-specific models conditional on the global and country-specific factors...
  - ... and is then combined with a volatility module

GVAR – First step

- Consider a vector of country-specific macro-financial variables

$$\mathbf{x}_{it} = \left(y'_{it}, \chi'_{it}\right)$$

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- Country-specific foreign variables $\mathbf{x}^*_{it}$ are

$$\mathbf{x}^*_{it} = \sum_{j=0}^{N} w_{ij} \mathbf{x}_{jt} = \mathbf{W}_i \mathbf{x}_t$$

  - $\mathbf{x}_t = (\mathbf{x}'_{0t}, \mathbf{x}'_{1t}, ..., \mathbf{x}'_{Nt})'$ is the vector of all endogenous variables
  - $\mathbf{W}_i$ is a matrix of fixed trade weights

GVAR – Second step

- Define a selection matrix $\mathbf{S}_i$ such that $\mathbf{x}_{it} = \mathbf{S}_i \mathbf{x}_t$

$$\mathbf{S}_i \mathbf{x}_t = \mathbf{\Phi}_i \mathbf{S}_i \mathbf{x}_{t-1} + \mathbf{\Lambda}_{0i} \mathbf{W}_i \mathbf{x}_t + \mathbf{\Lambda}_{1i} \mathbf{W}_i \mathbf{x}_{t-1} + \varepsilon_{it}$$

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- Re arrange

$$\mathbf{G}_i \mathbf{x}_t = \mathbf{H}_i \mathbf{x}_{t-1} + \boldsymbol{\varepsilon}_{it}$$

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- Stack each country-specific model for $i = 0, 1, ..., N$

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$$\mathbf{G}\mathbf{x}_t = \mathbf{H}\mathbf{x}_{t-1} + \boldsymbol{\varepsilon}_t,$$

- Get the reduced form GVAR model

$$\mathbf{x}_t = \mathbf{F}\mathbf{x}_{t-1} + \mathbf{u}_t,$$

Volatility module

- ARDL model as the one sketched above

$$\mathbf{v}_t = \mathbf{\Phi}_v \mathbf{v}_{t-1} + \mathbf{\Psi}_{1,v} \Delta \boldsymbol{y}^*_{t+1} + \mathbf{\Psi}_{0,v} \Delta \boldsymbol{y}^*_t + \mathbf{\Psi}_{-1,v} \Delta \boldsymbol{y}^*_{t-1} + \boldsymbol{\xi}_t,$$

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- Re-write as

$$\mathbf{v}_t = \mathbf{\Phi}_v \mathbf{v}_{t-1} + \mathbf{\Psi}_{1,v} \mathbf{P} \Delta \mathbf{x}_{t+1} + \mathbf{\Psi}_{0,v} \mathbf{P} \Delta \mathbf{x}_t + \mathbf{\Psi}_{-1,v} \mathbf{P} \Delta \mathbf{x}_{t-1} + \boldsymbol{\xi}_t$$

- $\mathbf{P}$ is a weighting and selection matrix made up of zeros and PPP-GDP weights
  - Only the macroeconomic variables (y_{it}) and not the financial variables (χ_{it}) are selected from $\mathbf{x}_t$

The GVAR-VOL model

- The combined GVAR-VOL can be written as

$$\boldsymbol{\Xi}_0 \begin{bmatrix} \mathbf{v}_t \\ \mathbf{x}_{t+1} \end{bmatrix} = \boldsymbol{\Xi}_1 \begin{bmatrix} \mathbf{v}_{t-1} \\ \mathbf{x}_t \end{bmatrix} + ... + \begin{bmatrix} \boldsymbol{\zeta}_t \\ \mathbf{u}_{t+1} \end{bmatrix}$$

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- The only way a volatility innovation ($\boldsymbol{\xi}_t$) can have an impact on activity is *via* its correlation with the reduced-form residuals of the GVAR ($\mathbf{u}_{t+1}$)

- Two important implications of our assumptions
  - A causal interpretation is valid only for macro variables (less so for financial variables)
  - The volatility innovations can affect the GVAR residuals only with a lag

Data for the construction of realized volatility measures

Country-specific asset markets

- Daily prices for 33 advanced and emerging economies
  - stock market equity indices
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International commodity markets

- Daily prices for 17 internationally traded commodities

Final data set

- The data set spans 109 asset prices and, for each asset price, up to 8479 daily observations from 1979 to 2011

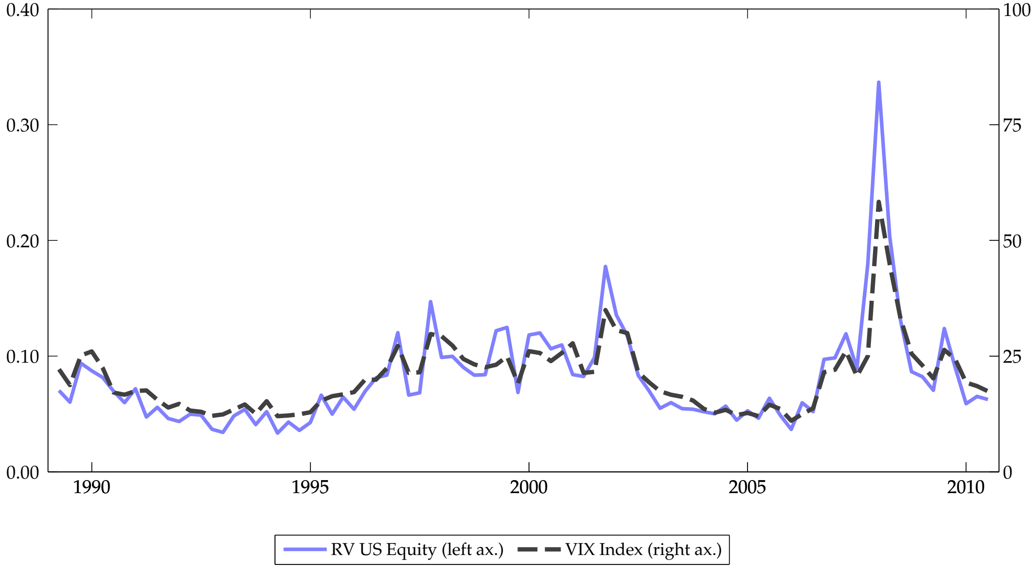
Market-specific realized volatility measures

- Realized volatility for asset of type κ, in country i, at quarter t

$$\mathcal{RV}_{\kappa it} = \sqrt{D_t^{-1} \sum_{\tau=1}^{D_t} \left(r_{\kappa it}(\tau) - \bar{r}_{\kappa it}\right)^2}$$

  - $r_{\kappa it}(\tau) = \Delta \ln P_{\kappa it}(\tau)$ is the daily return asset of type κ, in country i, measured on close of day τ in quarter t
  - $\bar{r}_{\kappa it} = D_t^{-1} \sum_{\tau=1}^{D_t} r_{\kappa it}(\tau)$ is the average daily price changes over the quarter t
  - D_t is the number of trading days in quarter t

U.S. equity realized volatility and the VIX Index



Aggregated measures of realized volatility

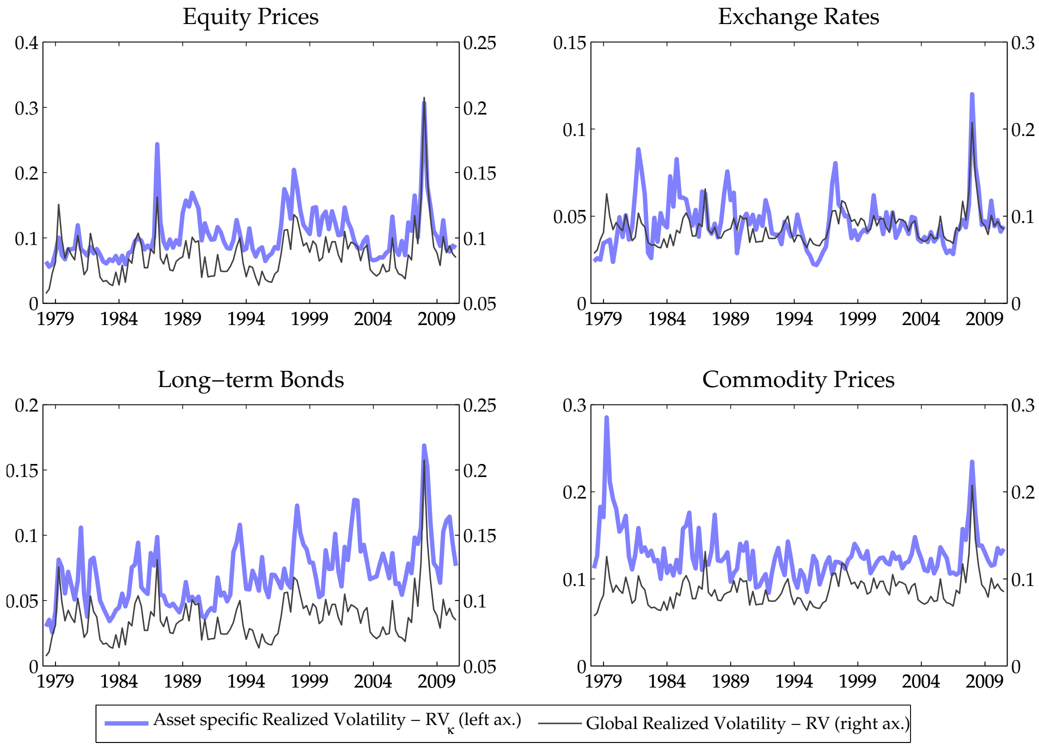
- Asset-specific realized volatility

$$\mathcal{RV}_{\kappa t} = \sum_{i=1}^{N_t} w_{it} \mathcal{RV}_{\kappa i t}$$

- Global volatility

$$\mathcal{RV}_{t} = \frac{1}{M} \sum_{\kappa=1}^{M} \sum_{i=1}^{N_t} w_{it} \mathcal{RV}_{\kappa i t}$$

Global & Asset-specific volatility measures



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  - Time series properties of realized volatility
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Volatility module estimation

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$$... + \mathbf{\Psi}_{0,v} \begin{bmatrix} \Delta y^*_{t} \\ \pi^*_{t} \end{bmatrix} + \mathbf{\Psi}_{-1,v} \begin{bmatrix} \Delta y^*_{t-1} \\ \pi^*_{t-1} \end{bmatrix} + \begin{bmatrix} \xi_{EQ,t} \\ \xi_{FX,t} \\ \xi_{LB,t} \\ \xi_{COM,t} \end{bmatrix}$$

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Volatility module estimation (cont'd)

	$v_{EQ,t}$	$v_{FX,t}$	$v_{LB,t}$	$v_{COM,t}$
c	0.09	0.05	0.04	0.08
	[3.91]	*[5.25]*	*[2.97]*	*[5.50]*
$v_{EQ,t-1}$	0.53	-0.08	-0.03	-0.09
	[5.86]	*[-2.16]*	*[-0.55]*	*[-1.52]*
$v_{FX,t-1}$	0.08	0.55	0.00	0.00
	[0.36]	*[6.54]*	*[-0.01]*	*[0.02]*
$v_{LB,t-1}$	-0.01	-0.03	0.71	0.11
	[-0.06]	*[-0.64]*	*[9.37]*	*[1.37]*
$v_{COM,t-1}$	-0.14	-0.01	-0.03	0.48
	[-1.12]	*[-0.19]*	*[-0.37]*	*[6.02]*
Δy^*_{t+1}	-3.37	-0.98	-1.21	-0.99
	[-5.41]	*[-4.04]*	*[-3.17]*	*[-2.50]*
$\Delta \pi^*_{t+1}$	0.60	0.17	0.07	-0.50
	[1.57]	*[1.14]*	*[0.28]*	*[-2.03]*
Δy^*_{t}	0.63	-0.50	-0.21	-0.71
	[0.85]	*[-1.73]*	*[-0.46]*	*[-1.52]*
$\Delta \pi^*_{t}$	-0.07	0.23	0.11	0.23
	[-0.17]	*[1.50]*	*[0.44]*	*[0.94]*
Δy^*_{t-1}	-0.01	-0.08	-0.11	0.11
	[-0.02]	*[-0.32]*	*[-0.27]*	*[0.27]*
$\Delta \pi^*_{t-1}$	-0.23	-0.07	0.11	-0.06
	[-0.61]	*[-0.48]*	*[0.48]*	*[-0.25]*

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	[-1.12]	*[-0.19]*	*[-0.37]*	*[6.02]*
Δy^*_{t+1}	-3.37	-0.98	-1.21	-0.99
	[-5.41]	*[-4.04]*	*[-3.17]*	*[-2.50]*
$\Delta \pi^*_{t+1}$	0.60	0.17	0.07	-0.50
	[1.57]	*[1.14]*	*[0.28]*	*[-2.03]*
Δy^*_{t}	0.63	-0.50	-0.21	-0.71
	[0.85]	*[-1.73]*	*[-0.46]*	*[-1.52]*
$\Delta \pi^*_{t}$	-0.07	0.23	0.11	0.23
	[-0.17]	*[1.50]*	*[0.44]*	*[0.94]*
Δy^*_{t-1}	-0.01	-0.08	-0.11	0.11
	[-0.02]	*[-0.32]*	*[-0.27]*	*[0.27]*
$\Delta \pi^*_{t-1}$	-0.23	-0.07	0.11	-0.06
	[-0.61]	*[-0.48]*	*[0.48]*	*[-0.25]*

Volatility module estimation (cont'd)

	$v_{EQ,t}$	$v_{FX,t}$	$v_{LB,t}$	$v_{COM,t}$
c	0.09	0.05	0.04	0.08
	[3.91]	*[5.25]*	*[2.97]*	*[5.50]*
$v_{EQ,t-1}$	0.53	-0.08	-0.03	-0.09
	[5.86]	*[-2.16]*	*[-0.55]*	*[-1.52]*
$v_{FX,t-1}$	0.08	0.55	0.00	0.00
	[0.36]	*[6.54]*	*[-0.01]*	*[0.02]*
$v_{LB,t-1}$	-0.01	-0.03	0.71	0.11
	[-0.06]	*[-0.64]*	*[9.37]*	*[1.37]*
$v_{COM,t-1}$	-0.14	-0.01	-0.03	0.48
	[-1.12]	*[-0.19]*	*[-0.37]*	*[6.02]*
Δy^*_{t+1}	-3.37	-0.98	-1.21	-0.99
	[-5.41]	*[-4.04]*	*[-3.17]*	*[-2.50]*
$\Delta \pi^*_{t+1}$	0.60	0.17	0.07	-0.50
	[1.57]	*[1.14]*	*[0.28]*	*[-2.03]*
Δy^*_t	0.63	-0.50	-0.21	-0.71
	[0.85]	*[-1.73]*	*[-0.46]*	*[-1.52]*
$\Delta \pi^*_t$	-0.07	0.23	0.11	0.23
	[-0.17]	*[1.50]*	*[0.44]*	*[0.94]*
Δy^*_{t-1}	-0.01	-0.08	-0.11	0.11
	[-0.02]	*[-0.32]*	*[-0.27]*	*[0.27]*
$\Delta \pi^*_{t-1}$	-0.23	-0.07	0.11	-0.06
	[-0.61]	*[-0.48]*	*[0.48]*	*[-0.25]*

The macroeconomic impact of volatility innovations

- Estimate the following country-specific, variable-specific equations

$$\hat{u}_{i\ell t} = \alpha_{i\ell} \bar{\bar{\xi}}_{t-1} + \zeta_{i\ell t},$$

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The macroeconomic impact of volatility innovations

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- $\hat{u}_{i\ell t}$ picks up the GVAR residuals of variable ℓ in country i
- $\bar{\xi}_t$ is the average of the volatility module residuals constructed as

$$\bar{\xi}_t = \frac{1}{M}\sum_{\kappa=1}^{M}\hat{\xi}_{\kappa t}$$

- We define $\bar{\xi}_t$ a **global volatility shock**

Global volatility innovations and GVAR residuals

	GDP		
	α_i^y	t-Stat	R^2
ARGENTINA	0.10	0.88	0.01
AUSTRALIA	0.04	0.71	0.00
BRAZIL	0.04	0.34	0.00
CANADA	0.03	0.96	0.01
CHINA	0.07	0.89	0.01
CHILE	0.07	0.69	0.00
EURO	0.04	1.35	0.01
INDIA	0.09	1.27	0.01
INDONESIA	0.04	0.36	0.00
JAPAN	0.00	0.03	0.00
KOREA	0.24	2.90	0.07
MALAYSIA	-0.04	-0.39	0.00
MEXICO	0.05	0.63	0.00
NORWAY	-0.07	-0.98	0.01
NEW ZEALAND	0.00	-0.02	0.00
PERU	-0.06	-0.33	0.00
PHILIPPINES	0.09	0.93	0.01
SOUTH AFRICA	0.05	1.09	0.01
SAUDI ARABIA	0.38	3.05	0.07
SINGAPORE	-0.06	-0.49	0.00
SWEDEN	0.14	1.88	0.03
SWITZERLAND	0.13	3.53	0.09
THAILAND	0.07	0.75	0.00
TURKEY	0.03	0.19	0.00
UNITED KINGDOM	0.05	1.25	0.01
USA	0.10	2.32	0.04

Global volatility innovations and GVAR residuals

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CHILE	0.07	0.69	0.00
EURO	0.04	1.35	0.01
INDIA	0.09	1.27	0.01
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SINGAPORE	-0.06	-0.49	0.00
SWEDEN	0.14	1.88	0.03
SWITZERLAND	0.13	3.53	0.09
THAILAND	0.07	0.75	0.00
TURKEY	0.03	0.19	0.00
UNITED KINGDOM	0.05	1.25	0.01
USA	0.10	2.32	0.04

	Equity Price		
	α_i^{eq}	t-Stat	R^2
ARGENTINA	4.19	2.33	0.04
AUSTRALIA	0.18	0.31	0.00
BRAZIL	–	–	–
CANADA	0.69	1.36	0.02
CHINA	–	–	–
CHILE	1.08	1.65	0.02
EURO	0.97	1.79	0.03
INDIA	0.44	0.46	0.00
INDONESIA	–	–	–
JAPAN	1.54	2.66	0.06
KOREA	2.11	2.37	0.04
MALAYSIA	2.08	1.88	0.03
MEXICO	–	–	–
NORWAY	1.26	1.38	0.02
NEW ZEALAND	-0.15	-0.28	0.00
PERU	–	–	–
PHILIPPINES	0.99	0.87	0.01
SOUTH AFRICA	0.64	0.94	0.01
SAUDI ARABIA	–	–	–
SINGAPORE	1.67	1.88	0.03
SWEDEN	1.50	1.87	0.03
SWITZERLAND	0.67	1.32	0.01
THAILAND	2.09	2.03	0.03
TURKEY	–	–	–
UNITED KINGDOM	0.33	0.63	0.00
USA	0.54	1.14	0.01

Reconciling our findings with the literature

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  - the macroeconomic variables ($\Delta \mathbf{y}_{it}$) are not allowed to affect volatility ($\mathbf{v}_t$) contemporaneously

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  - the macroeconomic variables $(\Delta \mathbf{y}_{it})$ are not allowed to affect volatility $(\mathbf{v}_t)$ contemporaneously

- **Modified volatility module**

$$\mathbf{v}_t = \mathbf{\Phi}_{1v}\mathbf{v}_{t-1} + \underbrace{\mathbf{\Psi}_{0v}\Delta\bar{\boldsymbol{y}}_t}_{=0} + \mathbf{\Psi}_{1v}\Delta\bar{\boldsymbol{y}}_{t-1} - \underbrace{\mathbf{\Psi}_{0v}\bar{\boldsymbol{\zeta}}^0}_{O_p\left((N+1)^{-1/2}\right)} + \boldsymbol{\zeta}_t^0$$

Modified global volatility innovations and GVAR residuals

	GDP		
	β_i^y	t-Stat	R^2
ARGENTINA	-0.21	-2.23	0.04
AUSTRALIA	-0.03	-0.82	0.01
BRAZIL	-0.29	-3.41	0.09
CANADA	-0.03	-1.09	0.01
CHINA	0.02	0.23	0.00
CHILE	-0.17	-1.89	0.03
EURO	-0.04	-1.88	0.03
INDIA	0.06	0.90	0.01
INDONESIA	-0.16	-1.60	0.02
JAPAN	-0.14	-2.83	0.06
KOREA	-0.21	-3.00	0.07
MALAYSIA	-0.24	-2.67	0.06
MEXICO	-0.01	-0.15	0.00
NORWAY	0.00	-0.06	0.00
NEW ZEALAND	-0.05	-0.88	0.01
PERU	0.06	0.38	0.00
PHILIPPINES	-0.06	-0.69	0.00
SOUTH AFRICA	-0.04	-1.02	0.01
SAUDI ARABIA	0.04	0.33	0.00
SINGAPORE	-0.10	-0.93	0.01
SWEDEN	-0.14	-2.14	0.04
SWITZERLAND	-0.03	-1.03	0.01
THAILAND	-0.22	-2.93	0.07
TURKEY	-0.20	-1.42	0.02
UNITED KINGDOM	-0.07	-1.93	0.03
UNITED STATES	-0.10	-2.97	0.07

Modified global volatility innovations and GVAR residuals

	GDP		
	β_i^y	t-Stat	R^2
ARGENTINA	-0.21	-2.23	0.04
AUSTRALIA	-0.03	-0.82	0.01
BRAZIL	-0.29	-3.41	0.09
CANADA	-0.03	-1.09	0.01
CHINA	0.02	0.23	0.00
CHILE	-0.17	-1.89	0.03
EURO	-0.04	-1.88	0.03
INDIA	0.06	0.90	0.01
INDONESIA	-0.16	-1.60	0.02
JAPAN	-0.14	-2.83	0.06
KOREA	-0.21	-3.00	0.07
MALAYSIA	-0.24	-2.67	0.06
MEXICO	-0.01	-0.15	0.00
NORWAY	0.00	-0.06	0.00
NEW ZEALAND	-0.05	-0.88	0.01
PERU	0.06	0.38	0.00
PHILIPPINES	-0.06	-0.69	0.00
SOUTH AFRICA	-0.04	-1.02	0.01
SAUDI ARABIA	0.04	0.33	0.00
SINGAPORE	-0.10	-0.93	0.01
SWEDEN	-0.14	-2.14	0.04
SWITZERLAND	-0.03	-1.03	0.01
THAILAND	-0.22	-2.93	0.07
TURKEY	-0.20	-1.42	0.02
UNITED KINGDOM	-0.07	-1.93	0.03
UNITED STATES	-0.10	-2.97	0.07

	Equity Price		
	β_i^{eq}	t-Stat	R^2
ARGENTINA	-4.10	-2.74	0.06
AUSTRALIA	-2.05	-4.65	0.15
BRAZIL	–	–	–
CANADA	-2.21	-5.83	0.22
CHINA	–	–	–
CHILE	-1.58	-2.94	0.07
EURO	-2.42	-5.94	0.23
INDIA	-2.54	-3.25	0.08
INDONESIA	–	–	–
JAPAN	-2.23	-4.89	0.16
KOREA	-1.38	-1.82	0.03
MALAYSIA	-2.73	-3.00	0.07
MEXICO	–	–	–
NORWAY	-4.07	-6.00	0.23
NEW ZEALAND	-1.89	-4.59	0.15
PERU	–	–	–
PHILIPPINES	-1.17	-1.23	0.01
SOUTH AFRICA	-1.94	-3.53	0.09
SAUDI ARABIA	–	–	–
SINGAPORE	-3.68	-5.42	0.20
SWEDEN	-2.20	-3.38	0.09
SWITZERLAND	-2.19	-5.70	0.21
THAILAND	-2.15	-2.51	0.05
TURKEY	–	–	–
UNITED KINGDOM	-2.19	-5.65	0.21
UNITED STATES	-2.01	-5.70	0.21

Conclusions

What we do

- A novel approach to study the interrelation between volatility and macroeconomic dynamics

Results and implications

- Volatility shocks have no statistically significant impact on economic activity
- Most of the effect often found in the literature could stem from the fact that volatility is driven by the same common factors that affect the business cycle
- Volatility may be a symptom rather than a cause of economic instability